The Changing Role of Education in the California Labor Market

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Foreword

Today's insistent demands for improving public education are unprecedented in California's history. Governor Gray Davis has repeatedly listed K–12 education as his number-one priority, and respondents to the PPIC Statewide Survey consistently rank education as their greatest public policy concern. Demands for improvement range from increased literacy and higher test scores to reduced dropout rates and major investments in school infrastructure. Rarely has the state had a greater consensus on the importance of one policy issue—and rarely have the solutions been so elusive, both in theory and in practice.

One reason for the lack of consensus on solutions is our limited understanding of the consequences of demographic change. In the decade from 1980 to 1990, California's population grew by six million people. Over half of them came from another state or another country. No other state has experienced this scale of growth in the history of the United States. There are strong currents and eddies of population change under way in California that simply must be understood before

we can improve program effectiveness or set new courses for the 21st century. This study by Julian Betts takes a big step in improving our understanding of the demographic transformations under way, examining the dramatic changes that have occurred in the educational composition of the California workforce over the past 30 years.

The role that California schools and colleges play in the education of the adult population is one key issue addressed by the author. His findings are troubling on one dimension and encouraging on another. First, he concludes that a majority of California's high school dropouts are immigrants and that nearly three-fourths of the immigrants living in California ended their schooling before coming to the United States. In other words, many of the state's residents in need of a solid education are beyond the reach of our formal education programs. Second, at the other end of the education spectrum, our system of higher education acts like a magnet in attracting students from other states and countries. This is also true of the state in general. Betts estimates that just over half of the state's adult labor force who earned bachelor's and higher education degrees between 1970 and 1990 received those degrees in California. The remainder was imported from elsewhere. Thus, California has maintained the magic of the "Golden Dream" for high-skilled workers, and perhaps for many low-skilled workers as well.

Through all of the growth, however, the author notes the continuing trend of high returns to education and the consequence these higher returns have for exacerbating the wage gap between skilled and unskilled workers. California faces the prospect of a continued growing disparity between rich and poor, and the challenge is to address this disparity openly and without unrealistic expectations. The author concludes, "Given the mobility of workers into and out of California, we must be

careful not to lay all of the credit for improvements in the skills of the state workforce at the feet of California's public schools and universities. At the same time, it is equally inappropriate to hold the state's schools and colleges entirely accountable for perceived weaknesses in the educational attainment of Californians." The policy course between these two markers is difficult to define. More investment in education with a continuing expansion of immigration may not change the fundamentals. But a failure to take on the challenge could undermine the attractiveness of the state and imperil its economy. The "right" course will not be an easy one to find, but this latest report from PPIC on education in California provides a chart of the territory that should help bring expectations in line with future possibilities.

David W. Lyon
President and CEO
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Summary

California's labor market has undergone dramatic changes in the past quarter of a century. The distribution of earnings has changed radically, while at the same time the educational composition of the adult population has evolved in rather complex ways.

The goal of this study was to examine the changing role of education in California's labor market, both in an absolute sense and in comparison with the rest of the nation. This report presents a detailed discussion of changes in the educational attainment of the adult population and the role that changes in the geographic origin of the state's residents have played in this regard. The report also analyzes the effect of education on the earnings of the state's residents. The report's principal source of information is Census data from 1970, 1980, and 1990, updated with data from the 1996 and 1997 Current Population Surveys. In some cases, the surveys do not ask questions included in the decennial Census, and in these cases the report's analyses are restricted to the 1970 to 1990 period.

Between 1970 and 1997, the mean years of schooling of California's adult population aged 18 to 65 rose considerably, from 11.9 to 12.6 years. However, increases in educational attainment in the rest of the country dwarfed the increase in California. In 1970, California residents held a one-year advantage in educational attainment over residents in other states; by 1997, California residents on average held only one-quarter year more education. Compared to the rest of the country, California has seen a slight hollowing out of its workforce, in the sense that by 1997 it had a significantly smaller proportion of workers with high school diplomas and a significantly higher proportion who were high school dropouts.[1]

Changes in the geographic origin of California's residents have contributed in important ways to the observed changes in educational attainment. Between 1970 and 1990, the share of immigrants in the overall adult population rose from 10.7 percent to 26.2 percent. Moreover, by 1990, immigrants constituted 54 percent of all high school dropouts in the state's adult population. U.S. natives born outside California have also contributed significantly to the educational mix, although the population share of this group has declined between 1970 and 1990. By 1990, natives born outside the state accounted for only 36 percent of the population but constituted 50 percent of the state's population with postgraduate education, that is, education beyond a bachelor's degree. California natives represent a slowly increasing share of the adult population, rising from 32 percent in 1970 to 38 percent in

[1]In this report, the term *high school dropout* refers to a person who has not completed twelve years of schooling, and *dropout rate* refers to the percentage of eighteen to twenty-four year olds who have not completed twelve years of education. In California, a large percentage of the people included in this category are immigrants who did not attend school in the United States.

1990. This group tends to occupy the middle of the educational distribution, complemented by immigrants who are overrepresented among high school dropouts, and by natives who migrated from other states and who are overrepresented at the "some college," college graduate, and postgraduate levels.

To What Extent Have California's Schools and Colleges Educated the Adult Population?

The large number of California residents who have come to California from other states and countries raises important questions about the extent to which California's schools and universities can affect the educational attainment of the state population. A majority of California's high school dropouts are immigrants. Yet it appears that roughly three-quarters of immigrants living in California left school before immigrating to the United States. At the other end of the educational spectrum, California's universities appear to have produced just over half of the bachelor's and higher degrees that California would have needed to be self-sufficient between 1970 and 1990. Clearly, California imports many highly skilled workers from elsewhere. At the same time, the report uncovers evidence that California's postsecondary system acts like a "college magnet," attracting young students from outside the state. Two pieces of evidence point in this direction. First, in 1990 natives born outside California and immigrants made up 42.4 percent of college students aged 18 to 24 in California, compared to only 34.4 percent of youth aged 13 to 17. Second, in 1990 16 percent of college students aged 18 to 24 in California reported living in other states or abroad in 1985.

Wage Trends in California

Just as the relative supplies of workers of different educational levels have changed in California over time, so has the relative demand for these workers. Together, these shifts in demand and supply have generated changes in earnings. California has undergone a radical change in its distribution of earnings between 1969 and the mid-1990s. In 1969, workers with more than a bachelor's degree enjoyed a modest wage premium of 24 percent relative to high school graduates with otherwise similar backgrounds; by 1996, this premium had skyrocketed to 95 percent. In 1969, dropouts earned 21 percent less than high school graduates, a gap that increased to 29 percent by 1996.

It is not the case that most of the increase in the "returns to education" (that is, the wage gains associated with additional schooling) has been caused by a handful of California's industries. Rather, the trends toward a higher college wage premium seem to be widespread.

Of course, in addition to understanding how the returns to education have changed, it is equally important to understand what happened to real earnings (that is, earnings adjusted for inflation) by educational level. Between 1969 and 1996, workers with postgraduate education experienced a slight increase in real earnings. Workers with bachelor's degrees or "some college" experienced slight declines in real earnings, and workers with a high school diploma or less experienced large declines. Especially hard hit were high school dropouts, whose earnings expressed in 1996 dollars dropped from about $31,000 in 1969 to about $17,000 in 1996.

Comparing Wage Trends in California and the Nation

By any standard the changes noted above are dramatic. But is California's experience unique, or do these wage trends reflect what has happened elsewhere? To a large extent the rest of the nation has experienced the same trends as noted above. But important exceptions emerge. In 1969, the returns to education in California lagged behind those in the nation. Since that time, the returns to education have risen more quickly in California than in the rest of the country, so that by 1996, California had slightly higher returns to education. In 1996, the most significant difference between California and other states was that California exhibited a much larger gap in earnings between high school dropouts and high school graduates.

It is difficult to pinpoint the cause of the widening gap in earnings between high school graduates and dropouts in California relative to the rest of the nation. However, it is noteworthy that the composition of high school dropouts in California has changed markedly over time. Between 1970 and 1990, the proportion of California's dropout population that consisted of immigrants soared from 17 percent to 54 percent. If immigrant high school dropouts have difficulty finding productive job matches in California, it could partly explain the widening gap in earnings between the state's high school graduates and dropouts.

Interestingly, at the college level, the wage structure in California has converged toward that of the rest of the country over time. It is the large discrepancy in earnings at the dropout level that makes the overall returns to education slightly higher overall in California. The convergence in the college wage premium between California and other

states suggests that California's employers compete for college-educated workers in a highly integrated national labor market.

Further evidence that the state's market for skilled labor is best viewed as part of a nationally integrated market comes from analysis by individual industries. The wage gains associated with postsecondary education in a given industry in California and in the rest of the nation appear to be quite highly correlated. In contrast, the wage gap between high school dropouts and high school graduates by industry was not strongly related to corresponding gaps in each industry in the rest of the nation. This finding implies that the market for less skilled labor in a given industry is better characterized as a series of local labor markets rather than one nationally integrated market.

Regional Variations in California

Of course, the evidence presented above does not suggest that California necessarily contains a geographically homogeneous labor market. We found evidence of quite large variations in relative supplies of workers of different education levels across the state's regions, and quite large variations in the returns to education. The areas with the largest spread in earnings between workers with a high school diploma and workers with other education levels were the Los Angeles area, Orange County, and the Central Valley, although in some cases other areas also exhibited quite large wage gaps. The same three regions, along with the Central Coast and the Inland Empire, exhibited the largest gaps in earnings between those with a high school diploma and high school dropouts.

Variations Among Immigrants, Migrants, and Native Californians

We also estimated the returns to education separately for workers in California who are immigrants, California natives, and natives born elsewhere. All three groups exhibit highly similar trends in the returns to education over time. Perhaps most notable among the intergroup differences, the returns to education are smallest for California natives. It was beyond the scope of this report to establish the causes of this discrepancy. One leading explanation is that both immigrants and natives who have migrated to California from other states are a self-selected group. Simple economic theory would argue that neither immigrants nor migrants are likely to be representative of the populations outside California from which they originate. Instead, they are likely to be a self-selected group whose characteristics are particularly well-suited to the needs of the California labor market. In other words, an immigrant or migrant to California is likely to be more productive in the California economy than a randomly selected person from the source country or state would be if transferred to California.

Policy Implications

Several policy implications emerge from the analysis. The increasing disparity in the earnings of highly educated and less highly educated workers in California does increase the incentive for young Californians to attend college. But it seems unlikely that young people from different socioeconomic strata will be equally able to respond to this increased incentive to undertake postsecondary education. Specifically, the large wage reductions that have occurred for those with a high school diploma or less make it more difficult for the children of the disadvantaged to

afford a college education. More generally, the widening of the earnings distribution threatens to rend the fabric that holds California's society together.

A second policy concern is the low educational attainment of immigrants living in California. It might seem that an obvious response is to find ways to improve the education that public schools provide to immigrants. No doubt the public schools play an important role in educating immigrant children and disadvantaged children more generally. But we find evidence that perhaps three-fourths of immigrants in California have ended their schooling before entering the United States. Policymakers thus need to supplement programs in the regular schools with training programs that can help the many adult immigrants who have not graduated from high school.

A third policy consideration is the role of the state's postsecondary institutions in meeting the growing demand for highly skilled workers. Between 1970 and 1990, California's colleges and universities appear to have met about half the increased demand for workers with bachelor's degrees or higher. This is an important achievement, given that only 38 percent of adult Californians in 1990 were born in the state. Evidence suggests that California's colleges might serve as a "magnet" to attract young people to California from other states and countries. At the same time, however, about one-half of college-educated workers are recruited from elsewhere. It thus becomes incumbent upon the state to undertake policies to help guarantee that California can continue to attract skilled labor from within California and other states and countries. Part of the answer may be to expand already large financial support for California's universities, although there is no guarantee that all or even most of the graduates from state universities will remain in California after

graduating. More generally, we cannot know whether expanding support for the state's universities and colleges makes economic sense without conducting a detailed cost-benefit analysis, which lies beyond the scope of this report.

A less obvious but arguably effective strategy for assuring an adequate supply of educated workers is to undertake infrastructural projects that make California an attractive place to live. In the end, government policies that seem to have little to do with the market for skilled workers might prove important in ensuring that California continues to have an adequate supply of college-educated workers.

An underlying and unifying theme throughout this report is that California's labor market imports workers at both ends of the educational spectrum from other states and countries. Clearly, policy analysis of California's labor market and the skills of the labor force must take this into account. Public expenditures on the state's K–12 and university sectors no doubt contribute to the overall supply of skills in the California economy. But the increasing proportion of the state population holding a bachelor's degree cannot be attributed entirely to California's universities. By the same token, alarming statistics about the high share of dropouts in California relative to the rest of the country should not be entirely attributed to a failure of the state's public schools. Indeed, highly mobile immigrants without high school diplomas, most of whom arrived in the United States after leaving school, appear to have contributed in major ways to the increase in the relative share of dropouts in California compared to the rest of the country.

In short, given the mobility of workers into and out of California, we must be careful not to lay all the credit for improvements in the skills of the state work force at the feet of California's public schools and

universities. At the same time, it is equally inappropriate to hold the state's schools and colleges entirely accountable for perceived weaknesses in the educational attainment of Californians.

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Although this report reflects the contributions of many people, the author is solely responsible for its content.

1. Introduction

The dream of "making it" in California's labor market has long hinged upon getting a good education. The emergence of California as a world leader in a number of "high tech" industries including computers, software, and biomedical research has strengthened the popular perception that obtaining a good education is more important than ever for California's youth.

Economists have documented that the economic returns to education have risen substantially between the late 1970s and today.[1] Yet we know surprisingly little about the extent to which trends in the wages of college graduates, high school graduates, and high school dropouts in California mirror wage trends in the nation as a whole.[2] Is it

[1]See, for instance, papers in the *Quarterly Journal of Economics* special issue on inequality (Vol. 107, No. 1, 1992).

[2]In this report, the term *high school dropout* refers to a person who has not completed twelve years of schooling, and *dropout rate* refers to the percentage of eighteen to twenty-four year olds who have not completed twelve years of education. In California, a large percentage of the people included in this category are immigrants who did not attend school in the United States.

true that education is the key to economic success in California? Does the payoff for a college degree in California exceed the payoff observed in other states? Does recent experience in California match the nationally observed shift in labor demand away from less skilled workers, or is this shift in fact stronger or weaker in California? Given the diverse industrial sectors that have spurred economic growth in California since 1970, it becomes equally important to test whether education matters equally in all industries and in all geographic areas. Although Silicon Valley looms large in the public imagination, for policy purposes we need to know whether a college degree confers the same wage gains for workers in all industries and all areas and whether patterns have shifted over time.

These issues lead to an important set of policy questions concerning the ability of California's education sector to provide a supply of skilled workers well matched to the needs of the state's employers.

The first of these policy questions concerns the degree to which California employers depend on the state's secondary and postsecondary education systems to provide them with skilled workers. Simply put, from where do California's skilled workers originate? Are they products of California's system of public schools and colleges? Or do they come from other parts of the country or from other countries altogether? If the increase in the share of college-educated workers in California over the past few decades is accounted for mostly by the flow of freshly minted graduates from California's colleges and universities, it suggests that the state's postsecondary sector has played a crucial role in fulfilling local employers' needs. If, on the other hand, many of California's most skilled workers migrate to California from other states or from outside the country, it creates both benefits and risks for California. It would

suggest that policymakers do not necessarily need to "fine tune" California's postsecondary enrollment to respond to transitory imbalances in the local market for skilled workers. It would also suggest that California, by running a "trade deficit" in skilled workers, has benefited from subsidies that other state governments routinely provide to their university systems. Such a policy, of course, would represent a double-edged sword—changes in demand or supply in the labor markets of other regions of the country could seriously affect California employers' ability to continue to recruit highly skilled workers, thus posing a major risk for the state.

Similar issues apply to the market for workers with high school diplomas or less. Obviously, the state's schools play a key role in preparing students for jobs at both ends of the skill spectrum. But what proportion of California's workers obtained some or all of their primary and secondary education in California? As Chapter 2 demonstrates, between 1970 and 1990 natives born in California remained a minority of California's adult residents, whereas the share of immigrants in this population rose considerably. These facts raise the possibility that California's public schools have reached only one portion of California's adult work force.

A second policy concern is how well California's K–12 schools, four-year colleges, and community colleges have matched supply to demand by geographic region and industry. If the returns to education vary dramatically across regions and industries, it would suggest that a "one-size-fits-all" education policy is unlikely to be appropriate for California.

To address these issues, we analyzed pooled data from the 1970, 1980, and 1990 Censuses of Population, supplemented with data from the 1996 and 1997 rounds of the March Current Population Survey

(CPS). Because the CPS has a much smaller sample than any of the decennial Censuses, we increased precision by combining the 1996 and 1997 CPS data, after adjusting financial variables for changes in the cost of living between 1996 and 1997. This merged dataset offered a detailed and representative portrait of the distribution of earnings and educational attainment among the adult populations of California and the rest of the country. In all census years, information is provided on each person's state of birth (or country of birth for immigrants). The Census and CPS data also contained the information needed to perform the analyses of variations in trends within California and across industries.

Information from the CPS about educational attainment will apply to 1996/97. But because the CPS provides retrospective information on earnings in the year before the survey, the 1996/97 data describe annual earnings in 1995/96.

This report uses the Census/CPS data to answer the following specific questions:

- How did the educational composition of California's workforce change between 1970, 1980, 1990, and 1996/97? Are these changes significantly different from those observed in the rest of the United States?
- To what extent has California's postsecondary education sector met the demand for skilled workers between 1970 and 1996/97? We answer this question in two ways. First, using postsecondary institutions as the unit of observation, we compare the flow of graduates from California's colleges and universities with the growth rate in the number of college-educated working-age adults. This provides an estimate of the extent to which California is self-sufficient in the market for workers with a bachelor's degree or higher. As another approach to the

question, we document the proportion of skilled adults in California who were born in a different state and the proportion who are immigrants.

- Immigrants have played a role in the growing gap between California and the rest of the nation in the share of high school dropouts in the adult population. Approximately what proportion of California's immigrants ended their schooling before entering the United States? If the proportion is large, it challenges simple notions that California's public schools are to blame for the perceived dropout problem in the state.
- Between 1969 and 1995/96, what was the overall trend in the wage premium earned by college graduates? Is it increasingly true that a college education is a prerequisite for individuals who wish to achieve the "California dream" of economic security? Does California stand apart from the rest of the country in how it rewards a college degree? We answer similar questions about the wage gap between those with a high school diploma and those who drop out of school.
- How do these trends vary across regional and industrial sectors in California? Is it appropriate to think of California's labor market as a uniform entity, or would policymakers do better to draft plans for the postsecondary sector that view California as a series of highly local and industry-specific labor markets?
- To what extent can variations in workers' educational attainment explain variations in earnings across regions, across industries, and between immigrants, California natives, and natives who migrated to California from other states?

The next two chapters, which focus on the number of adults in California by education level, provide a snapshot of workers available from this merged dataset. The subsequent two chapters focus on patterns in annual earnings. Because the surveys ask retrospective

questions about earnings in the prior year, the analysis of earnings covers the years 1969, 1979, 1989, and 1995/96.

The CPS, which is used to bring 1996/97 information into the study, is quite similar in structure to the Census. However, some of the questions in the Census are not repeated in the CPS. In such cases, we focus on the period 1970 through 1990 rather than through 1996/97.

Because it is not possible to know with certainty where a person received his or her education, it is important to supplement the Census analysis with administrative data that report community college and four-year college graduation data. Since the 1960s, the U.S. Department of Education has sponsored a census of postsecondary institutions that provides the required information. This survey, the Integrated Postsecondary Education Data System (IPEDS), is the successor to the earlier but similarly structured Higher Education General Education Information Survey (HEGIS). These data are used to examine to what extent California's college system has met the growing demand for workers with a college education between 1970 and 1990.

Appendix A contains a detailed description of data sources, data cleaning, and variable and sample definitions.

2. The Changing Skill Mix in California: Trends and Sources of Workers by Education Level

Trends in Educational Attainment in California and the Rest of the United States

Between 1970 and 1980, the average years of schooling in the adult population of California rose sharply. However, as shown in Figure 2.1, this growth slowed considerably, nearly flattening out between 1980 and 1996/97. Overall, mean years of schooling increased by about two-thirds of a year between 1970 and 1996/97, suggesting that the average stock of skills, or "human capital," increased considerably in California over time.[1]

[1]This section presents educational attainment in two ways, first using a single number—the mean years of education completed—and then using a more detailed breakdown by educational category. The first measure is the more effective at giving a

NOTE: All figures are based on the author's calculations. See Appendix A for details.

Figure 2.1—Mean Years of Education of Adults in California

How does California's pattern of rising educational attainment, especially between 1970 and 1980, compare to trends in the rest of the country? As shown in Figure 2.2, California's adult population was much more highly educated than the population in the rest of the country in 1970. However, by 1980 this advantage had diminished, and by 1990 it had almost disappeared.

To gain insight into the story behind these lines, it is useful to examine what happened in specific categories of educational attainment. Table 2.1 shows this for five categories: high school dropout (fewer than

snapshot of educational attainment because it is a single number. However, the detailed breakdowns reveal important subtleties. In addition, the Bureau of the Census changed its survey question on educational attainment in the 1990 Census, which makes it impossible to provide perfectly consistent measures of years of educational attainment over time. See Appendix A for details. This problem is mitigated somewhat by the use of the five-level categorization we employ. For this reason, most of the report focuses on the categorical measure of educational attainment.

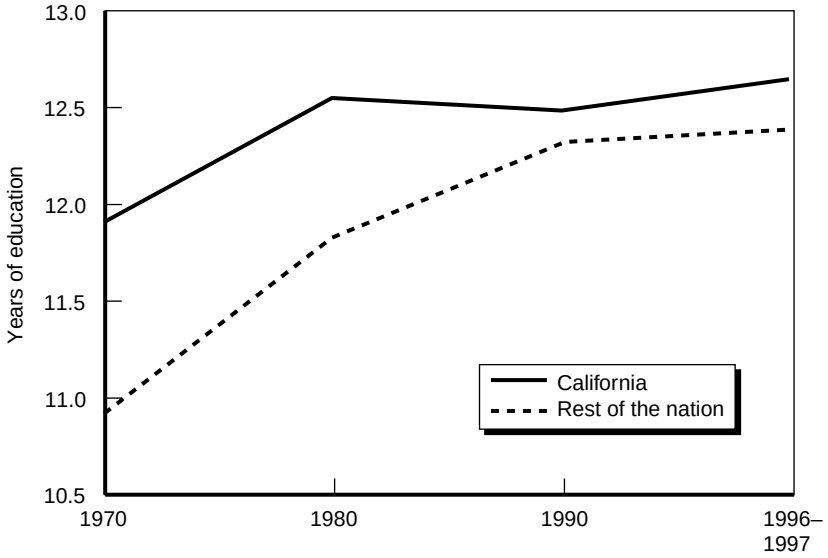

Figure 2.2—Mean Years of Education of Adults in California and the Rest of the Nation

12 years of schooling), high school graduate, some college, a bachelor's degree (measured as 16 years of schooling in years before 1990), and postgraduate education (i.e., additional postsecondary training after a bachelor's degree). The top panel shows trends in California and the bottom panel shows trends elsewhere.

We see a large decline in the proportion of adults in California holding a high school diploma or less and a sharp increase in the proportion who have at least some postsecondary education or a bachelor's degree. The proportion with a postgraduate degree has remained quite stable over the decades, on the order of 6–9 percent. This table presents a picture similar to that in Figure 2.1. The

Table 2.1

Percentage Distribution of Adult Population by Years of Education for California and the Rest of the Nation

Years of Education	1970	1980	1990	1996/97
California				
<12	30.3	23.0	22.5	20.1
12	32.1	28.8	22.1	23.9
Some college (13–15)	24.3	30.2	33.0	30.6
16	7.0	8.8	15.0	17.9
>16	6.3	9.2	7.4	7.5
Rest of the Nation				
<12	40.4	27.1	19.5	15.2
12	34.3	35.6	31.8	34.5
Some college (13–15)	14.7	22.0	28.6	27.7
16	6.4	8.5	13.4	15.6
>16	4.2	6.7	6.7	7.1

educational attainment of California's adult population has clearly increased over time. The table also shows that the main reasons for the slow-down in the rate of growth of educational attainment after 1980 was a cessation in growth of the proportion of the population holding "some college" education and a decrease in the proportion with postgraduate education. In contrast, growth in the proportion of the population holding a bachelor's degree continued unabated after 1980.

How did the rest of the country catch up with California? Did other states gain relative to California in the postgraduate category, or was it at the bachelor's or sub-baccalaureate levels that the population elsewhere began to surpass the population of California? A comparison of trends in California and other states suggests that the main divergence occurred among high school dropouts. The bottom panel of Table 2.1 shows the growth in the educational breakdown of residents of other states. The difference in the percentage of the California population and the "rest-of-nation" population in each educational category is depicted in Figure

2.3. (The data underlying this figure are shown in Appendix Table A.4.) The patterns revealed in the figure are telling. In 1970, California had 10.1 percent fewer dropouts in its population than did the rest of the country, but by 1996/97 it had 4.9 percent *more*. The second most important factor in California's relative decline in educational attainment during this period was a drop of over 6.5 percentage points in the relative share of the adult population holding some college education below a four-year college degree. Changes in the proportions of the California population holding a college or postgraduate degree relative to the population elsewhere were relatively minor.

What do the raw trends, and the trends relative to the rest of the country, imply? First, because Census and other data indicate that

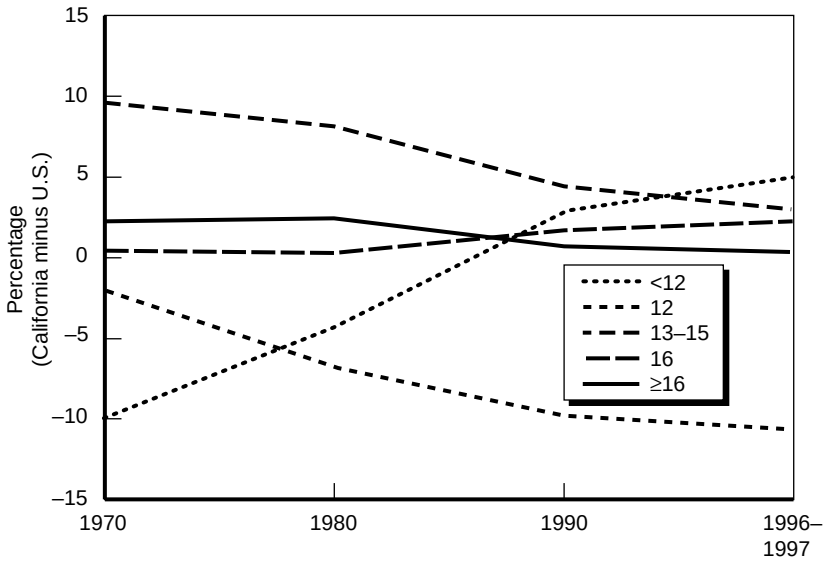

Figure 2.3—Percentage of Adult Population in Each Education Category in California Minus the Corresponding Percentage in the Rest of the Nation

education is strongly and positively related to earnings, the undeniable improvement in the average educational attainment of Californians over the two and a half decade period suggests that the adult population is more productive now than in the past. Second, Figure 2.3 reveals that California has not lost ground to other states at the bachelor's or higher levels but has lost considerable ground in the share of the population holding only a high school diploma or 13–15 years of schooling. At the same time, the share of dropouts in California compared to elsewhere has risen steeply. The skyrocketing proportion of Californians who are high school dropouts *relative* to the proportion in the rest of the United States is a cause for genuine concern. Less educated adults are likely to face more social and economic difficulties and are more likely to depend upon government assistance. In addition, to the extent that a highly educated work force is a prerequisite for rapid economic growth, the data suggest that California's economy may have lost some comparative advantage over time.

Table 2.1 and Figure 2.3 also deliver a more subtle message about the degree of equality in educational attainment of California's population relative to that in the rest of the country. In 1970, only 30.3 percent of California's population were dropouts, compared to 40.4 percent elsewhere. Californians were also "bunched in the middle," with far more holding some college education than was true elsewhere. Over time, relative to the rest of the nation, California has witnessed a "hollowing out" of its population, with sharply declining relative shares of adults holding a high school diploma or "some college" and a sharply rising relative share holding less than a high school diploma. Little change relative to the rest of the country has occurred at the bachelor's or higher levels. Figure 2.4 illustrates that, compared to the rest of the

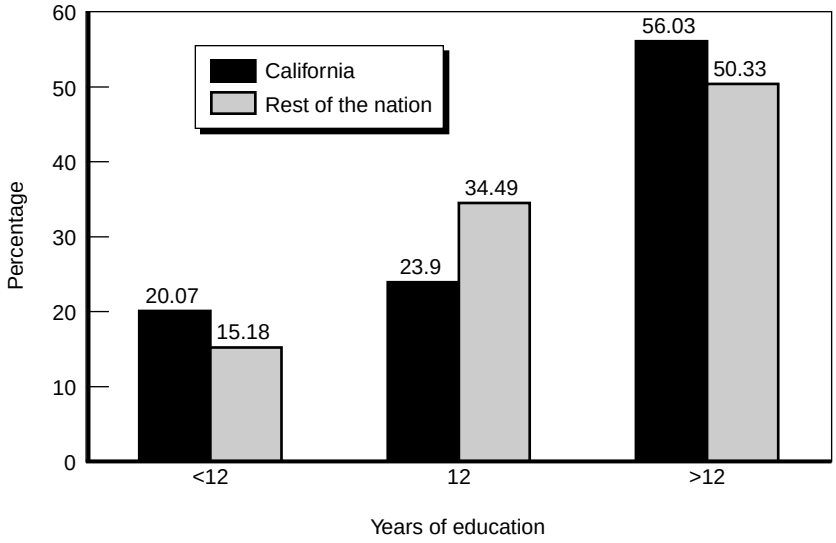

Figure 2.4—Percentage of Adult Population by Years of Education in California and the Rest of the Nation, 1996/97

country, California has a greater share of the population with low levels of education and fewer in the middle. Table 2.1 establishes that this is a relatively recent phenomenon.

As shown below, the changing geographic origin of the state's residents plays a key role in explaining the widening educational distribution in California.

Sources of California's Population by Education Level

Numerous reports (for example, Borjas, 1994; Smith and Edmonston, 1998; and Betts and Lofstrom, 2000) have shown that, at the national level, immigrants' educational attainment has lagged that of natives over the past several decades. The gap has widened considerably

since 1980. This divergence assumes particular importance for California because of the state's unusually large immigrant population. Reed (1999) explores changes in the distribution of earnings in California over the past 30 years and establishes that the rising share of immigrants in the population plays a major role in rising earnings inequality within California. With this in mind, this section explores the relative levels of educational attainment of immigrants and natives in California.

Just as immigrants in California are likely to differ from natives in their level of skills, or "human capital," it stands to reason that natives who have migrated to California from other states vary from natives born in state in their educational attainment. After all, migrants from other states, or perhaps their families as a unit, have consciously decided to migrate to California. This self-selected group is likely to differ in measurable ways from natives born in other states who never migrated to California. More to the point, they may differ from California natives.[2] For instance, the lure of Silicon Valley and California's burgeoning biotechnology industries is likely to have attracted some of the nation's and other countries' most talented and most highly educated scientists and engineers.

Table 2.2 shows that California is indeed a state of immigrants and migrants. It is true that between 1970 and 1990 the proportion of California's adult population that consists of California natives rose from 31.6 percent to 38.3 percent, but still in 1990, well over half of Californians were natives from other states or immigrants from other countries. Over this period, the share of immigrants in the adult

[2]In the rest of this report, the term "California natives" refers to U.S. natives born in California.

Table 2.2

Sources of California's Adult Population
by Year and Birthplace

	1970	1980	1990
California native	31.6	36.8	38.3
Native, born elsewhere	57.7	45.9	35.5
Immigrant	10.7	17.2	26.2

population more than doubled, to 26.6 percent, whereas the share of migrants from other states fell by just over a third, to 35.5 percent.

Figure 2.5 shows mean years of schooling by year for four groups (immigrants and natives in California and the rest of the United States). The figure shows that natives in California have maintained the greatest number of years of schooling throughout the period, followed closely by

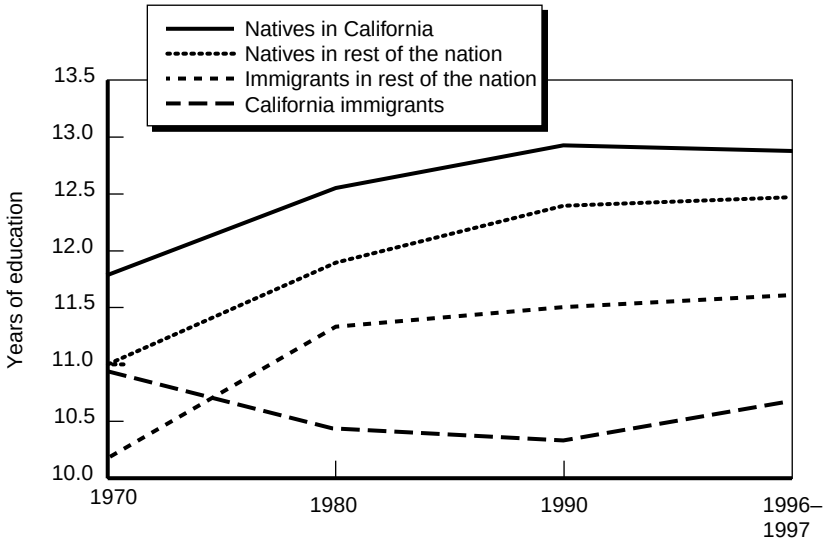

Figure 2.5—Years of Education of Immigrants and Natives Living in California and the Rest of the Nation

natives living in other states. Immigrants have lagged their native counterparts in both California and the rest of the country throughout the period.

The education levels of immigrants in California and the rest of the nation have followed divergent paths. In 1970 immigrants in California had more education than immigrants elsewhere. But by 1996/97, the educational attainment of immigrants in California lagged that of immigrants elsewhere by almost a full year.

By 1996/97 the gap in mean years of schooling between natives and immigrants in California was about *twice* the gap in the rest of the United States. This finding suggests that a widening immigrant/native disparity has contributed to the widening in the overall inequality in education between Californians that the previous section showed has occurred since 1970.

Table 2.3 delves further into variations in the educational attainment of Californians by their geographic origin. The table shows changes between 1970 and 1990 in the educational attainment of immigrants and natives, this time further subdividing natives into those born in California and those born elsewhere. By far, the most dramatic change over the period is a marked increase in the dispersion of educational attainment *across* groups between 1970 and 1990. Educational attainment increased in all three groups, but immigrants exhibited the smallest increase and natives born in the rest of the country exhibited the largest increase. The proportion of immigrants who hold less than a high school diploma declined only 2.1 percent between 1970 and 1990, compared to drops of 8 percent and 18 percent for California natives and natives born elsewhere, respectively. By 1990, the share of immigrants with less than a high school diploma was three times that for California

Table 2.3

Years of Education of California Residents by Birthplace

Years of Education	Immigrant	California Native	Native Born Elsewhere
	1970		
<12	48.3	23.0	30.9
12	24.4	34.0	32.6
Some college (13–15)	16.8	30.8	22.2
16	5.2	6.8	7.4
>16	5.4	5.5	6.9
	1990		
<12	46.2	15.1	13.0
12	16.5	25.9	22.0
Some college (13–15)	20.2	39.3	35.7
16	11.2	14.2	18.8
>16	5.9	5.5	10.5
	Change, 1970–1990		
<12	–2.1	–8.0	–18.0
12	–7.9	–8.1	–10.5
Some college (13–15)	3.4	8.6	13.6
16	6.0	7.5	11.4
>16	0.6	0.0	3.6

NOTE: Columns in 1970 and 1990 sum to 100 percent.

natives and three and a half times that for natives born elsewhere. Important differences also emerge at the top end of the distribution in 1990. In 1970 the shares of each group with a bachelor's degree or higher were quite similar. By 1990 natives born elsewhere had significantly larger shares of population in these categories than did immigrants or even California natives.

Table 2.3 shows how the educational mix of immigrants and the two native groups has evolved over time, but it gives no indication of the shares of each group in each educational category. For instance, the table cannot tell us how the shares of immigrants and natives in the population

of high school dropouts changed over the period. The next figures and tables deal with this issue.

Figure 2.6 shows the proportion of immigrants, California natives, and natives born elsewhere in each educational category in 1990. The figure indicates that in 1990, California natives contributed most strongly to the middle educational groups—those with a high school diploma or some college (13–15 years of education). California's large community college sector may have contributed to the high representation of California natives in the "some college" category. Looking at the ends of the spectrum, over one-half of the dropouts in

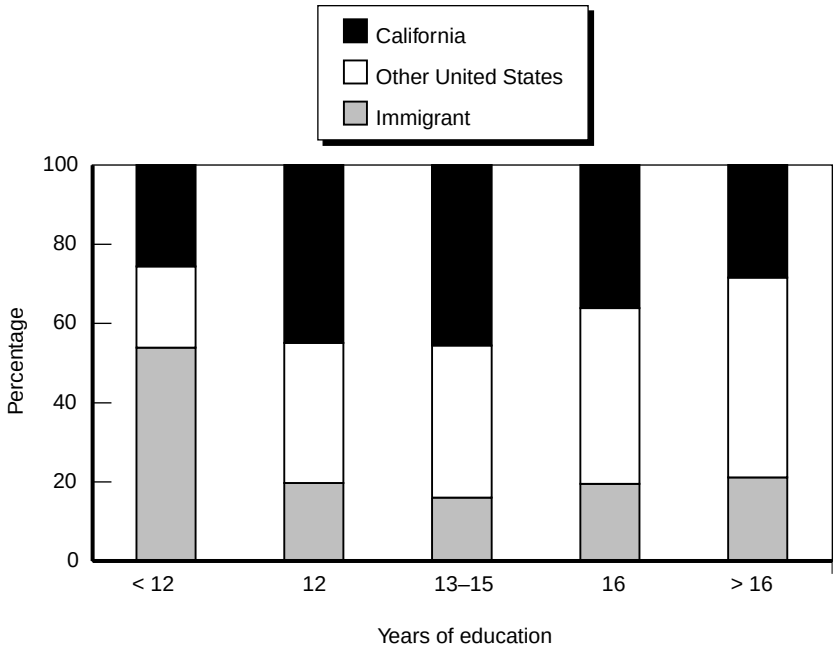

Figure 2.6—Percentage of California's Adult Population by Years of Education and Birthplace, 1990

1990 were immigrants, and natives born elsewhere contributed a greater proportion of the population at the bachelor's and postgraduate levels.

Of course, one cannot tell from place of birth whether natives born elsewhere, or even immigrants, obtained any or all of their education after arriving in California. Regardless, it seems clear that immigrants differ radically from either type of native in educational attainment. Similarly, natives born elsewhere have more education than their counterparts born in California. It is likely that this disparity partly reflects the selective nature of migration by adults to California from other states. The hypothesis that natives who have migrated to California from other states self-select from the top end of the educational distribution of other states is certainly borne out by a comparison of Figures 2.5 and 2.6. The former shows that natives in other states have less education than California natives; the latter shows that natives in California who were born elsewhere have higher educational attainment than California natives.

Table 2.4 presents the data underlying Figure 2.6, and in addition shows the changes over the two-decade period between 1970 and 1990. Perhaps the most remarkable change in the makeup of any educational group is at the dropout level. In 1970, the majority of dropouts were natives from outside California, with immigrants making up about one-fifth of dropouts. By 1990, this situation had nearly reversed itself, with immigrants constituting a majority of dropouts.

The table also shows that the share of natives born elsewhere was much higher at all levels of education in 1970 than in 1990. The declines reflect the slowing down of migration from other states to California over the past several decades.

Table 2.4

Sources of California's Adult Population by Year, Birthplace, and Years of Education

Years of Education	Immigrant	California Native	Native Born Elsewhere
	1970		
<12	17.1	24.0	58.9
12	8.2	33.4	58.4
Some college (13–15)	7.4	40.0	52.6
16	8.0	30.6	61.5
>16	9.2	27.3	63.5
Overall population share	10.7	31.6	57.7
	1990		
<12	53.9	25.6	20.5
12	19.6	45.0	35.4
Some college (13–15)	16.0	45.6	38.4
16	19.4	36.2	44.4
>16	21.1	28.5	50.4
Overall population share	26.2	38.3	35.5
	Change, 1970–1990		
<12	36.8	1.7	–38.4
12	11.5	11.6	–23.0
Some college (13–15)	8.6	5.6	–14.2
16	11.5	5.6	–17.1
>16	11.9	1.2	–13.1
Overall population share	15.5	6.7	–22.2

NOTE: Rows in 1970 and 1990 sum to 100 percent.

Given the radical change in the source of California's adult population, and the differences in the way educational attainment has evolved within each group, it becomes useful to ask some "what if" questions to determine whether changes in the population mix or changes in educational attainment within population groups have contributed more to observed trends. First, suppose that the population shares of immigrants, California natives, and natives born elsewhere had

changed as observed, but educational attainment within each group had remained at its 1970 level. How would overall educational attainment have changed? Second, suppose that the educational attainment within each group had changed as observed but that population shares had remained constant between 1970 and 1990. How would the overall educational attainment of California's adult population have been affected?

Table 2.5 shows the results. The first row shows the percentage change in the share of the population at each education level between 1970 and 1990. The second row shows what would have happened if the population shares of immigrants and natives in California had both grown as observed, and the share of natives born elsewhere had declined as observed, but educational attainment had remained constant within each group. The predicted changes differ dramatically from the actual changes. The only group that would have increased its share of the adult population is high school dropouts. The shares of all the other more highly educated groups would have fallen. This dramatic result mainly reflects the 15.5 percent increase in the share of immigrants in

Table 2.5

Percentage Change in Education Shares

Scenario	Less Than High School Diploma	High School Diploma	Some College	Bachelor's Degree	More Than Bachelor's Degree
Actual change 1970–1990	–7.8	–10.1	8.7	8.1	1.1
Predicted change if population shares changed but education levels stayed constant	2.2	–1.2	–0.3	–0.4	–0.3
Predicted change if population shares stayed constant but education mix of each group changed	–13.1	–9.5	10.9	9.6	2.1

California's population between 1970 and 1990. The third row shows the predicted change in the "educational mix" if population shares had remained constant but within the three groups educational attainment had risen between 1970 and 1990 as observed (and shown in the bottom panel of Table 2.3). The predicted changes roughly resemble the actual decline in the share of high school dropouts and graduates, but the predicted effects are larger than the actual case. Note that the two predicted scenarios bracket the real-world changes. This table conveys the message that educational attainment in California would have grown much more quickly between 1970 and 1990 if the shares of immigrants and the two sources of natives had remained constant. The rapid increase in the share of immigrants, the least highly educated group, slowed down the rise in overall educational attainment considerably.

This section has established that since at least 1970 California natives have constituted a minority of the adult population in the state. This group is more heavily represented than immigrants or natives born elsewhere at intermediate levels of educational attainment and more weakly represented at the two extremes of the educational distribution. Immigrants have played an increasingly important role in the population of dropouts. In contrast, natives from out of state have constituted smaller proportions of each educational group over time but have been and continue to be most heavily represented at the bachelor's degree or higher levels of education.

Regional Variations in Educational Attainment in 1990

To examine how the educational attainment of California's residents differs throughout the state, we first divided the state's counties into ten

regions, based on an informal analysis of population distributions, types of industry, and terrain.[3] Figure 2.7 shows the ten regions, with the fainter lines showing county boundaries. As may be apparent to the reader, the ten regions in Figure 2.7 are defined first as geographically

Figure 2.7—Ten Regions of California and the Underlying Counties

[3]I thank Hans Johnson for helpful discussions about possible ways of combining California's counties into regions.

contiguous, and second in terms of the mix of industries within each area.

Table 2.6 shows the mean level of education of adults in each region in 1990, along with the percentage of the population in each educational category. The table shows dramatic variations in mean educational attainment across regions, from a high of 13.3 years in the Bay Area to a low of 11.5 years in the Central Valley.[4]

Figures 2.8, 2.9, and 2.10 use shading to show variations in the mean years of education by region, the proportion of the adult population with less than 12 years of education, and the proportion with 16 or more years of education, respectively. The figures show differing

Table 2.6

Detailed Educational Distribution by Geographical Area, 1990

County/County Group	Mean Years of Education	Percentage of Population by Years of Education				
		<12	12	13–15	16	>16
Northern California	12.66	19	28	38	12	5
Bay Area	13.29	14	21	34	20	11
Greater Sacramento	12.95	16	24	38	15	7
Central Valley	11.54	31	25	30	9	4
Central Coast	12.61	20	21	37	15	8
Los Angeles area	12.05	28	21	30	14	7
Orange County	12.80	19	20	35	18	8
San Diego County	12.88	18	22	37	16	8
Inland Empire	12.14	25	27	34	9	4
Sierra Nevada/Foothills	12.84	14	34	36	12	4

NOTE: In some regions percentages do not sum to 100 because of rounding.

[4]Appendix Table A.5 lists the same information for each county in the state. (In several cases, two or more counties are combined, because of the geographical aggregations used in the 1990 Census data from which the estimates were generated.) This table shows even more variation than Table 2.6 in the level of education across areas. However, the estimates for these smaller areas are much less precise than for the ten-region aggregation because of small samples in some of the counties or county aggregates.

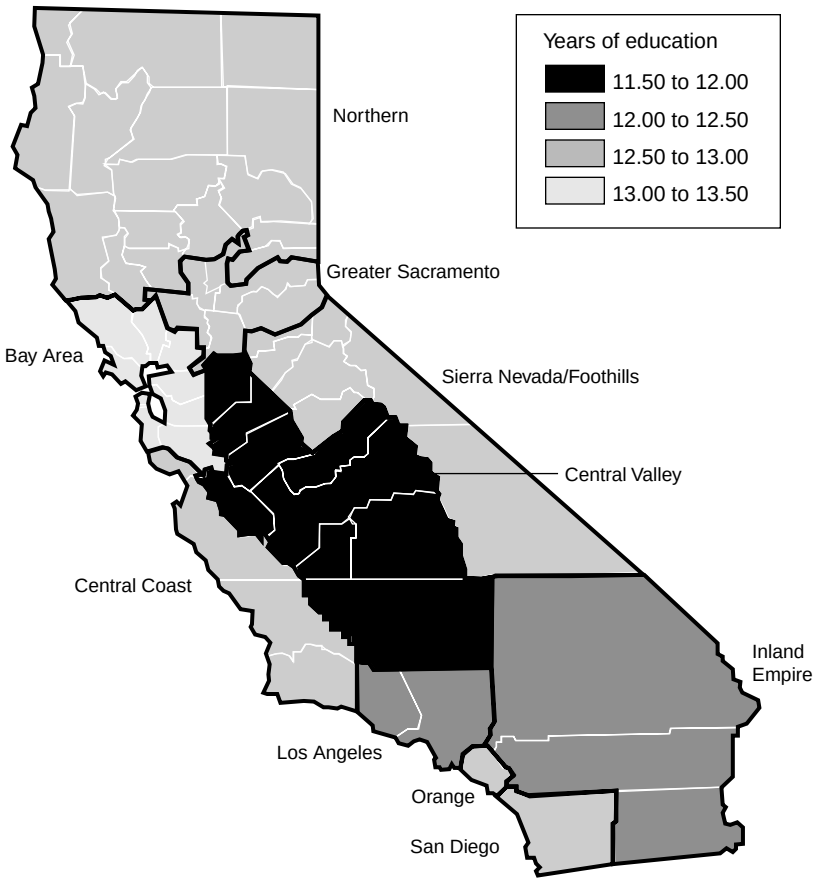

Figure 2.8—Mean Years of Education of Adult Population by Region, 1990

gradations of the same story: the Bay Area stands out as the region with the most highly educated workers, and the Central Valley and, to a lesser extent, the Inland Empire stand out as regions with populations that rank at the bottom in terms of educational attainment.

Some readers may be surprised to see that the Los Angeles region ranks far behind other coastal areas in terms of educational attainment. Even the relatively unpopulated Central Coast area boasts higher levels of

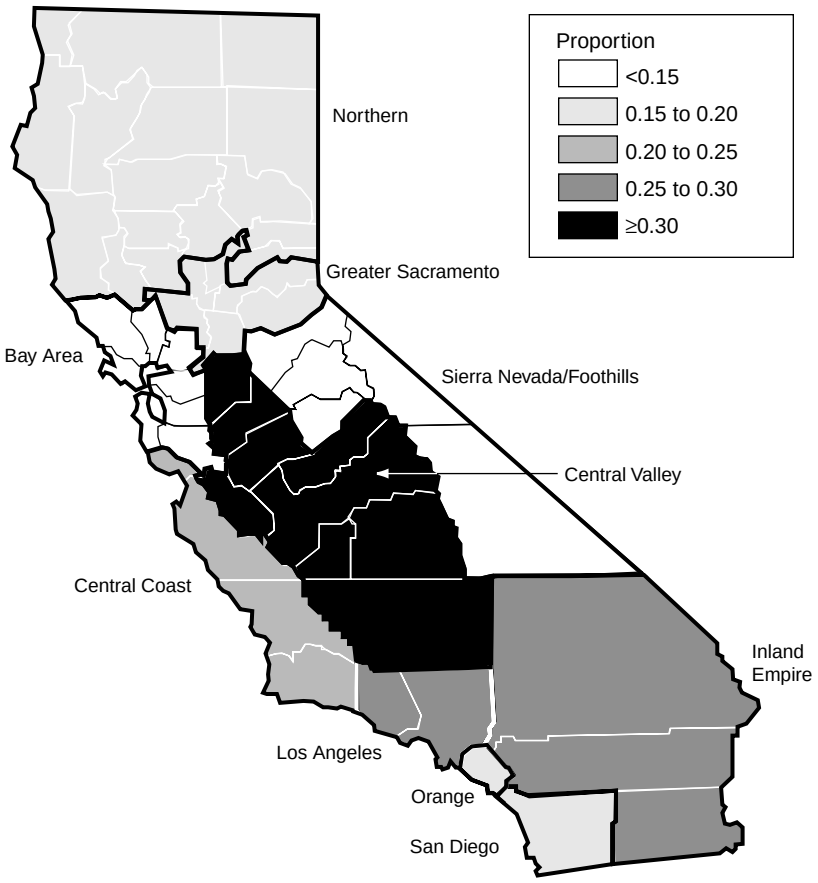

Figure 2.9—Proportion of the Adult Population with Less Than 12 Years of Education by Region, 1990

education. The large immigrant population in the Los Angeles area, combined with the relatively large size of industries such as garment fabrication there, may partly explain the discrepancy.[5]

[5]As Appendix Table A.5 shows, within the Los Angeles region, Ventura County residents are significantly better educated than their counterparts in Los Angeles County proper (12.7 years compared to just 12.0 years). If anything, then, the figure overstates the educational attainment of the adult population of Los Angeles.

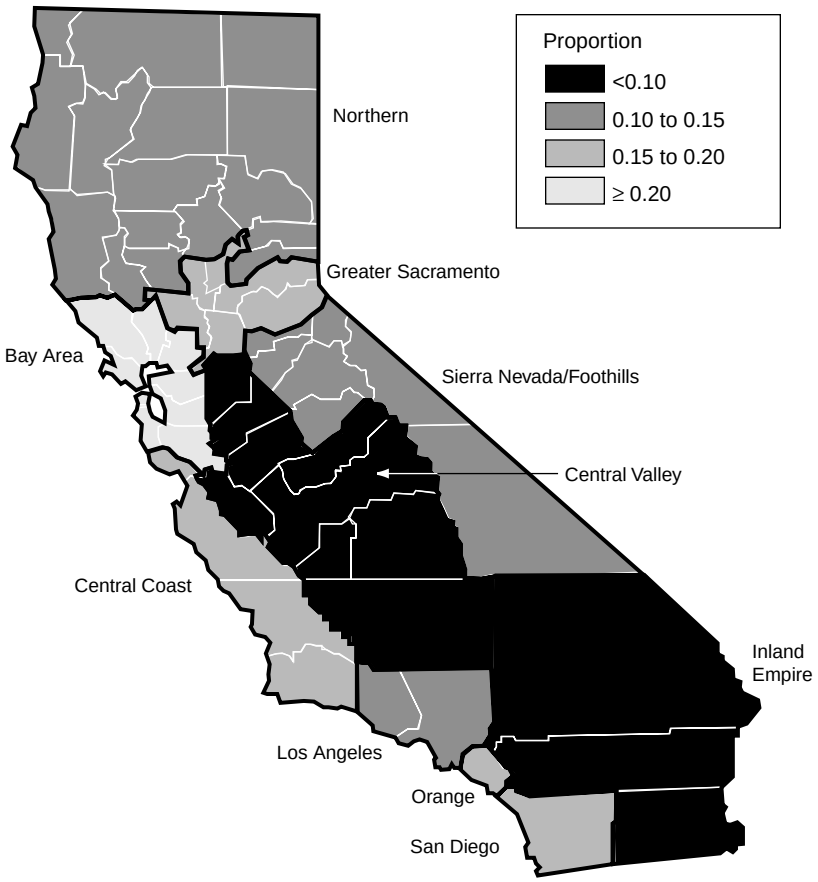

Figure 2.10—Proportion of the Adult Population with At Least 16 Years of Education by Region, 1990

What do these results suggest about the notion of a unified labor market within California? From an economist's perspective, in an economy that allows free movement of labor between areas, relative numbers of workers by skill level could well differ between regions.

Indeed, such variations should be expected if firms' capital stock is relatively fixed and workers can move freely. It certainly is the case that many industries, especially primary industries such as agriculture, are relatively fixed geographically. If the price system is working effectively, then workers will migrate within the state to fill the most attractive job openings given their own levels of education. This process should continue until the earnings of workers at each level of education are approximately equalized across regions.

In other words, the only sure way to tell whether California operates as one large labor market or as many smaller markets is to test for equalization of earnings across regions for workers at each level of education. (In fact, given variations in the cost of living between regions, a more appropriate test is to examine whether the returns to education, that is, the gains from additional education, are similar among regions.) Chapter 4 will address this question.

This chapter has established that workers living in various California regions differ markedly in their level of education. Chapter 5 will not only test for equality of earnings by education level across regions but will also show the extent to which these marked variations in human capital across regions can explain variations in overall earnings by region.

Conclusions

Over the past three decades, the population of California has proven amazingly dynamic. In 1990, California natives constituted 38 percent of the population, and immigrants and natives born elsewhere accounted for the remaining 62 percent. The two main streams feeding the California population—migrants from other states and immigrants from abroad—have varied in relative importance. As shown in Table 2.4, the

flow of migrants from other states has declined somewhat over time, whereas the flow of immigrants from other countries has grown in volume considerably over the decades. The population of California natives has in fact become a relatively more important source of workers over time, but the state still relies mostly on streams of migrants and immigrants for its continued growth.

Just as the educational attainment of California residents varies significantly with their geographic origin, within California the educational attainment of the population differs considerably from one region to another. In 1990, the San Francisco Bay Area had the most highly educated population, followed by the Greater Sacramento and San Diego areas. Residents of the Central Valley had by far the lowest level of educational attainment, with 11.5 years of schooling on average, compared to 13.3 years among residents in the Bay Area. Somewhat surprisingly, the Los Angeles area had the second lowest level of educational attainment, with only 12.1 years of schooling among the adult population. The status of Los Angeles as one of the prime "gateway" cities for immigrants to the United States may play a role in this lower-than-average level of educational attainment.

Given that California has received a disproportionate share of immigrants in recent years, one could make a case that the rest of the United States should have experienced fewer shocks to the educational mix of its population than did California. And yet, there is a central irony in all of this. Between 1970 and 1996/97, the overall educational attainment of the population in the rest of the country has risen more than it has in California. In other words, despite the turbulent changes in the sources of California's population since 1970, California's overall

population has changed *less* in terms of mean educational attainment than has the rest of the country.

But beneath the surface, California's population has become increasingly diverse, even though its mean years of schooling has not risen as rapidly as elsewhere. By 1996/97, California, reflecting the diverse streams feeding its population growth, had more adults at both the top *and* the bottom of the educational distribution than did the rest of the country. It is interesting to note that California natives occupy the middle of the educational distribution, whereas natives who migrated to California from other states occupy the upper end of the educational distribution, and immigrants occupy mainly the bottom end.

Overall, by 1990 California's immigrants were significantly less educated than immigrants in the rest of the country. In other words, the immigrant stream into California differs in important ways from the immigrant stream elsewhere in the United States. In contrast, throughout the period under study, California natives have had slightly more years of schooling than have natives living in the rest of the country. These disparities contribute to the larger degree of dispersion in educational attainment in California than in the rest of the United States.

It is extremely difficult to prescribe the type of imported workers from other states or countries that is "best" for California. However, simple economic principles do argue in favor of the idea that a society will benefit most economically by importing from elsewhere workers whose skill levels differ considerably from those of local workers. Borjas (1998b) argues that if workers of different skill levels are complements, so that more skilled workers become more productive if they can work together with less skilled workers, and vice versa, then imported workers

should ideally have quite different skill levels from those of the local population. But what should be done in the case of California, where the state's natives occupy the middle of the skill distribution?

Would the economy do best if workers from elsewhere were much more skilled, as is the case on average for natives from other states, or much less skilled, as is the case on average for immigrants? Borjas extends his simple model by adding physical capital. He concludes from empirical evidence that highly skilled labor is particularly complementary with capital. Thus, a society with "average" skill levels might do best to import more skilled, rather than less skilled, workers.[6]

To be sure, this simple model abstracts from some extremely important uncertainties about the way workers of various skill levels affect each other's productivity and the productivity of capital owned by local firms. It also ignores noneconomic considerations that a society must consider when deciding on the optimal mix of workers across skill classes and, indeed, on the value of a multicultural society.[7] But one result from the economic model is quite robust—a society gains by importing workers whose skill levels are quite different from those of local workers. This appears to match trends in California over the past quarter century, as California natives dominate at middle levels of education, and natives from elsewhere and immigrants have provided

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[6]The economic argument here is that a society that imports skilled workers will benefit not only from complementarity between these workers and less skilled natives from the local area but also from complementarity between the skilled labor and capital. Higher profits will presumably flow to local shareholders.

[7]Freeman (1998) also raises the important issue of the endogeneity of society in a world with migration and immigration: who "is" society if the population continually changes? Should all policy changes benefit only those who are in a region now, or should policymakers instead think of the interests of all the people who will reside in the area ten years from now?

considerably higher and considerably lower levels of educational attainment, respectively. By this measure, California might have done quite well by importing workers whose skills differ dramatically from those of natives born in state.

The importance of immigrants at lower educational levels and of migrants from out of state at higher education levels leads to the following policy-related question. To what extent have California's schools and universities provided education to the state's adult population? The next chapter addresses this issue.

3. Implications of Migration and Immigration for California's Schools and Universities

Migrants and immigrants are significantly represented in the populations of California's college graduates and high school dropouts, respectively. In this chapter, we seek to answer the question: "How many college graduates and high school dropouts were educated outside California?" The answer can provide insights about the extent to which California's K–12 and postsecondary education sectors have contributed to the education of the most highly and least highly educated residents of the state.

In the next section, we estimate the number of adults with a bachelor's degree or higher who between 1970 and 1990 entered California's pool of adults aged 18 to 65. We then calculate the proportion of these adults who graduated from California universities. The subsequent section focuses on the other end of the educational spectrum by asking: "What proportion of immigrants living in California

have obtained their K–12 education in California?" If this proportion is low, it suggests that California's K–12 system may not represent the ideal policy tool for improving the skill level among California's least highly educated immigrants.

How Self-Sufficient Is California in the Market for College-Educated Workers?

Figure 2.6 and Table 2.4 in the previous chapter show that in 1990 only about one-third of Californians with a bachelor's degree or higher were natives born in state. Does this imply that California's colleges have provided the state's employers with similarly small fractions of college-educated workers? The answer, of course, is no. Many migrants and immigrants to California will have moved to California at a sufficiently young age to have obtained most if not all of their education in state. The Census data that form the backbone of this report are not particularly well-suited to answering the question of how many college graduates California imports from elsewhere. The mere fact that a California resident was born in New York does not necessarily imply that he or she obtained a college degree outside California.

To address the issue of how many college graduates in California were trained in California's colleges and universities, this section reports on the following "thought experiment." Suppose that between 1970 and 1990 California did not import any college-educated workers from other states or from abroad. At the same time, assume that all those who received bachelor's or higher degrees in California remained in state. We can use information on degrees granted in California to estimate the overall increase in the adult population in California who would have held bachelor's or higher degrees between 1970 and 1990. We then use

Census data to calculate the actual change in the number of people in California holding bachelor's or higher degrees during this period and compare the two figures to answer how self-sufficient California was over this period in producing college graduates. To take a hypothetical example, if California's universities produced 750,000 bachelor's graduates over the period, but Census data indicate that the total actual increase in the number of people in California holding a bachelor's degree was 1,000,000, then we would conclude that California's universities supplied 750,000/1,000,000 = 0.75, or 75 percent, of the actual increase in the number of highly educated people living in the state.[1] This affords an estimate of the degree to which California is self-sufficient in the market for college-educated workers.

We derived data on degrees from the HEGIS/IPEDS surveys described in Chapter 1 and in further detail in Appendix A. Unfortunately, this data source does not count people; rather, it counts the numbers of degrees granted. To translate number of degrees into number of college-educated workers trained by the state's universities, we assumed that a person with a postgraduate degree must have first obtained a bachelor's degree. Overall, during 1970 to 1989, California's universities produced about 0.75 million postgraduate degrees, and about 1.65 million bachelor's degrees. This translates into about 0.75 million people who received both a bachelor's and a postgraduate degree and 0.9 million who received a bachelor's degree only.

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[1]Of course, in reality, many who obtain degrees in California may afterward migrate to other states. But these outflows are irrelevant for our purposes of simply calculating the degree to which California has produced enough graduates to meet the observed increase in the number of graduates in state.

The next step is to compare the actual number of people educated by California's universities with the gross increase in the number of working-age people with a bachelor's degree or higher in California during this period. We defined the gross increase in the number of graduates as the net increase in the number of working-age Californians who are graduates as indicated by census data, plus the likely number of people in this group in 1970 who would have retired by 1990. (Because the goal of the exercise is to estimate the number of degrees required for self-sufficiency, it is important to estimate the number of additional graduates that California would have to produce to replace retirees.) We estimated the number of retirees between 1970 and 1990 as the number of college-educated people in California in the 1970 Census who would have been older than 65 by 1990. Figure 3.1 shows the resulting estimates of the increase in the total number of bachelor's and postgraduate-trained workers in California between 1970 and 1990. Retirements add about 100,000 each to the estimate of the gross increase in the number of bachelor's (only) graduates and postgraduates over the period. The final column shows that, overall, about 3 million new graduates with a bachelor's or higher degree were added to the California economy between 1970 and 1990.

To gauge the contribution that California's universities were likely to have made to this growth, we divided the actual number of bachelor's only and postgraduates educated in California's universities by the gross increase in the number of adults with these education levels actually observed in California. Figure 3.2 shows that roughly 53 percent of the overall growth in highly educated California residents is likely to have been produced by in-state universities. California colleges appear to have produced a much higher share of the overall growth in the postgraduate

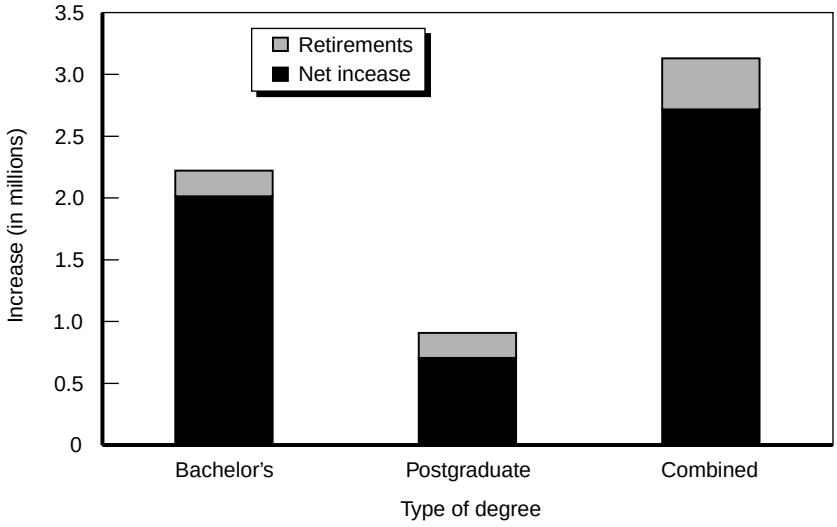

Figure 3.1—California's Gross Increase in Number of Adults with Bachelor's Degree Only or Bachelor's Plus Higher Degree, Including Replacements Implied by Retirements, 1970–1990

population (83 percent) than they did for the bachelor's-only population (40.3 percent). However, there is some uncertainty about these two latter statistics. The most precise and accurate estimate from this figure is that California produced about 53 percent of the overall supply of college graduates that was necessary to replace retirees and to account for net growth in the number of college graduates.[2]

[2]It is likely that the degrees to which California is self-sufficient in graduates (bachelor's) and postgraduates are slightly understated and overstated, respectively, because if any worker obtains two postgraduate degrees, say, an M.D. followed by a Ph.D., this would be counted as two postgraduates in the degree data. If we combined these postgraduate degrees with the person's bachelor's degree and the bachelor's degree of another student who did not go on to postsecondary education, we would overcount the number of postgraduates by one while undercounting the number of bachelor's-only graduates by one. Note, however, that the estimate of the degree of self-sufficiency in the *combined* number of college graduates and postgraduates produced will not suffer from this problem: The overall measure provides an accurate count of the number of college

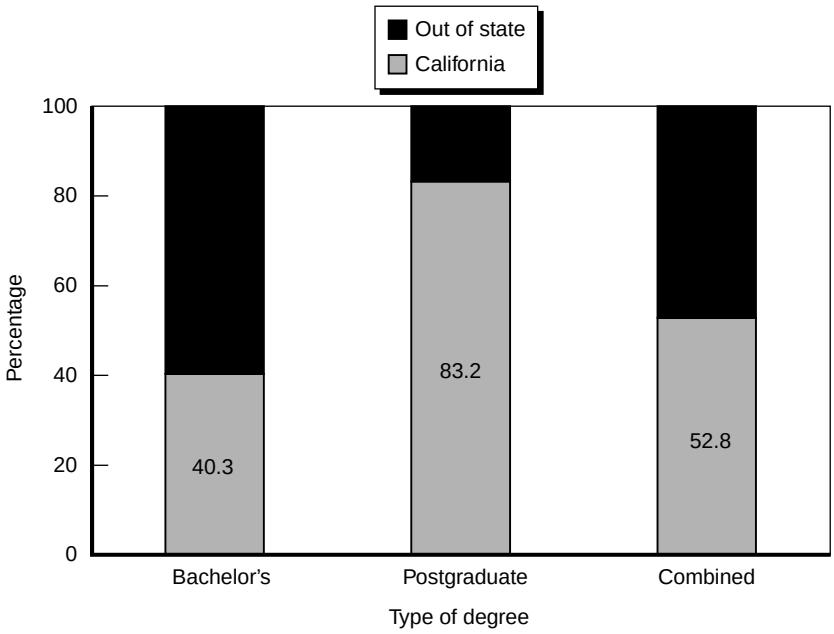

Figure 3.2—Estimated Percentage Share of Gross Increase in California's Residents with Bachelor's Degree Only, or Bachelor's Plus Higher Degree, Supplied by California and Out-of-State Colleges, 1970–1990

What are the policy implications of this finding? It seems clear that California imported workers at the bachelor's or higher level throughout this period. Suppose that in the future California loses ground to other states in the factors that workers typically consider when deciding where to work, such as wage rates, job vacancies, housing prices, commuting times, and the overall cost of living. Any such change could imperil the

graduates unless some students obtain a postgraduate degree without first receiving a bachelor's degree. But the overall "combined" measure may itself slightly understate the contributions of California's colleges for another reason. If an adult in California obtained a bachelor's degree outside the state but a postgraduate degree in California, we will undercount California's "combined" contribution by one-half a person.

ability of California to continue to import skilled workers from other states or other countries.

California's habit of importing highly educated workers from elsewhere may of course confer benefits in addition to the very real risks listed above. First, if the out-of-state labor market acts as a safety valve for California's employers in times of skilled labor shortages, it implies that California need not continually fine-tune its college enrollment. A second benefit might be that employers prefer a mix of skilled workers from universities around the country, or even around the world, to allow for a cross-pollination of ideas. Third, public universities offer highly subsidized education to their students, typically at the expense of state taxpayers. When California imports college-educated workers from other states (or countries) it in essence "free rides" on governments elsewhere. That is, California obtains skilled workers whose education has been subsidized by government agencies in other regions. To some extent, this may mitigate the risk at which California places itself by relying to such a large extent on importing skilled workers from elsewhere.

Finally, it is useful to compare Figures 2.6 and 3.1. Figure 2.6 showed that in 1990 only about 35 percent of California residents with a bachelor's degree or higher were California natives. All the others were born in other states or were immigrants. Figure 3.1 does not look at the *stock* of California residents in 1990. Instead, it accounts for the *growth* in the college-educated population between 1970 and 1990. It appears that between 1970 and 1990, California's colleges produced 53 percent of the growth in the number of California residents holding bachelor's or higher degrees. These two figures together suggest that a part of this 18 percent gap may reflect California residents with college degrees who

were born elsewhere but who received their college education *after* moving to California.

The implication of this finding is intriguing. Social scientists have long sought evidence of a "welfare magnet," that is, an effect whereby states or cities with generous welfare benefits attract less skilled migrants from other regions or immigrants from other countries.[3] But it seems equally if not more likely that there exist "college magnets": The presence of thriving colleges may attract an unusually large number of skilled migrants or immigrants to certain areas of the country. After completing their education, many of these people are likely to stay. It would appear that California has acted as a "college magnet" in that a meaningful proportion of the state's most highly educated residents are migrants and immigrants who most likely obtained their college educations in California.

If California is indeed a college magnet, then the proportion of the college-attending population in California that comes from other states and countries should be significantly higher than the share in the slightly younger population that is still of school age. The first column in Table 3.1 breaks down the composition of those aged 18 to 24 who hold at least a high school diploma and who report being enrolled, ostensibly in college. The second column gives the breakdown for those aged 13 to 17 who live in California. The table shows that a significantly higher share of young college enrollees in California were born in other states or are immigrants, compared to a slightly younger cohort. People from out of

[3]See for instance Levine and Zimmerman (1995) who find little evidence of interstate migration by poor single women with children toward states with more generous welfare benefits, and Borjas (1998a) who finds that immigrants do seem to be attracted to states with more generous benefits.

Table 3.1

Comparison of College-Age and School-Age Cohorts in California by Birthplace, 1990
(percent)

By Birthplace	Aged 18 to 24, Enrolled and Holding at Least a High School Diploma	Aged 13 to 17, in School or Dropped Out
California natives	57.6	65.6
Natives born elsewhere	21.1	15.2
Immigrants	21.3	19.2

state constitute 42.4 percent of the young college-attending population, compared to just 34.4 percent of the age group 13 to 17. The results are consistent with the notion that California's colleges and universities attract substantial numbers of young people from other states and countries.

Of course, it is not clear whether this 8 percent gap between the shares of college enrollees and school-age youth who are from out of state arises because some people migrate to California with the specific intention of attending college in this state. An alternative explanation might be that the higher percentage of migrants and immigrants in the college population relative to the school-age population reflects higher probabilities of enrollment among migrants and immigrants relative to California natives. Indeed, all migrants and immigrants attending California colleges might have lived in California for many years before entering college.

Census data do not contain detailed information on the history of a person's residence. However, the Census form does ask people where they lived five years before the Census. It is noteworthy that 9.4 percent of college enrollees in California aged 18 to 24 in 1990 lived in another

state in 1985, and a further 6.6 percent lived abroad. These recent movers represent about one-half and one-third of all California college students who were born out of state or who are immigrants, respectively. Of course, not all of these 16 percent of college enrollees will have come to California specifically to attend college. But this figure supports the hypothesis that quite a few people did migrate to California to attend college.

The idea of California as a "college magnet" would gain credence if California's college system differed substantially from that in the rest of the country. In comparing California's universities to those elsewhere, it is important to look at the quantity of education provided as well as the quality. In 1996, 12.9 percent of the U.S. population aged 18 to 34 called California home.[4] So if California enrolled roughly a 12.9 percent share of this prime college-attending population nationwide, it would appear that the state provides roughly the same level of university education as the rest of the country. In fact, in 1996 California enrolled 8.8 percent of all four-year college students and 18.7 percent of all two-year college students, when both types of enrollment are measured on a full-time-equivalent basis.[5] These divergent figures reflect variations in the extent to which California and other states encourage undergraduates to begin their four-year programs at community colleges. When total undergraduate enrollment is calculated by combining enrollment at the two types of colleges, California is found to enroll 11.8 percent of all full-time equivalent students, just slightly less than its 12.9 percent share of the population aged 18 to 34. In terms of the quantity of postsecondary

[4]Author's calculation from the U.S. Bureau of the Census (1997), Table 33.

[5]Author's calculation based on U.S. Department of Education (1999), Table 201.

education supplied, California seems similar to the rest of the country as a whole, except that it has a much larger community-college system, in part because the state's Master Plan for postsecondary education calls for many students to transfer from community colleges to universities partway through their studies. Such an alternative may appeal to some students from outside California.

What appears to distinguish California's postsecondary system from that in the rest of the country is not so much the quantity offered as the quality. It is difficult to gauge university quality accurately. Nevertheless, California appears to have a disproportionate share of top-ranked universities. The 1999 rendition of the always controversial *U.S. News and World Report* college rankings[6] places nine California universities among the top 50 universities in the nation, with the California Institute of Technology and Stanford ranked first and sixth, respectively. In the list of top national public universities, University of California campuses with undergraduate programs dominate, with all eight ranked in the top 37. The Berkeley, Los Angeles, and San Diego campuses are ranked first, third, and seventh nationally among national public universities.

To sum up, California's postsecondary education system appears to differ in significant ways from that in the rest of the country. California has a disproportionate share of the top national universities, and thanks to the University of California, a tremendously disproportionate share of the top national public universities, at least as ranked by *U.S. News and World Report.* Although the quality of four-year colleges in California seems to be quite high, California's share of four-year college students is

[6]http://www.usnews.com/usnews/edu/home.htm.

lower than its share of the prime university-age population, because California places unusual emphasis on encouraging students to begin their bachelor's degrees by attending community colleges, transferring to universities in their junior year. Indeed, California enrolls about twice as many two-year college students as would be expected from its population alone. Together, the quality of public and private universities in California, and the multiple routes to the bachelor's degree that California offers, may attract students from the rest of the nation, accounting in part for the apparent "college magnet" effect observed above.

Are California's Public Schools a Policy Tool That Can Reach the Majority of Young Immigrants?

The above section considers the extent to which California's colleges and universities have trained the skilled workers that have entered California's economy. At the other end of the distribution, one can ask a parallel question: Have most adults in California acquired some or all of their K-12 education in the state's schools? This question assumes particular importance for the population that has dropped out of high school. Do California's high school dropouts in fact attend the state's schools for any period of time? If not, it suggests that policymakers cannot assume that improving the mainstream public school system can single-handedly eliminate high dropout rates. Rather, the answer may lie in finding innovative methods to encourage people who have already dropped out of school before arriving in California to "drop back in" to school.

Unfortunately, Census data do not reveal the ages at which people have moved around the country, so it is exceedingly difficult to infer

whether migrant natives from other states have acquired any of their K–12 education in California.[7] But recall the sharp rise in the share of immigrants in the state's population, as well as the fact that by 1990 immigrants constituted 53.9 percent of all high school dropouts in the state (Table 2.4). These facts suggest that the main concern here may well be immigrants: Do young immigrants spend much time in California's schools before graduating, or, alternatively, dropping out? Or have they finished their education before setting foot in the state?

The decennial Census asks immigrants about the year in which they arrived in the United States. For immigrants who arrived many years before the Census year, the information is provided as a range of years. (In such cases, we used the midpoint of the interval to estimate age at arrival.) Using information on years of schooling completed and estimated age at arrival, we estimated the proportion of each immigrant's education that was obtained in the source country before coming to the United States. We assumed that the person stayed in school continuously, so that somebody with ten years of schooling would have left school at age 16, and so on.[8]

As shown in Figure 3.3, 74.1 percent of immigrants in California in 1990 were likely to have completed all of the K–12 education that they

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[7]Census data do provide information on where people lived five years before the Census date, but this information gives only a partial picture of who has moved and when.

[8]The use of age at arrival and total years of schooling to infer the proportion of a person's education that was obtained abroad will no doubt introduce some random error. The 1976 Survey of Income and Education (SIE) is perhaps unique in that it specifically asks immigrants to the United States to report years of schooling obtained in the United States and abroad. Betts and Lofstrom (2000) use this dataset to test the accuracy of imputing pre- and post-immigration years of schooling based on age at entry to the country and total years of schooling, as is done in the present report. Wage regressions using the actual and imputed pre- and post-immigration years of schooling were virtually identical, suggesting that the method of imputation used here is fairly accurate.

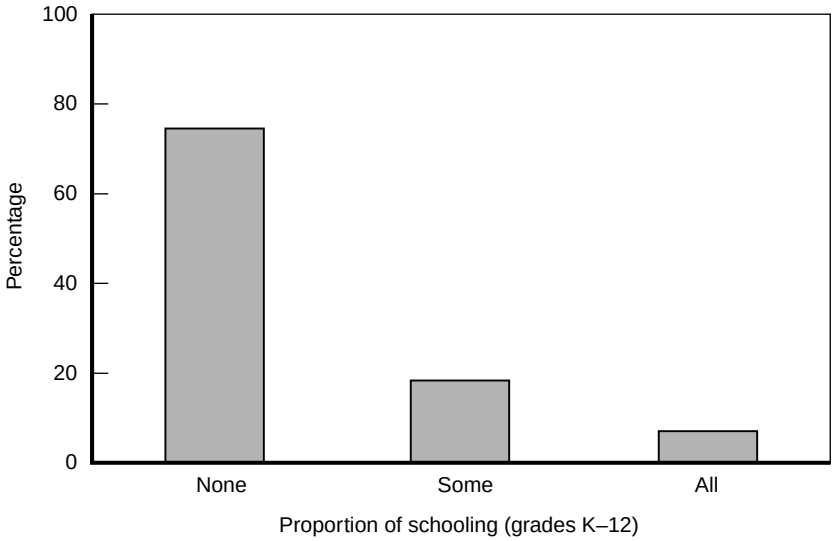

Figure 3.3—Percentage Distribution of Adult Immigrants in California According to the Proportion of Their Schooling Obtained in the United States, 1990

were going to receive before entering the United States. In contrast, 18.6 percent obtained some of this education in the United States, and only 7.3 percent obtained all of their education in the United States. Note that even these numbers likely overstate the percentage of immigrants in California who obtained some or all of their K–12 education in California because some immigrants may have moved to California well after entering the United States.

Some readers may be surprised by how little K–12 education the average California immigrant is likely to have received in the United States, let alone California. But these figures gain support from the finding by Betts and Lofstrom (2000) that at the national level in 1990 the average immigrant had received 9.5 years of schooling before

immigrating to the United States and only 2.4 years of schooling after arrival. A second factor that may be especially important for California is that immigrants from Mexico have particularly low levels of education. For instance, Betts and Lofstrom (2000) calculate that in the United States the average Hispanic immigrant in their sample of 1970, 1980, and 1990 Census data had fewer than nine years of schooling and had already been out of school for at least one year by the age of 16. Similarly, Vernez and Abrahamse (1996) report that the average Mexican immigrant has only seven years of schooling.

These figures suggest that even though many immigrant schoolchildren currently attend the state's schools, they represent a minority of immigrants, most of whom have finished whatever primary and secondary education they will acquire before entering the United States. Recall that California's immigrants have rather low levels of education, compared to both natives in California and immigrants elsewhere. This raises important policy questions: If most immigrants in California have spent little or no time in the state's schools, what programs can be created to encourage them to acquire more education? The answer may lie well beyond the scope of traditional education policy. It could be that many immigrants do not "drop in" to public schools because they are undocumented immigrants.[9] This topic deserves serious attention.

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[9]Warren and Passell (1987) use 1980 Census data and Immigration and Naturalization Service (INS) data to estimate that about one-half of the two million people in the Census who report being born in Mexico are illegal immigrants. Borjas, Freeman, and Lang (1991) extend this work by analyzing vital statistics on births and deaths and conclude that the 1980 Census includes only about two-thirds of the illegal aliens born in Mexico, because of undercounting.

The high proportion of immigrants who graduate from high school or drop out of school before arriving in California also carries important implications for the commonly held view that the state's public schools face a dropout crisis. Table 3.2 shows that the share of California residents aged 19 to 24 without a high school diploma rose to 26.7 percent by 1990, almost 10 percent more than observed in the rest of the country. This astonishing gap has been used in some quarters as evidence of the weakness of California's public school system.

A dramatically different pattern emerges when people in this age group are divided into natives and immigrants, as shown in Table 3.3. The proportion of natives aged 19 to 24 in California who are high school dropouts has remained virtually constant at about 16.5 percent

Table 3.2

Percentage of the Population Aged 19 to 24
Without a High School Diploma:
California and the Rest of the Nation

Year	California	Rest of Nation
1970	18.5	23.4
1980	21.5	18.7
1990	26.7	17.0

Table 3.3

Percentage of the Native and Immigrant Populations
Aged 19 to 24 Without a High School Diploma:
California and the Rest of the Nation

	Natives		Immigrants	
	California	Rest of Nation	California	Rest of Nation
1970	16.6	23.1	40.6	32.9
1980	16.4	18.2	47.0	29.6
1990	16.7	16.0	50.3	32.7

from 1970 through 1990.[10] In contrast, between 1970 and 1990, immigrants in this age group had a higher dropout rate in California than in the rest of the nation and the gap has widened considerably.

The bottom line appears to be that in 1990 California's schools were almost, but not quite, as successful as schools elsewhere at preventing young natives from dropping out of school. The discrepancy between California and other states comes from three factors:

1. the higher immigrant share in California,
2. the higher dropout rate among immigrants in general, and
3. the large and growing gap in dropout rates between immigrants in California and immigrants in the rest of the nation.

Given that overall about 74 percent of immigrants in California completed or dropped out of school before entering the United States, it would be quite unfair to California's teachers to blame the alarming dropout statistics in California entirely on a failure of California's schools. Of course, policies to improve educational outcomes for California's immigrants, both those who do and those who do not attend the state's public schools, are needed.[11]

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[10]Natives in this age group in other states initially had higher dropout rates, but by 1990 the gap in dropout shares between California and the rest of the nation was less than 1 percent.

[11]One can go further by breaking down California's immigrants in the 19 to 24 age group into those who five years before the Census lived in California, other states, or abroad. In 1990, 58.7 percent of California's immigrants who in 1985 had lived abroad were high school dropouts. This compares to a dropout rate of 46.7 percent among California immigrants in this age group who in 1985 had lived in California. The difference is not huge, but it suggests that presence in California during the high school years is associated with better outcomes for young immigrants.

Conclusions

The state's universities and colleges appear to have generated roughly one-half of the flow of new graduates in the working-age population between 1970 and 1990. In 1990, only 38 percent of the adult population consisted of California natives. Thus, the state has generated more graduates than one would expect, based on the representation of California natives in the overall population in the state.

A significant minority of California residents with a bachelor's degree or higher in 1990 are likely to have been born in other states or countries but moved to California and obtained their postsecondary education in this state. The factors motivating these people (and in some cases their families) to move to California cannot be known for certain, but it seems possible that the rich diversity of postsecondary institutions in California has made the state something of a college magnet. This idea gains support from the fact that natives born in other states and immigrants constitute a much larger share of college enrollees aged 19 to 24 than of school-age Californians aged 13 to 17.

If such a college-magnet effect exists, it points to a subtle benefit conferred upon states with well-developed postsecondary systems. California enrolls a proportion of community college students and four-year college students that is just slightly lower than its share of the population aged 18 to 34. What appears to distinguish California's postsecondary sector nationally is not the overall number of students enrolled in its postsecondary institutions but rather its disproportionately high share of highly ranked universities.

Of course, California also depends on other states and countries for skilled workers, which affords the state a number of advantages. First, the state government does not need to continually fine-tune the flow of

graduates from California's local universities in response to the vagaries of local labor markets. Second, the state's taxpayers benefit from importing skilled workers to the extent that governments elsewhere subsidize the college education of these workers. Third, hiring workers from colleges around the nation, and from universities abroad, may increase firms' productivity through the cross-pollination of ideas.

Of course, balanced against these advantages, there must be genuine concern about the continued ability of California to attract highly educated workers from other states and countries. If one or more of these groups were diverted to a different state, the consequences for California's employers could be meaningful. Shocks that could cause such a diversion might include any number of changes in the quality of life in California relative to other states, and indeed, to other countries.

The second policy concern addressed in this chapter is the extent to which California's K–12 schools educate the state's residents. If many adults in California receive their K–12 education elsewhere, it limits the ability of the state's school system to improve the overall stock of human capital, or skills, over time. The main concern is with immigrants, who by 1990 constituted over half of the high school dropouts in the state. Our analysis suggests that the vast majority of immigrants have completed their K–12 schooling or have dropped out of school before entering the United States, let alone before entering California. This finding raises serious questions about how the state can improve the educational attainment of immigrants, especially the 46 percent of immigrants in California in 1990 who were high school dropouts.

At the same time, the results show the danger of using aggregate statistics on the high dropout rate in California relative to the rest of the nation to condemn the state's public schools. Almost all of the dropout

gap between those aged 19 to 24 in California and those in the rest of the country derives from California's much higher share of immigrants, many of whom left school before entering California. There remains genuine concern, however, about the quality of education provided to those immigrants who do attend California's schools.

4. How Does Educational Attainment Affect the Earnings of Californians?

This chapter examines how the labor market has rewarded workers of different education levels, addressing the following questions: How much more do college graduates earn than high school graduates? How has this "college" wage premium changed over time? How do trends in California compare to those in the rest of the United States? Finally, how do returns to education vary between natives and immigrants?

Trends in California and the Rest of the Nation

Our analysis focused on the annual earnings of males aged 18 to 64 who earned at least $1,000 in 1996 dollars. Given the significant increases in women's labor force participation since 1970, we examine only male earnings to avoid confusing changes in labor-force participation with changes in wage rates. Earnings from all years are re-expressed in 1996 prices using the Consumer Price Index. In each of the

1970, 1980, and 1990 Censuses and in the March Current Population Surveys from 1996 and 1997, respondents provide information on prior year earnings, so that the analysis below shows trends in the returns to education between 1969, 1979, 1989, and 1995/96.

Figures 4.1 and 4.2 plot mean annual earnings of men in California and in the rest of the nation, respectively, by their education level. Both figures show that men with some college education or higher have experienced relatively stable or increasing real earnings. But workers with less education—in particular high school dropouts—have experienced a sharp decline in real earnings, with the bulk of the decline occurring after 1979.

Equally notable is the fact that the *gap* in earnings between education groups widened considerably after 1979. Reed (1999) notes that

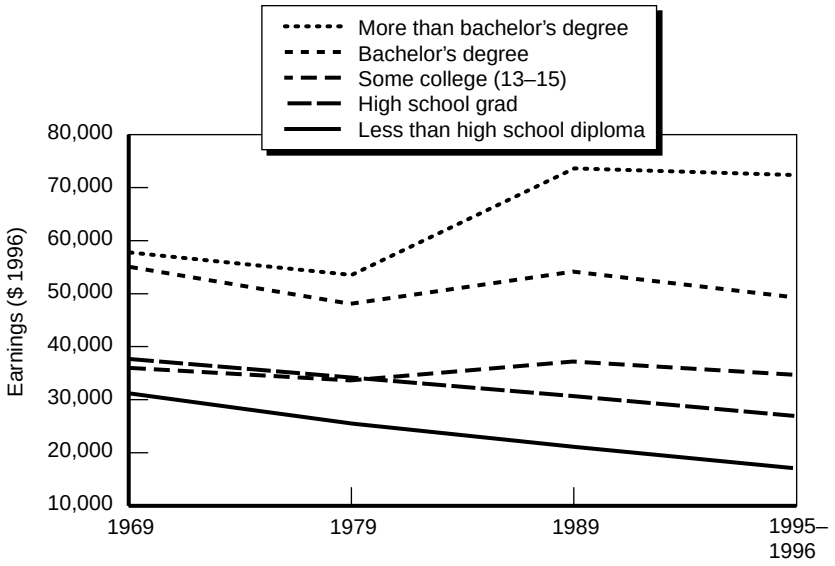

Figure 4.1—Average Earnings of Men Aged 18 to 64 in California

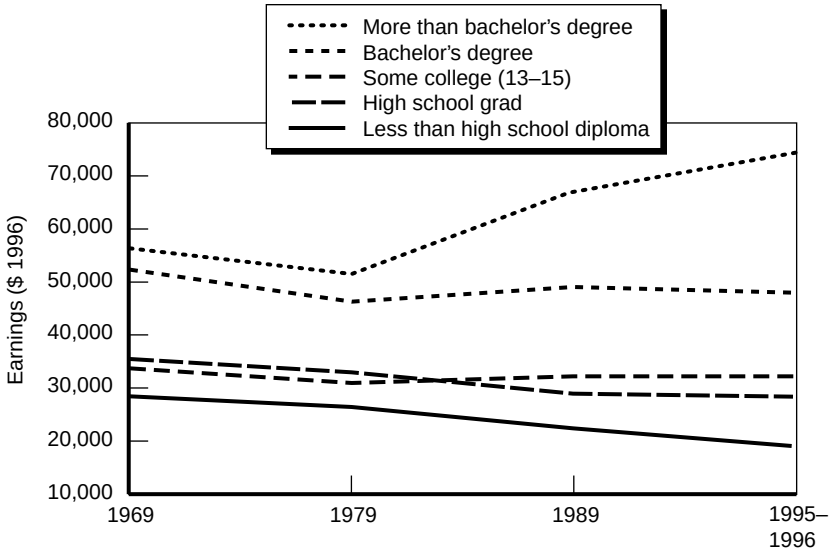

Figure 4.2—Average Earnings of Men Aged 18 to 64 in the Rest of the Nation

educational attainment accounts for about one-third of the widening dispersion in earnings in California over time. Figure 4.1 shows this graphically.

Figures 4.1 and 4.2 do not account for changes in the composition of the work force within each educational group over time. Most notably, the figures ignore the fact that the distribution of workers by age within each educational group might have changed. One question that might arise, for example, is whether the apparent drop in mean earnings of high school dropouts over time reflects changes in the mean age of high school dropouts.

To account for such compositional changes, we used linear regressions to predict men's earnings while holding age and other

personal characteristics constant.[1] Figures 4.3 and 4.4 plot the predicted earnings from these regressions for white males who are married and age 40. They are analogous to Figures 4.1 and 4.2 except that they remove changes that result from changes in personal characteristics. The figures tell an interesting story. For California, the *predicted* drop in earnings of high school dropouts is slightly larger than in the earlier figure. This suggests that changes in the characteristics of high school dropouts over the decades, such as mean age, and changes in the way the labor market remunerates these characteristics, have together partially masked the dwindling prospects of dropouts. After we hold race, age, and other

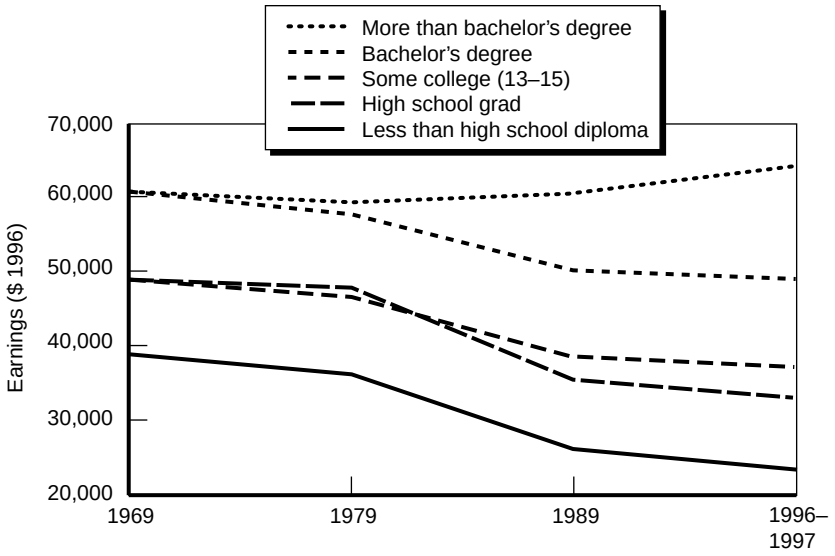

Figure 4.3—Predicted Earnings of Married White Males Age 40 in California

[1]Specifically, for each year we ran regressions that modeled the natural log of men's annual earnings as a function of a constant, dummy variables for the worker's education level, a fourth-order polynomial in age, and dummy variables for marital status and the worker's race.

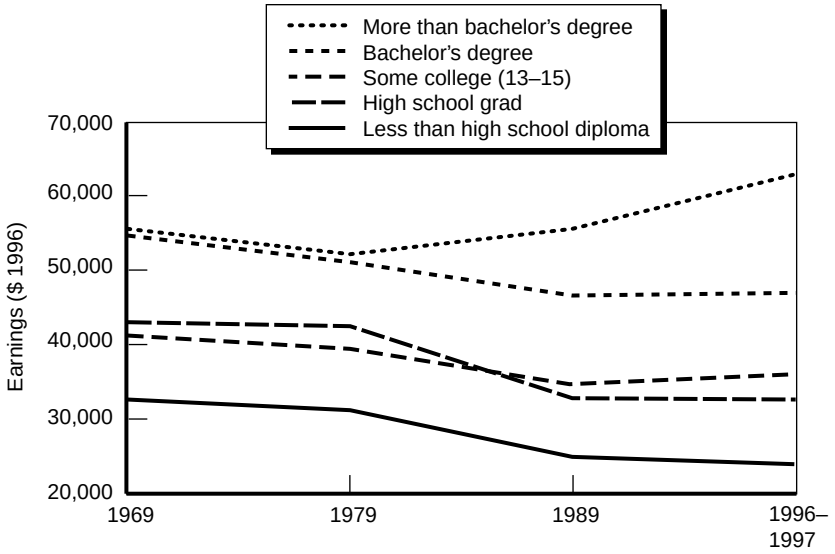

Figure 4.4—Predicted Earnings of Married White Males Age 40 in the Rest of the Nation

personal characteristics constant, the earnings of dropouts are predicted to have declined even more than they have in the raw data. The opposite is true for those with more than a bachelor's degree. Over half of the large increase in earnings of these workers in the raw data appears to be due to changes in their personal characteristics over time, such as age, and changes in the labor market returns to these characteristics.

Overall, the gap in predicted earnings between dropouts and those with more than a bachelor's degree widened by considerably more in the raw data than in the regression predictions. This indicates that some of the apparent increase in the returns to education in the raw data in fact reflect other changes, such as the increasing returns to labor market experience documented by Reed (1999).

For workers in the rest of the country, changes in background characteristics hidden in the raw data seem to have been less important. The most dramatic difference between Figures 4.2 and 4.4 is the much lower increase in the predicted earnings of those with more than a bachelor's degree, holding personal characteristics constant, than in the actual earnings based on raw data. This discrepancy indicates that much of the increase in the earnings of this group outside California over time can be attributed to factors such as changes in the mean age of these workers and in the link between age and earnings.

Appendix Tables A.3 and A.4 show the underlying regression results for the samples from California and the rest of the nation. The coefficients on the education variables confirm that even after controlling for a variety of personal characteristics, the returns to education increased markedly after 1979, both in California and in the rest of the nation. (Throughout the rest of this chapter, we will use the term "returns to education" to refer to the gap between the earnings of those with a given level of education and the earnings of high school graduates.) The tables show other important patterns as well. Most important, the wage gaps between whites and other races have changed over time. The wage gap between blacks and whites, after controlling for education and other personal characteristics, widened significantly in California between 1969 and 1995/96; in the rest of the country, the black-white wage gap narrowed, especially between 1969 and 1979. Similarly, the Hispanic-white wage gap widened in both California and other states, but the increase was markedly larger in California (7 percent versus 2 percent). The Asian-white wage gap was about the same in California and elsewhere by 1995/96, but was much larger in California in 1969.

Figures 4.5 and 4.6 convert the results from the tables into graphs of the predicted percentage wage gaps between workers of a given education level and workers with a high school diploma. In a sense, these figures are more informative than plots of the raw data (Figures 4.1 and 4.2) because these figures have "removed" variations in wages that reflect variations in other characteristics of workers at each education level, such as age. Figure 4.5 shows that in California in both 1969 and 1979 the returns to a bachelor's degree and to post-graduate education were quite similar to each other. But after 1979, those with more than a bachelor's degree began to earn substantially more than those with a bachelor's degree but no further degrees. The entire wage distribution spreads out after 1979. Trends in the rest of the nation, shown in Figure 4.6, are

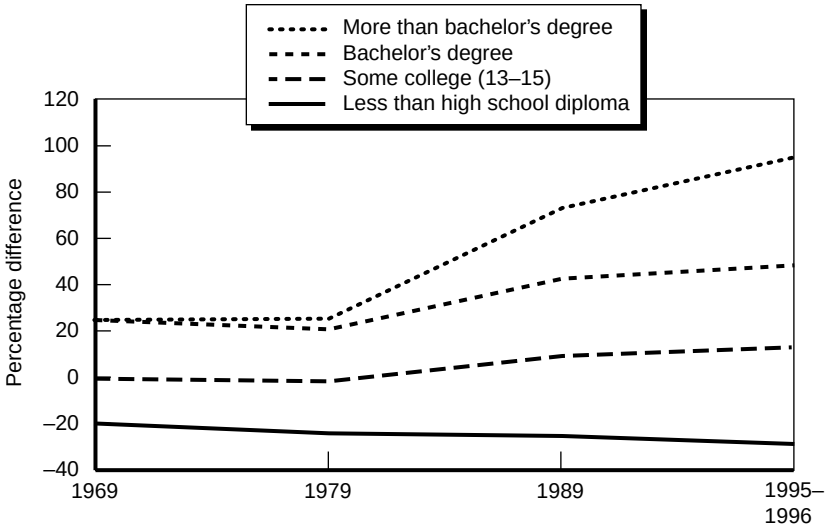

Figure 4.5—Predicted Percentage Wage Gaps Between Workers with Given Level of Education and Those with High School Diplomas, California

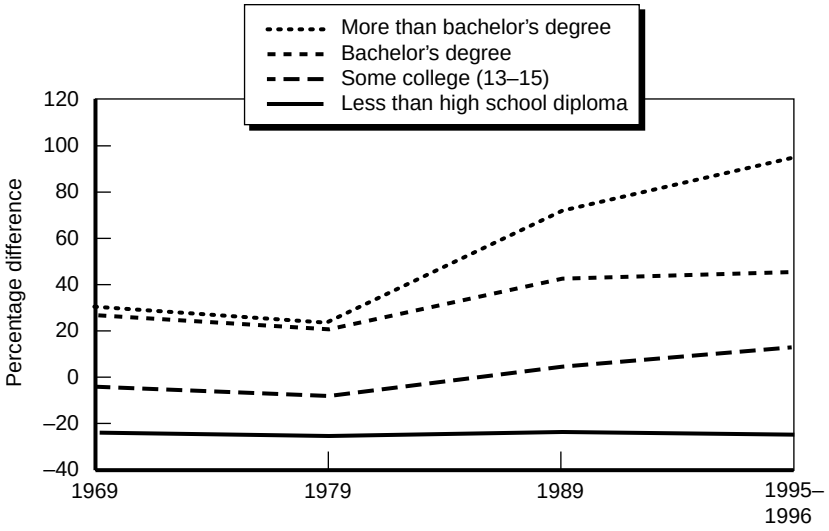

Figure 4.6—Predicted Percentage Wage Gaps Between Workers with Given Level of Education and Those with High School Diplomas, Rest of the Nation

similar but show a slightly smaller widening in the gap between the earnings of high school graduates and high school dropouts after 1979.

To illustrate differences in the trends between California and elsewhere more clearly, Figure 4.7 plots the predicted returns to education in California minus the predicted returns in other states. For all three of the predicted wage gaps for workers with some college or higher education, a positive value in the figure means that in the given year the returns to education were higher in California than elsewhere. For the less than high school diploma wage gap, the opposite applies, since the figure is graphing the difference

$$\text{earnings}_{\text{dropouts}} - \text{earnings}_{\text{HS graduates}})_{\text{California}} - (\text{earnings}_{\text{dropouts}} - \text{earnings}_{\text{HS graduates}})_{\text{Rest of nation.}}$$

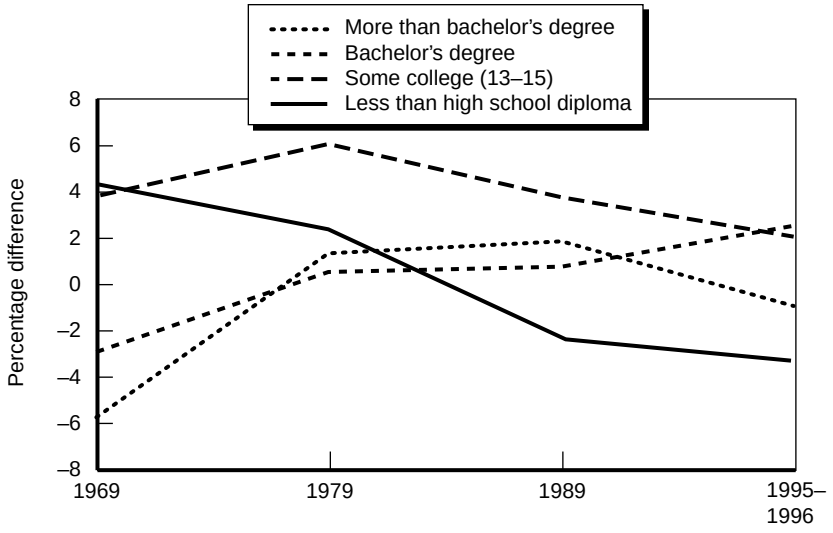

Figure 4.7—Percentage Returns to Educaton in California Minus the Corresponding Percentage in the Rest of the Nation

For example, in 1969 this gap was +4.2 percent, meaning that in California the wage gap between graduates and dropouts from high school was smaller than elsewhere.

Perhaps the most apparent and consistent trend in this figure is a widening wage gap between dropouts and high school graduates in California relative to the gap elsewhere. In 1969, the gap was 4.2 percent *smaller* in California than in other states; by 1995/96, the gap was 3.3 percent *larger* in California. The wage gap between those with a bachelor's degree and those with only a high school diploma also widened more in California than elsewhere. The same applies to those with postgraduate education.

Overall, have the returns to a *given* level of education converged between California and the rest of the country over time? One way to

answer this question is to look at how far the California-U.S. gaps deviate from zero, while ignoring whether the gap is positive or negative. The gaps in the four measures of returns to education between California and the rest of the nation appear to be larger in 1969 than in 1989 or 1995/96. (This finding applies to the high school graduate/dropout gap as well, since in 1969 the gap was +4.2 percent but had reversed to –3.3 percent by 1995/96.) One interpretation is that to some degree the returns to education in California and the rest of the nation have converged.

It is impossible to tell from Figure 4.7 which of the gaps in the returns to education between California and the rest of the nation in a given year are statistically significant. Appendix Table A.7, which shows the returns to education in the rest of the nation, lists at the bottom results from tests that the returns to a given level of education are identical to those in California for the given period.[2] A very interesting pattern emerges. The returns to being a high school dropout or having some college are statistically different between California and the rest of the nation. In contrast, at the two higher levels of education (college degree or higher), the hypothesis that the returns to education in California and the rest of the nation are identical cannot be rejected. One interpretation of these latter results is that California competes in a national market for workers at the college and higher levels. That is, employers in California pay a wage "premium" to workers with a college degree or more that is very similar to that paid in other states; they are compelled to do so to prevent these workers from being lured away by

[2]The table shows that for 1995/96, we can never reject the hypothesis that the returns to a given level of education are the same in California and the rest of the nation, probably because we lack a sufficiently large sample in these years.

firms elsewhere. This idea of a "national market" for highly skilled workers meshes well with the findings from the previous chapter. There, it was shown that California's universities appear to have provided about half the supply of new bachelor's graduates required by the state's employers between 1970 and 1990. The remaining workers at this skill level presumably were recruited from other states (and other countries). The need to import skilled workers from other states makes it necessary for the state's employers to pay a nationally competitive wage.

Californians' Birthplaces and Returns to Education

Chapter 2 revealed strong dissimilarities between the educational attainment of immigrants, California natives, and natives born outside California. California natives tend to occupy the middle of the educational distribution. Immigrants constitute a large share at the lower end of the educational distribution, an extremely small share at middle levels, and somewhat higher shares at the postgraduate level. Natives born outside California tend to have the highest level of education of any of the three groups.

In light of the variations in educational attainment across these groups, it seems natural to ask whether the returns to education vary between them. Betts and Lofstrom (2000) test for variations in the returns to education between natives and immigrants by race and ethnicity. They find weak evidence that in the United States, Hispanic immigrants have lower returns to education than do Hispanic natives. For other groups, the differences are small or, in the case of Asians, slightly reversed, in that immigrant Asians gain more from education than do native Asians. It seems important to conduct at least an overall

test for equal returns to education between immigrants and natives in California.

As for the distinction between California natives and natives from other states, the element of self-selection in who chooses to migrate to California implies that natives from other states might earn more than California natives. It seems plausible that the large proportion of natives from elsewhere with at least a college degree were attracted to California because of an especially good match between their skills and the needs of California's employers.

This section reports the results from estimation of wage models that match those in the early part of this chapter, except that the regressions are run separately for the subsamples of Californians who are immigrants, California natives, and natives born elsewhere. Figures 4.8 through 4.11 summarize the results by plotting the returns to dropping out of high school, obtaining some college education, earning a bachelor's degree, and obtaining postgraduate education, all relative to workers with a high school diploma, for the three groups of workers.

The results for 1969 are somewhat more uncertain than the results for the later years, because they are based on a 1 percent population sample rather than the 5 percent sample used in later years. (Only one of the two 1 percent 1970 Census samples used earlier contains information on state of birth.) Still, the changes in the returns to education between 1969 and 1979 in some cases match the pattern of changes in the subsequent decade.

Figure 4.8 shows that the wage gap between dropouts and high school graduates is similar between immigrants, California natives, and natives born in the rest of the country, especially in later years. Notably,

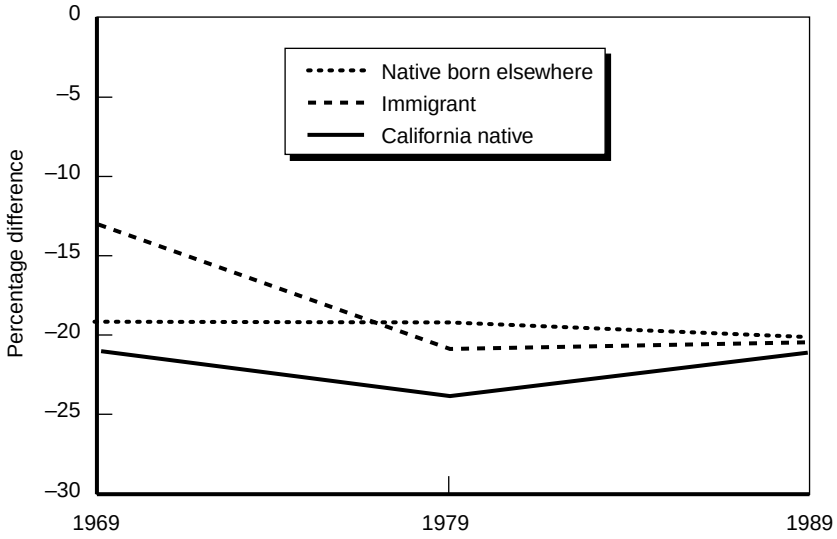

Figure 4.8—Predicted Returns to Education for Workers with Less Than a High School Diploma, Relative to Those with High School Diplomas, by Birthplace

though, California natives exhibit the largest wage gap between high school graduates and dropouts, at least in earlier years. Figure 4.9 shows the returns to "some college." Overall, all three groups experienced an increase in the returns to this level of education between 1969 and 1989. The returns to some college are the lowest for California natives. This pattern of lower returns for California natives strengthens considerably in the graphs of the returns to a bachelor's degree and postgraduate education, shown in Figures 4.10 and 4.11, respectively. The widest gaps occur for the wage premium earned by those with more than a bachelor's degree. In 1989, the predicted wage premium for this education level is 82.8 percent for immigrants in California, 75.8 percent

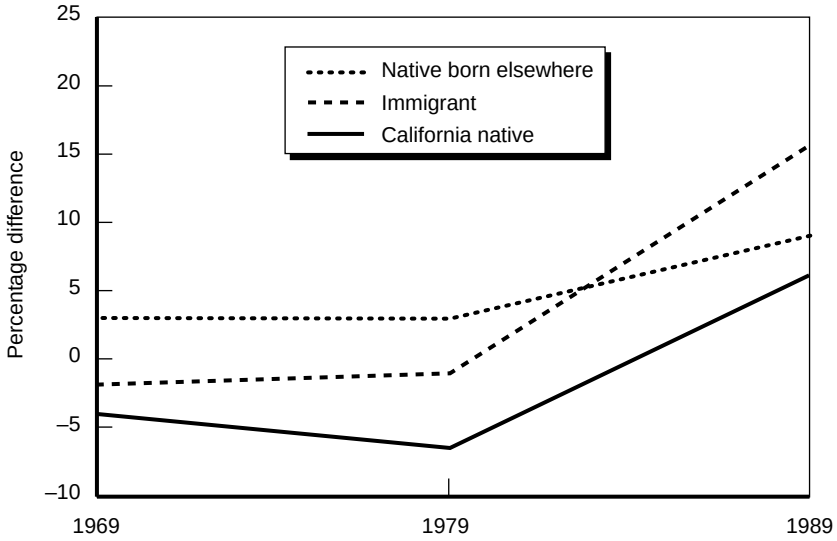

Figure 4.9—Predicted Returns to Education for Workers with Some College, Relative to Those with High School Diplomas, by Birthplace

for natives born outside California, and only 59.9 percent for California natives.[3]

These discrepancies are consistent with the notion that workers educated in California on average receive an education of lesser quality than those educated elsewhere, possibly because of the deterioration of relative spending in California's schools over the last two decades. It is possible that among college attendees, those who have attended more

[3]In regressions conducted separately by year, tests in 19 of 24 cases rejected the hypothesis that a given measure of the returns to education was identical between California natives and either immigrants or natives born elsewhere. There were five exceptions. In 1989, the estimated wage gap between high school graduates and dropouts was statistically indistinguishable between California natives and the other two groups. In 1969, there was no statistically significant difference in this wage gap between California natives and natives born elsewhere. Similarly, in 1969 no statistically significant gap in the returns to some college or a college degree emerged between California natives and immigrants.

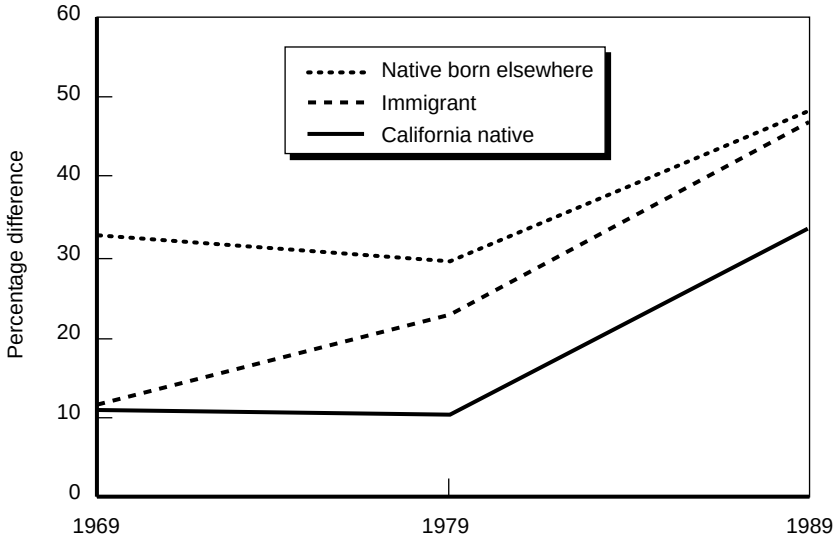

Figure 4.10—Predicted Returns to Education for Workers with a Bachelor's Degree, Relative to Those with High School Diplomas, by Birthplace

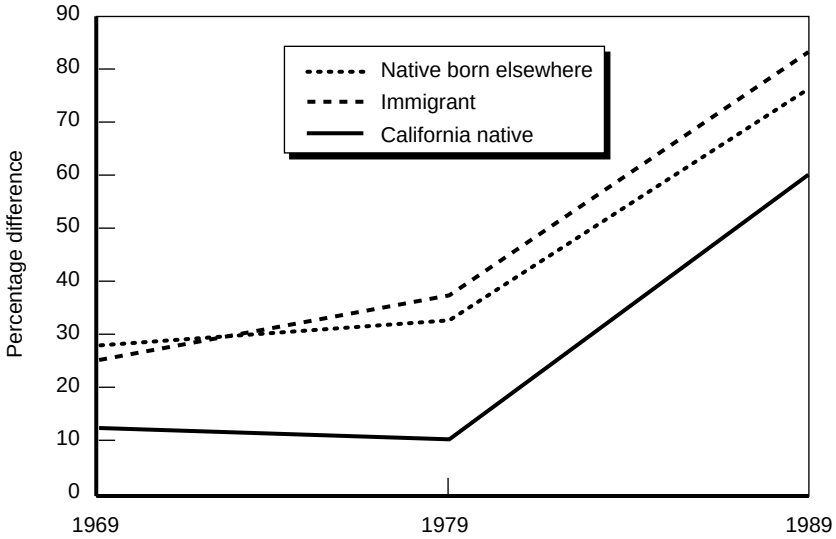

Figure 4.11—Predicted Returns to Education for Workers with More Than a Bachelor's Degree, Relative to Those with High School Diplomas, by Birthplace

poorly funded K–12 schools may consequently learn less during their college studies.[4]

Another possible explanation is that immigrants and natives born elsewhere who move to California are both self-selected groups. At the top end of the educational distribution, both immigrants and natives who choose to move to California appear to have skill sets that mesh particularly well with the needs of California's employers. Recall from the previous chapter that natives from other states are strongly overrepresented at higher education levels. Immigrants are strongly overrepresented in the population at lower levels of education, although there are a surprising number of immigrants in the postgraduate education categories as well. It would appear from these population shares that natives from other states tend to self-select at the top end of the educational distribution and that immigrants self-select at the lower level, and to a far weaker extent, the upper level, of the education distribution.

If this self-selection behavior derives from particularly good matches between employers and workers from elsewhere who are at the upper end of the educational distribution, then the returns to college and higher levels of education should be particularly high for natives from the rest of the nation. The figures make clear that this is true. To the extent that immigrants self-select at the upper end of the education distribution,

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[4]Betts and Morell (1999) find some evidence that undergraduates at the University of California San Diego (UCSD) who attended high schools with more highly experienced teachers have higher university grade point averages. However, the teacher-pupil ratio and average teacher education at the student's high school did not bear a positive relation with outcomes of the students at UCSD. More generally, Betts (1996) finds only weak evidence in the literature of a meaningful link between school spending and either educational attainment or earnings of students later in life.

they, too, should experience higher returns to a bachelor's degree or higher. Figures 4.10 and 4.11 provide some evidence that this is true.

In summary, self-selection among immigrants and native migrants to California appears to result in higher returns to education for these groups at higher levels of education. Second, and strikingly, at all levels of education and in all years, the returns to education—that is, the wage increases related to obtaining additional education—are smaller for California natives than for the other two groups. This might reflect the fact that California natives are less strongly self-selected than those who come from elsewhere. Another possible explanation is that an extra year of education obtained in California is less valuable than a year of schooling obtained outside California, leading to lower returns to education. The latter hypothesis does not necessarily imply that the quality of education provided in California lags that provided by other states. For instance, it might be that less-educated California natives develop stronger social networks than do more recent arrivals with similar education. These networks of contacts might act to provide workers with "inside information" about good jobs. Such networks could reduce the value of additional education in securing good jobs for native Californians.[5] It is not possible with the data employed in this report to distinguish between these possibilities.

Conclusions

Returns to education increased dramatically both in California and in the rest of the nation between 1979 and the 1990s. These "returns" are measured as the wage gap between those with a high school diploma

[5]I thank Jennifer Cheng for suggesting this hypothesis.

and those with some other level of education, and they thus provide indications of the way disparities in workers' educational attainment translate into disparities in earnings.

Is California in any way unique, or has this increase in the returns to education simply reflected national trends? In 1969, the first year analyzed in this study, California if anything was a state in which education mattered less than elsewhere. For instance, in that year, high school dropouts in California earned 20.5 percent less than high school graduates, after controlling for other personal characteristics. In the rest of the nation the same gap was 24.8 percent. Similarly, the wage gaps between those with more than a bachelor's degree and high school graduates in 1969 was only 24.4 percent compared to 30.3 percent elsewhere.

However, between 1969 and the 1989 and 1995/96 periods, the returns to education in California rose more quickly than elsewhere, so that by the 1990s education mattered at least as much as in other states.

The most striking divergence in trends between California and the rest of the nation is that the earnings of high school dropouts have deteriorated far more quickly in California than elsewhere. In 1969, the wage gap between dropouts and high school graduates was 4.2 percent *smaller* in California than elsewhere; by 1995/96 the situation had reversed, with the wage gap in California becoming 3.3 percent larger in California.

In this sense, education now matters more in California than in other states. The rewards to finishing high school are larger in California than elsewhere. At the postsecondary level, in contrast, by the 1990s there was no significant difference in the returns to education between California and the rest of the country. This evidence suggests that

California's employers found themselves competing in a national labor market for more highly skilled workers.

Given evidence in Chapter 3 that the educational attainment of immigrants, California natives, and natives born elsewhere differs, this chapter then tested the idea that workers from these three groups experience the same returns to education. Although the surge in returns to education noted above applies to workers from all three geographic origins, the groups differ in important ways. Most strikingly, in all years and for all postsecondary levels of education, California natives exhibit lower returns to additional schooling than do immigrants or natives born elsewhere. In this sense, education matters more for those who migrate or immigrate to California than it does to those born in California. These findings could be interpreted in a number of ways. One interpretation is that both migrants and immigrants self-select in the sense that only those whose skills best match the needs of California employers come to California. Another interpretation is that lagging school spending in California has reduced the amount that students who attend public schools in California learn, both in K–12 and in postsecondary education. The data used for this study cannot distinguish between these competing hypotheses, and there may well be others.

Finally, it is important to note that the role played by migrants from other states, and immigrants from other countries, underscores the idea that California's labor market is integrated with a wider labor market. The state's labor market for highly educated workers appears to be particularly highly integrated with the overall national market.

5. A Comparison of Variations in the Returns to Education in California's Regions and Industries

Chapter 4 revealed dramatic changes in the link between wages and education in California. But have these changes occurred in all areas of California? What about variation among industries? Are rising returns to education restricted to industries in the high-technology sector (a "Silicon Valley" effect), or do they represent a general trend? This chapter addresses these questions by examining the returns to education across the state's regions and industries.

The last chapter showed that the wage premium associated with a bachelor's degree or higher in California in the 1990s resembled that in the rest of the country fairly closely, implying that California competes in a highly integrated national market for college-educated workers. This chapter takes a second look at this hypothesis, by examining whether

variations in the returns to education among California's industries match closely with the corresponding variations in the rest of the nation. Evidence of such a correlation would indicate that perhaps the best characterization is that California's employers compete in a series of industry-specific national markets for skilled workers.

Variations in Returns to Education Across California's Regions

Does it make sense to think of California as a single labor market? One way to answer this question is to test for variations in the returns to education across areas. If there is a free flow of labor between areas, then the returns to education should vary little by region. If, on the other hand, workers cannot switch freely between one region and another, the returns to education should vary. (One potential cause of limited geographic mobility is that types of jobs may vary between areas.)

To test formally the idea that returns to education are identical across California's regions, we ran a wage regression for 1989, in which all of the variables including the intercept were interacted with dummy variables for eight of nine regions. Table 5.1 shows the predicted percentage wage gaps by region between workers at each level of education, compared to workers with a high school diploma. The table suggests considerable heterogeneity. This heterogeneity is perhaps best understood graphically. To this end, Figures 5.1 through 5.4 show the predicted wage gap between high school graduates and workers in the four other education groups. The figures vary in the details, but together they tell a strikingly similar story. Los Angeles, Orange County, and Central Valley regions tend to exhibit the largest wage gaps between workers with different levels of education. The Northern and Sierra

Table 5.1

Predicted Percentage Returns to Education Relative to High School Graduates by Region, 1989

	Less Than High School Diploma	Some College	Bachelor's Degree	Postgraduate Degree
Northern	–23.66	–3.17	14.22	53.59
Bay Area	–22.03	8.85	39.31	66.81
Greater Sacramento	–23.95	7.98	37.14	62.04
Central Valley	–29.50	9.55	40.31	72.46
Central Coast	–29.88	–4.72	22.80	46.14
Los Angeles	–25.81	11.08	44.40	74.53
Orange	–25.26	10.00	47.45	72.91
San Diego	–23.25	3.69	35.49	61.08
Inland Empire	–25.90	11.56	34.68	48.87
Sierra Nevada/Foothills	–16.51	8.76	24.61	49.93

Nevada regions tend to show the smallest gaps across education groups. Somewhat surprisingly, San Diego exhibits smaller returns to education than the metropolitan areas immediately to the north. Other areas show less clear patterns. For example, the San Francisco Bay Area exhibits relatively high returns to a college or postgraduate education but has the second smallest gap in earnings between dropouts and high school graduates.[1]

Overall, the results suggest that it is not appropriate to think of California as a completely homogeneous labor market. But why do the returns to education vary between regions? Do variations in labor demand explain the differences, or do variations in the supply of workers by skill class explain more of the variations across regions? Appendix B provides a detailed explanation of a somewhat technical analysis of this question. The basic idea is that if the main difference among regions is

[1]As shown in Appendix B, the variations in the returns to education across regions are highly statistically significant.

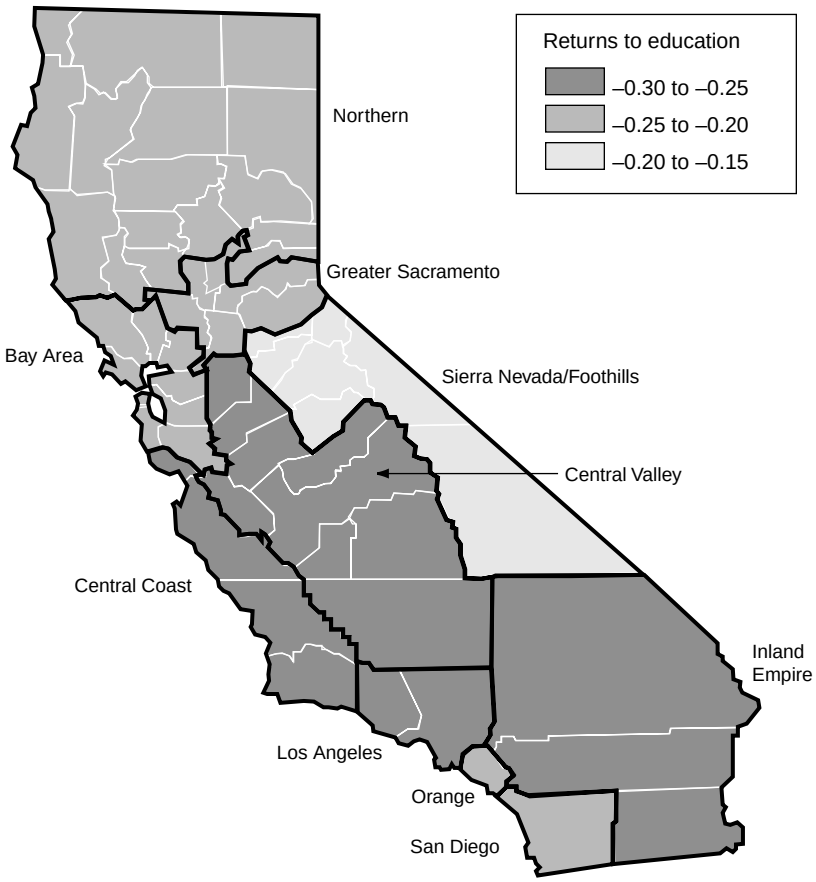

Figure 5.1—Returns to Education Relative to High School Graduates, for Workers with Less Than a High School Diploma, by Region, 1989

that the relative numbers of highly educated and less educated workers vary, then in regions with unusually high shares of educated workers the returns to education should be low, because too many highly educated workers would be competing for a limited number of jobs with high skill requirements. This would translate into a negative relation between the returns to education and the ratio of more highly to less highly educated

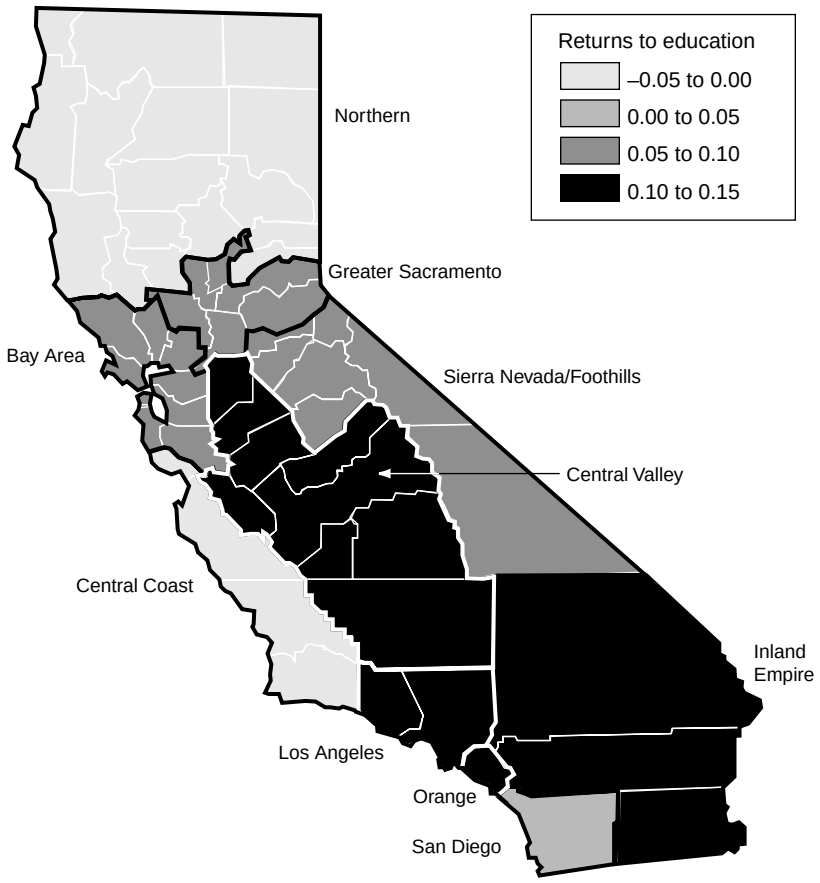

Figure 5.2—Returns to Education Relative to High School Graduates, for Workers with Some College, by Region, 1989

workers. In contrast, if each region has about the same relative supplies of highly and less highly educated workers, and variations in employers' relative demand for more and less highly educated workers are large, then we should expect to see a positive relation between the returns to education and the ratio of more highly to less highly educated workers. For example, in the Bay Area, we might expect high returns to a

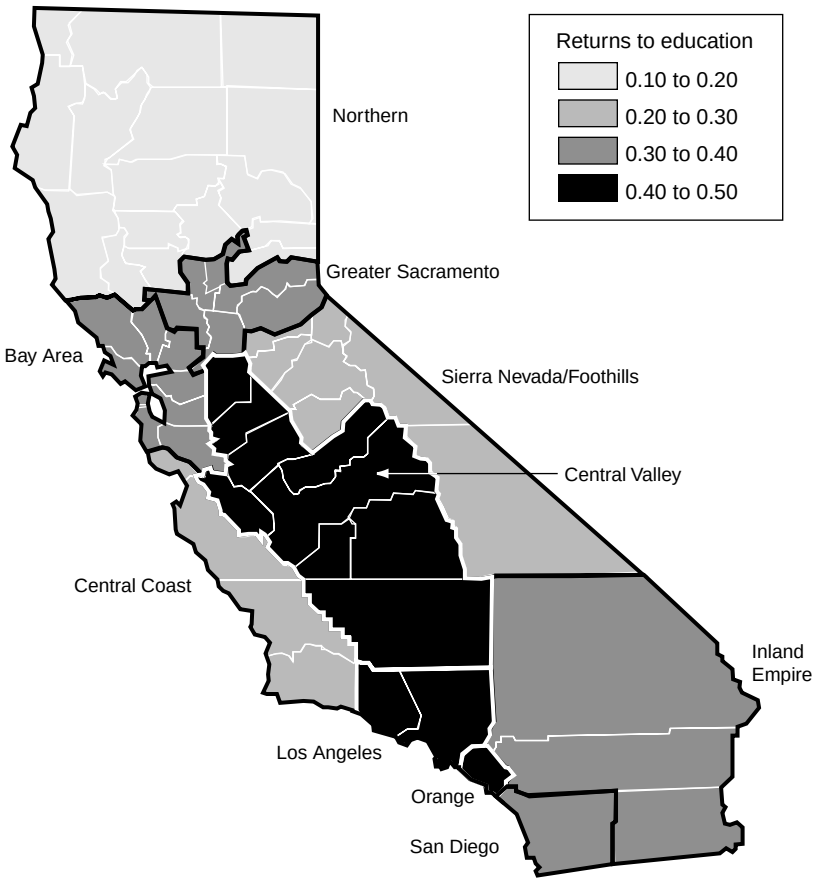

Figure 5.3 Returns to Education Relative to High School Graduates, for Workers with a Bachelor's Degree, by Region, 1989

bachelor's degree because Silicon Valley firms create an insatiable demand for highly skilled workers.

Figures 5.5 through 5.8 show the plots of the predicted percentage wage gaps between workers at various levels of education and workers with a high school diploma and the actual ratio of employment between the two skill classes. Relative earnings are calculated as the percentage

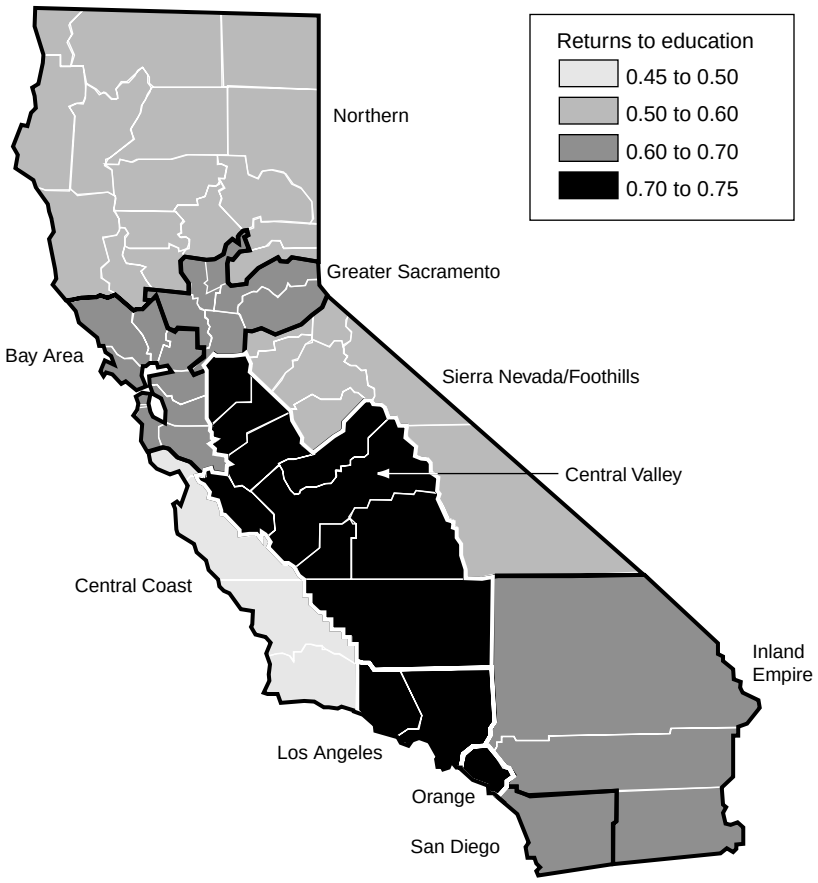

Figure 5.4 Returns to Education Relative to High School Graduates, for Workers with More Than a Bachelor's Degree, by Region, 1989

difference in predicted earnings between workers at the given level of education and workers with a high school diploma. On the horizontal axis of each graph, the relative quantity of each level of worker is calculated as the ratio of employment at the given education level to employment of high school graduates, expressed in percentage terms. Figure 5.5 graphs high school dropouts. The line displays a slightly

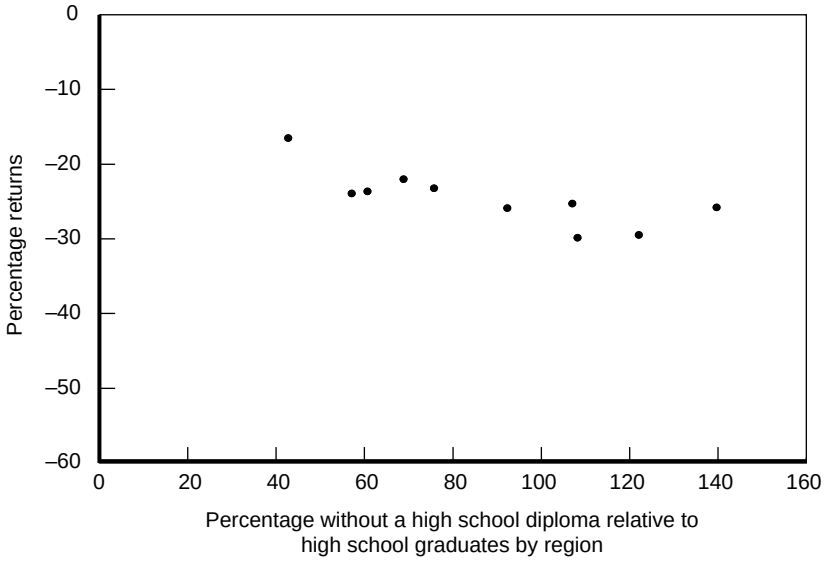

Figure 5.5—Predicted Percentage Returns to Education for Those Without a High School Diploma Relative to High School Graduates Plotted Against the Ratio of Population Shares, by Region, 1990

negative slope, suggesting that variations in relative supply might be somewhat more important in explaining variations in the dropout–high school wage gap. Clearly though, variations in relative supply and relative demand are probably both at work.

Figures 5.6 through 5.8 show the analogous relative earnings and employment graphs for workers with some college, bachelor's degrees, and postgraduate education, respectively. In the case of "some college," the plot is almost horizontal, suggesting that variations in relative supply and demand across regions nearly counterbalance each other. For workers with bachelor's degrees, the plot suggests a fairly strong positive correlation between relative wages and relative employment. This suggests that variations in relative demand are the more important

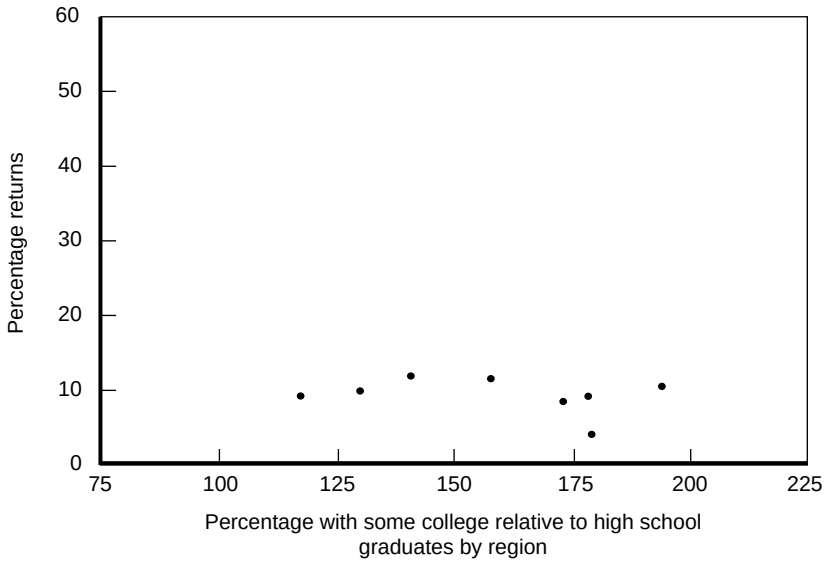

Figure 5.6—Predicted Percentage Returns to Education for Those with Some College Relative to High School Graduates Plotted Against the Ratio of Population Shares, by Region, 1990

driving force behind variations in the returns to a college degree in California. The graph of relative earnings and employment ratios for workers with more than a college degree, in Figure 5.8, similarly suggests that variations in relative demand are the more important factor, although the positive correlation in this instance is clearly weaker.

Overall, the graphs suggest that variations in relative supply and demand both contribute to variations in the "education premium" between California's regions. In the case of workers with bachelor's degrees and to a lesser extent those with more than a bachelor's degree, differences in relative demand between areas appear to be relatively more important. In the case of dropouts, variation in relative supply seems to be more important.

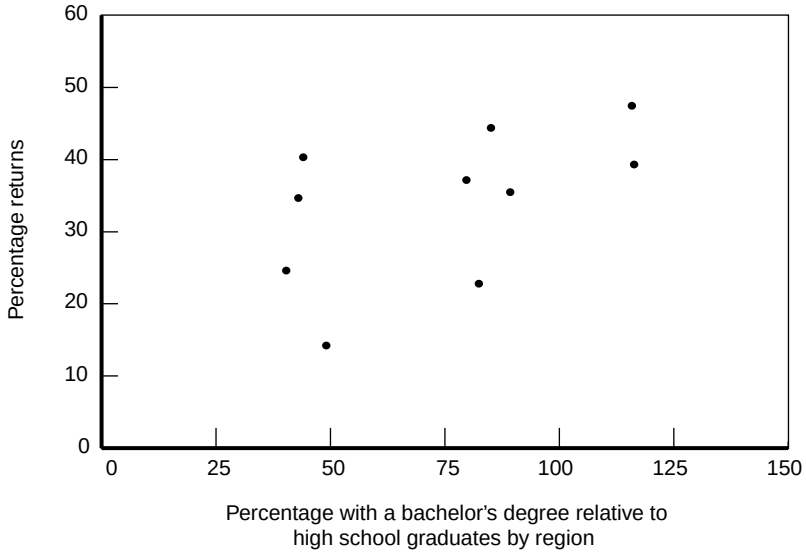

Figure 5.7—Predicted Percentage Returns to Education for Those with Bachelor's Degrees Relative to High School Graduates Plotted Against the Ratio of Population Shares, by Region, 1990

What could be causing variations in relative demand for skilled workers among California's regions? Regression analysis appearing in Appendix B suggests that the overall difference in the returns to a given level of education among regions does not systematically fall after controlling for variations in industrial mix among regions. One dramatic exception was the gap in earnings between dropouts and high school graduates. Roughly speaking, this wage gap varied by about 17 percent among regions, with about 7 percentage points of this difference arising from differences in the industrial mix. The second half of this chapter will search for variations in the returns to education among California's industries in some detail.

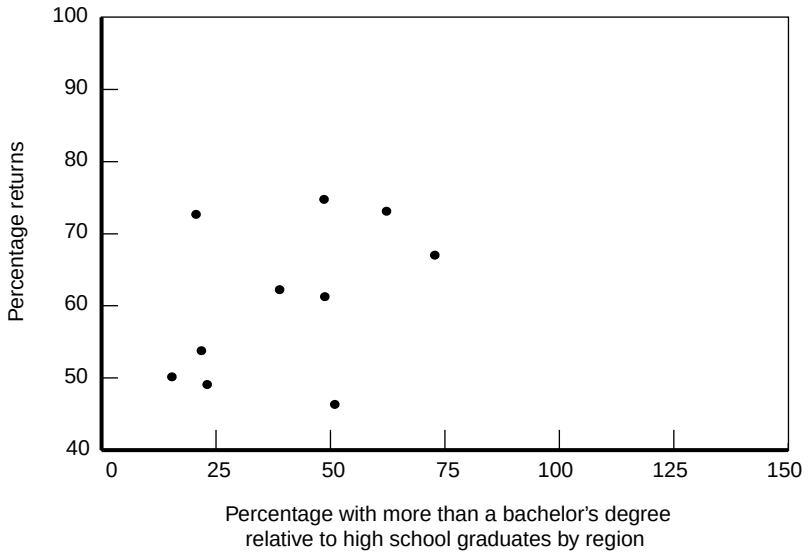

Figure 5.8—Predicted Percentage Returns to Education for Those with More Than a Bachelor's Degree Relative to High School Graduates Plotted Against the Ratio of Population Shares, by Region, 1990

In the case of the regional patterns in the wage gap between dropouts and high school graduates, where interregional variations in relative supply seem to dominate, what additional factors might be causing these variations? Given the observation that immigrants constitute a majority of high school dropouts, it seems logical to ask whether differences among regions in immigrant shares of the population are correlated with variations in the returns to graduating from high school. Figure 5.5 shows that across regions, the difference in wages between dropouts and high school graduates is strongly negatively related with the ratio of dropouts to graduates. The correlation between this wage gap and the share of immigrants in the local population is also negative and quite strong. Perhaps more suggestive, the wage gap between high school

dropouts and graduates is even more strongly negatively related to the ratio of immigrant high school dropouts to immigrant high school graduates.[2] These findings suggest that immigration contributes substantially to the relative supply shocks that are apparent in Figure 5.5. In other words, the share of immigrants in the population and immigrants' distribution of education can explain a substantial part of the interregional variations in the wage gap between high school dropouts and graduates.

Variations in Returns to Education Across California's Industries

Is it true that the returns to education in California have increased in all industries, or only in a select few? To answer this, we ran separate regressions for each of 31 industries, combining observations about prior year employment from the 1980 and 1990 Censuses for California.

In many industries no statistically significant change in the earnings gap between dropouts and high school graduates occurred over the decade, but in all of the cases with a significant change, the gap widened. In other words, the returns to graduating from high school in some industries, notably utilities and sanitary services, transportation, and construction, rose. The fact that in some industries the gap did not widen in a statistically significant fashion may simply indicate that small sample sizes of dropouts in some industries make it difficult to identify trends. Nevertheless, it seems prudent to note that the regressions indicate some variations across industries.

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[2]Appendix B summarizes these results in more detail.

Changes in the wage premium from attending "some college" between 1979 and 1989 are much more clear-cut, with about two-thirds of industries experiencing a statistically significant increase in the returns to this level of education. In no industry did the returns to education drop significantly between 1979 and 1989. As for the returns to a college degree and postgraduate education, 25 and 28 industries out of 31 show an increase in the returns to these two levels of education, respectively. The coefficients for the remaining industries are positive, indicating an increase in the returns to education, but they are not statistically significant.

Overall, these results strongly indicate that in California between 1979 and 1989 the phenomenon of increasing returns to schooling is in no way limited to one or a handful of industries; the effects are widespread.

The next question this section addresses is: "Do the returns to education in California's industries merely reflect the returns to education in the same industries outside California?" This question is relevant for two reasons. First, it is important to know whether trends in California are in any way unique. Second, evidence on degrees granted and on the gap in the overall returns to education between California and the rest of the nation suggests that at the college level, California's employers are competing in a national market for workers, compelling them to pay national rates. However, economists have long known that at the national level, some industries pay quite different wages than others. See for instance Krueger and Summers (1988).[3] If it is indeed

[3]A leading explanation for this variation is what economists refer to as "compensating differentials." If jobs in certain industries are less attractive than jobs in other industries, for instance because of variations in the susceptibility of the industries to

true that at higher skill levels the labor market is a national one, then the returns to a college education by industry in California should closely match the returns to education by industry elsewhere. The correlation should weaken in the markets for less educated workers, though.[4]

Figures 5.9 through 5.12 plot the estimated returns to each level of education in California versus the returns elsewhere. The underlying regression analysis appears in Appendix B. A 45 degree line appears on each figure to indicate where each industry observation should lie if there were perfect equality in the returns to education by industry between California and the rest of the country. The first two figures, for the dropout–high school graduate wage gap and the "some college"–high school wage gap, suggest a positive correlation between the returns to education in California and elsewhere. The correlation is much stronger at the "some college" level, though. The fact that the returns do differ suggests that the markets for workers with some college, and especially workers with a high school diploma and less, are not fully nationally integrated. The hypothesis of identical returns by industry is more closely obeyed at the "some college" level.

Figures 5.11 and 5.12, which display the returns to a bachelor's degree and higher, tell a quite different story. The industry points with a

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recession or other risks, wages will adjust until they compensate for these differences. A second explanation, addressed by Krueger and Summers (1988), is that firms in some industries find that the productivity gains that result from increasing wages exceed the gains that would result from increasing wages in other industries. This variation would then lead to dispersion among industries in average wages.

[4]It is possible for the returns to education among states to match closely even if average earnings for specific education levels of education vary by state. For instance, differences in the cost of living are likely to induce gaps in average earnings among states. But it is less clear that variations in the cost of living will affect the percentage wage gains from additional education among states. In other words, the returns to education should not depend strongly on the cost of living in each state.

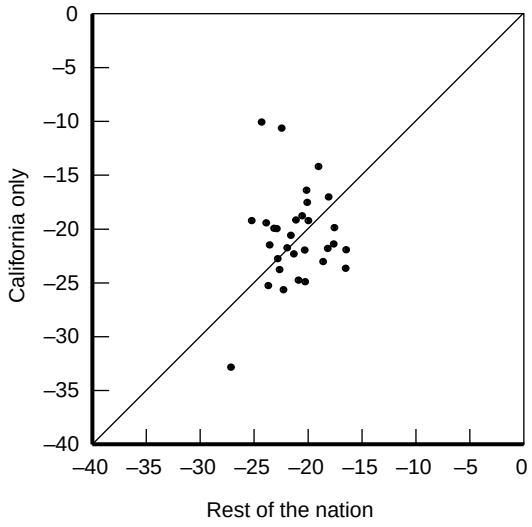


Figure 5.9—Predicted Percentage Returns to Education for Those with Less Than a High School Diploma Across 31 Industries

few exceptions all lie close to the 45 degree line. In other words, employers in a given industry in California pay a wage premium to workers with a bachelor's or higher degree that closely matches the wage premium paid to these workers elsewhere in the country.

The figures show that in percentage terms, industries vary more in the wage premium they pay to workers with a college degree or higher than they do to those with lower levels of education. Interindustry variations in the wage gap between high school dropouts and graduates are especially small.

The most important conclusion from these results is that the returns to education in California's industries match those in the same industries in other states fairly well, but that the interindustry patterns in wages in California and other states match particularly well at the college and

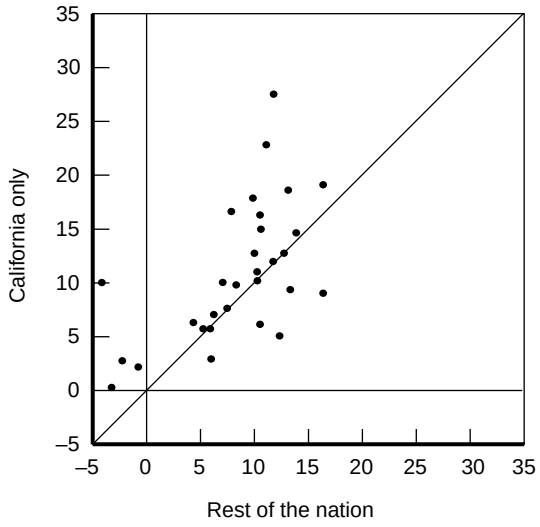


Figure 5.10—Predicted Percentage Returns to Education for Those with Some College Across 31 Industries

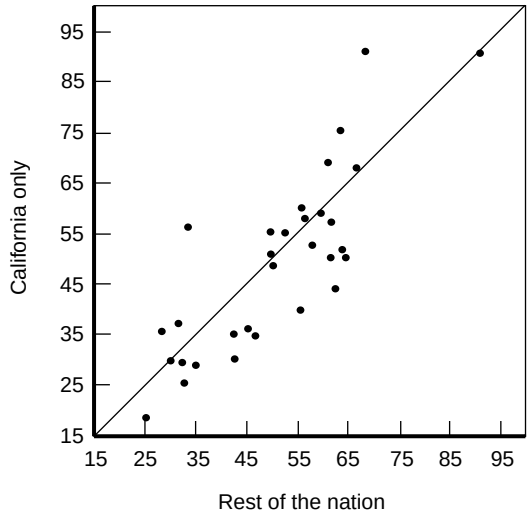


Figure 5.11—Predicted Percentage Returns to Education for Those with a Bachelor's Degree Across 31 Industries

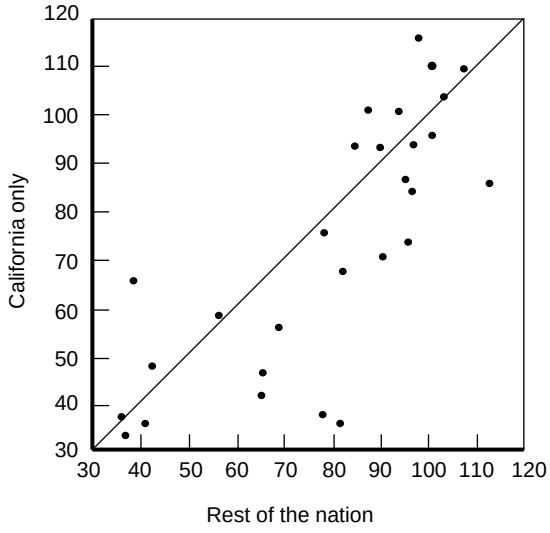


Figure 5.12—Predicted Percentage Returns to Education
for Those with More Than a Bachelor's Degree
Across 31 Industries

higher levels. Overall, this finding supports the two pieces of evidence uncovered above that point to a national market for college-educated workers.

Finally, this section addresses the following question: "How much of the observed wage variations across California's industries can be explained by variations in educational attainment of workers?" Regression analysis presented in Appendix B shows that the educational composition of the workforce does more to explain interindustry wage variations than it does to explain interregional wage variations. However, large interindustry wage differences remain after accounting for variations in educational attainment across industries.

Conclusions

Chapter 2 revealed that levels of education vary substantially between California's regions. The analysis in this chapter provides further evidence that California possesses several labor markets, each of which rewards education slightly differently. The three regions in which wage gaps between more and less educated workers appear to be largest are the Central Valley, the Los Angeles region, and Orange County. Variations in both labor supply and labor demand appear to contribute to regional variations. However, in markets for workers with bachelor's degrees or higher, variations in demand for skilled labor appear to be the more important driving force behind regional variations in returns to education. One potential explanation for differences in demand for highly educated labor between areas is interregional variations in the "industrial mix." However, this factor appears to explain only a small portion of regional differences in returns to education.

The pattern of geographical variations in the wage gap between high school dropouts and high school graduates suggests that interregional variations in relative supply explain most of the variations. One factor that could potentially account for these supply variations is interregional differences in the share of immigrants in the local population, which is strongly negatively correlated with the wage gap between dropouts and high school graduates among regions. In addition, regions in which a particularly high percentage of immigrants are dropouts tend to have larger dropout-graduate wage gaps.

Before concluding that the returns to education have surged across the board in California, it is necessary to ask whether pay rates in all of California's industries have shared in this trend. Between 1979 and 1989, the pattern of rising returns to education appears to be a

widespread phenomenon across industries. Evidence for a widespread increase in the returns to education is particularly strong at the college level.

Of course, this is not to say that returns to education were identical across all of California's industries. Indeed, in 1989 California's industries varied considerably in the wage premium they paid to those with a college degree or more. But these industry wage differentials were strikingly similar to those observed in the rest of the nation. In contrast, variations in the returns to "some college" or less by industry were not as consistent between California and the rest of the nation. Together, these results suggest that at the college level California's employers compete with employers nationwide in the same industry for limited supplies of skilled labor; but at lower skill levels, California's labor market seems less strongly integrated with labor markets elsewhere.

6. Conclusion and Policy Insights

For well over a century, California has attracted large flows of migrants from other states and immigrants from around the world. By and large, these newcomers have arrived with dreams of economic success for themselves and their families. For immigrants, migrants, and California natives alike, what have workers needed to thrive in California's labor market? In particular, has a good education become an essential ingredient in achieving the "California dream?" These are the central questions addressed in this report.

Analysis of trends in wages in California between 1969 and 1995/96 reveals a startling increase in the earnings gap between workers with different levels of education. In 1969, workers with more than a bachelor's degree enjoyed a modest wage premium of 24 percent relative to high school graduates with similar background characteristics; by 1995/96 this premium had skyrocketed to 95 percent. Similarly in

1969, dropouts earned only 21 percent less than high school graduates. By 1995/96, this wage gap had risen to 29 percent.

Clearly, a good education has become all but essential for workers in California who wish to participate fully in the California dream. But one must ask, is the extraordinary rise in the returns to education in California something unique to the state, or does it merely mimic wage trends in the rest of the country? Surprisingly, a comparison of trends inside and outside California suggests that in 1969, education mattered *less* in California than in other states. That is, the wage premium earned by those with more education was slightly smaller in California than elsewhere. However, between 1969 and the mid-1990s, the wage gaps between workers with different levels of education widened more quickly in California than in the rest of the nation. By 1995/96, the returns to education were slightly higher in California than in the rest of the nation. By the mid-1990s, one clear distinction stood out between California and other states: The wage gap between high school dropouts and high school graduates had become larger in California compared to the rest of the country, at 29 percent compared to 25 percent elsewhere.

Given that the wage premium paid to highly educated workers has risen so dramatically, the basic law of supply and demand suggests that in relative terms, demand for more skilled workers has grown more quickly than has supply, both in California and the United States as a whole. Similarly, the more rapid increase in the returns to education in California suggests that variations in the rates of growth of supply and demand for workers of various education levels must have occurred between California and the rest of the country.

Between 1970 and 1996/97, California has indeed experienced rather complex changes in the composition of its workforce. Average

educational attainment among California's adults has risen over the decades but not as quickly as in the rest of the country. In 1970, California residents held a one-year advantage in educational attainment over residents in other states; by 1996/97 this advantage had slipped to a mere one-quarter year. Viewed in the context of a supply and demand analysis, this finding fits well with the finding that returns to education have risen more quickly in California than elsewhere. For instance, suppose that the relative demand for highly educated workers has increased by similar amounts in California and other states. Then the fact that the relative supply of highly educated workers has grown more slowly in California suggests that the relative earnings of these skilled workers should have risen more quickly in California than in the rest of the nation, as indeed it has.

The *distribution* of workers by educational attainment has also changed in divergent ways in California and elsewhere. In 1970, California had a relatively more homogeneous population, with a bunching of adults in the middle educational categories of high school graduates and adults with some college. By 1996/97, the middle of the educational distribution had been hollowed out to some extent, relative to the population in other states, with California experiencing a large increase in its share of high school dropouts relative to the rest of the country.

Streams of workers from outside California have contributed significantly to the state's growing population. Remarkably, in 1990, California natives represented only 38 percent of the adult population, with natives born elsewhere and immigrants making up 36 percent and 26 percent of the population, respectively. Nonetheless, between 1970 and 1990, native Californians became a slightly larger component of the

adult population, whereas the fraction of adults who were immigrants more than doubled, and the fraction of adults who were migrants from other states fell.

These changes in the origin of California's adult population play a key role in explaining changes in the overall educational composition of the workforce. Over time, immigrants have become an ever larger share of California's high school dropouts. Natives born in other states have accounted for decreasing shares of each education group over time, although in 1990 they still accounted for one-half of all Californians who held more than an undergraduate degree. By 1990, California natives were most strongly represented in the middle of the educational distribution, with immigrants representing the majority of high school dropouts and natives born elsewhere representing a slim majority of those with more than a bachelor's degree.

Although it is true that immigrants in California have contributed significantly to the state's population of high school dropouts, it is important to remember that immigrants are not an educationally homogeneous group. Indeed, in 1990, the two educational groups with the largest share of immigrants in California were dropouts (54 percent) followed by those with more than a bachelor's degree (21 percent). This is not a minor point. Saxenian (1998) establishes that 24 percent of Silicon Valley high-technology firms are run by Indian or Chinese chief executive officers. In relative terms, immigrants contribute most strongly to California's workforce at the two extremes of the educational distribution.

Overall, though, the most striking difference between California and the rest of the nation in terms of the educational mix of the population is the relatively large number of less highly educated immigrants in

California. At the same time, probably the most important distinction between the returns to education in California and the rest of the nation is California's relatively large earnings gap between high school dropouts and graduates. Could there be a causal link between immigration and the declining earnings of the least highly educated in California? National studies have shown that it is difficult to establish that inflows of immigrants have altered the wage structure.[1] Nonetheless, the fact that recent immigrants arriving in California have had substantially less education than natives living in California or than immigrants in the rest of the country is suggestive. Additional evidence that immigrants may have affected the wage structure comes from our analysis of variations in the returns to education between regions of California. Regions with larger gaps between the earnings of high school dropouts and high school graduates tend to have a larger percentage of immigrants in their populations, as well as a larger share of immigrants who are dropouts.

Turning from the issue of high school dropouts to the issue of workers with college degrees, the report examined whether California has been a net importer of college-educated workers from other states and countries. To answer this question, we compared the number of graduates produced by the state's universities with the estimated number of new graduates that California would have needed to account for observed growth between 1970 and 1990. It appears that California's colleges have contributed about one-half of the increase in the number of working-age Californians with bachelor's degrees or higher observed over

[1]For instance, see Card (1990) who finds that the Mariel boatlift of thousands of Cuban refugees to Miami had little apparent effect on earnings of natives in that city. In contrast, Borjas and Ramey (1995) find some evidence that differences in trends in the returns to education among American cities can be partly explained by variations among cities in immigration patterns and exposure to adverse trends in international trade.

the period. This is impressive given that by 1990 only 38 percent of the state's adult population was born in-state. At the same time, the results suggest that California must have imported large numbers of workers with bachelor's degrees or higher between 1970 and 1990. The implication is clear: California's employers compete in a national market for highly educated labor.

Two insights gained from wage patterns support the contention that the state's employers compete in a national market for skilled workers. Over time, the gap between California and other states in the returns to a college education have converged, suggesting that an increasingly highly integrated national market for workers with a bachelor's degree or higher has developed. Similar evidence of an integrated national market comes from examination of interindustry differentials in wages. Gaps in earnings between industries suggest that to some extent separate labor markets exist for different industries. The question for California is, are these industry-specific markets national or local? When the returns to education by industry were computed separately for California and the rest of the nation, the correlation in the returns to a high school diploma (relative to the earnings of dropouts) in a given industry in California and in the same industry elsewhere was quite low. In contrast, the returns to "some college" and especially to a college degree or higher were highly correlated between industries in California and the same industries in other states. Industry by industry, then, California's employers appear to compete for college-educated workers in nationally integrated markets. In the markets for workers with a high school diploma or less, the evidence instead points to markets that more closely resemble local "California-only" labor markets.

The findings from this research project point to several issues that should concern the state's policymakers. First, and most broadly, the rising gap in earnings between the most highly educated and the least highly educated workers in California has led to an increase in inequality, as Reed (1999) documents. From an economic viewpoint, the rapid growth in the college wage premium has created an extraordinary incentive for young people in California to finish high school and attend postsecondary institutions. Many would argue that this strengthening of incentives to attend college is all to the good. But the issue is not that simple. A higher gap in earnings between the most well educated and the least well educated can sow the seeds of social division. In California, where the earnings gap between dropouts and high school graduates has widened considerably further than in the rest of the country, policymakers should be especially concerned about the economic circumstances of the least advantaged members of society. Such concerns seem particularly well justified, given evidence presented in this report about how the "rising returns to education" played out in terms of trends in actual wages: The real earnings of high school dropouts expressed in 1996 dollars plummeted from about $31,000 in 1969 to about $17,000 in 1995/96.

Second, and more specifically, the finding that immigrants by 1990 represented 54 percent of all high school dropouts in the state raises the question of whether many of these least skilled members of the population have had any contact with California's public school system. Judging by immigrants' age at arrival in the United States, the report estimates that in 1990 approximately 74 percent of adult immigrants in California had completed their K–12 schooling or dropped out of school before arriving in the United States.

This raises serious policy questions. To what extent can reforms to the state's public school system reduce the proportion of dropouts in the adult population if many dropouts never attended school in California? Furthermore, given the fact that such a large proportion of immigrants have dropped out of school before arriving in California, what adult education programs could the state implement or expand to reach the less skilled among this population? Finally, the results suggest that the public and policymakers should be careful not to ascribe the alarming gap in dropout rates between California and the rest of the country entirely to a failure of California's schools. Analysis of the population aged 19 to 24 in California and in the rest of the country suggests that the higher dropout rate among young Californians is due entirely to three factors: the higher percentage of immigrants in California, the higher dropout rates among immigrants relative to natives, and the higher dropout rate of California's immigrants relative to immigrants in the rest of the country. The data suggest, but cannot establish with absolute certainty, that the majority of young immigrant dropouts in California's population never attended California's schools. These are important issues that deserve further study.

The third broad policy concern raised by the report has to do with the contributions of California's postsecondary sector. The state's universities and colleges have made major contributions to the stock of "human capital" in California. The report estimates that between 1970 and 1990, California's postsecondary sector generated roughly one-half of the observed overall increase in the supply of the working-age population with bachelor's and postgraduate degrees. Given that in 1990 only 38 percent of the state's adult population was born in

California, this figure is a testament to the success of California's Master Plan for postsecondary education.

At the same time, California has clearly depended on imports of college-educated workers to fuel the growth of its industries. Between 1970 and 1990, the share of California natives in the middle educational tier, "some college," rose from 40 percent to 45.5 percent. At the bachelor's degree level, the share rose from 30.6 percent to 36.2 percent. But at the postgraduate level, the share of California natives rose from 27.3 percent to only 28.5 percent.

From a policy perspective, California's reliance on skilled workers from elsewhere is something of a double-edged sword. In many ways the state benefits from these imports. For instance, the ability of state employers to recruit nationally reduces the need for policymakers in California to attempt constantly to fine-tune enrollments in universities based on the perceived needs of local employers. In addition, California's taxpayers in essence have a free ride on the taxpayers in other states (and countries) because the latter subsidize the postsecondary education of many students who subsequently take jobs in California.

However, these advantages are offset by the obvious disadvantage that the state's employers, by relying on skilled workers from outside California, become subject to the whims of the national market for these workers. Of course, California's policymakers can do little to affect national wage rates. But two key areas of policy can influence the supply of college-educated workers that California receives—and retains—from other states and countries.

First, financial support for California's colleges might act to attract talented young people to the state. As noted above, California's colleges appear to be generating roughly one-half of all college graduates entering

the adult working-age population over time. At the same time, well *under* half of the state's college-educated workers were born in California. The gap in these two figures suggests that many students choose to move to California to attend one of the state's universities and subsequently take jobs in California. Support for the idea that California's postsecondary sector acts like a magnet to attract young students from elsewhere comes from two sources. First, in 1990 natives born outside California and immigrants made up 42.4 percent of college students aged 18 to 24 in California, compared to only 34.4 percent of youth aged 13 to 17. Second, in 1990 16 percent of college students aged 18 to 24 in California reported living in other states or abroad in 1985. If it is true that California's postsecondary institutions serve as magnets to attract bright young people from around the country and around the world, then it provides an additional rationale for California to continue to support its postsecondary sector financially. Similarly, it suggests that policymakers should encourage universities to remain open to students applying from other states and countries.

Second, given that California's employers compete in a highly integrated national market for skilled workers, it makes sense for policymakers to consider the complex set of factors that workers take into account when choosing where to live. There is much that the various tiers of government in California and in Washington, D.C., can do to improve the amenities that contribute to the overall quality of life. For instance, legal and fiscal policy can alter the attractiveness of California to migrants from other states and to immigrants from outside the country. One example of relevant legal and quasi-legal policy established at the federal level is the set of rights extended to legal immigrants, which arguably affects the probability that immigrants will come to the United

States and choose to remain. A second example, this time of policy established within California, is the extent to which skilled migrants from other states can transfer to California their hard won professional certifications (to teach, to practice law, and so on). Examples of state fiscal policy that can affect the attractiveness of California to migrants run the gamut from automobile import fees to differential fees for college students from out of state.

Similarly, the quality of local public services such as public safety, schools, sanitation, water supply, and public transportation can each play major roles in attracting skilled workers to California and retaining them after they arrive. Ironically, the dependence of California on skilled workers from other states and countries means that adequate expenditures on K–12 and postsecondary institutions may form only part of the optimal policy response. Ultimately, sustained spending in areas far removed from education, such as spending on public safety and transportation, may prove to be crucial ancillary methods of ensuring that California continues to attract skilled workers from around the world.

Appendix A

Data Sources and Tables to Supplement Chapters 2 to 4

Data Sources and Variable Construction

This part of Appendix A details information about the data sources and the ways key variables were constructed. The first section provides general information about the data sources, and the specific characteristics about each dataset are described in separate sections at the end of this appendix. The section on "Variables" provides information about variables that are standardized throughout different datasets, and data problems particular to one dataset are described at the end of this appendix in the section "Data Specifics."

Data Sources

Census Data

Data used in this study are from the U.S. Bureau of the Census: the 1970, 1980, 1990 data from the decennial Censuses of Population and Housing, and the 1996 and 1997 data from the March Annual Demographic File of the Current Population Survey (CPS). The Census data of 1970 is taken from the two 1 percent Public Use samples—the 5 percent and the 15 percent questionnaires. In each of these 1970 datasets, the sample represents 1 percent of the total population, providing this study with a 2 percent sample of the population. However, because of the two different questionnaires, not all of the 1970 data were consistent or could be used for all the questions. The 2 percent sample was used whenever possible; for instances limited by the questions and noted in the text, only one of the 1 percent samples could be used. The 1980 and 1990 Census data are 5 percent samples of the population. The relatively small CPS 1996 and 1997 datasets were pooled to provide a larger sample of the population. Appropriate sampling weights were used for the 1990 and 96/97 data and the appropriate constant weights were assigned to the 1970 and 1980 data.

The sample used for the study consisted of all people between the ages of 18 and 65 who were not in the military and who were not living in group quarters. In addition, because years of schooling is the focal point of the study, any person who had education variables allocated by the Census Bureau or who had missing education information was removed from the sample. The education variables affected were years of schooling and, in the Census years 1970 and 1980, the variable indicating whether the person had finished the grade. Because of this

sampling restriction, for the "all of U.S." samples, we used the following portions of the aged 18 to 65 raw data: 89.3 percent in 1970, 98.7 percent in 1980, 94.2 percent in 1990, and 99.4 percent and 99.4 percent in 1996 and 1997, respectively. For the "California only" samples, we used the following portions of the original samples: 88.5 percent in 1970, 98.1 percent in 1980, 92.7 percent in 1990, and 99.4 percent and 99.6 percent in 1996 and 1997, respectively.

Degrees Data

The data used to calculate degrees awarded come from the Higher Education General Information Survey (HEGIS) and the Integrated Postsecondary Education Data System (IPEDS), which is conducted by the Department of Education's National Center for Education Statistics (NCES). The HEGIS/IPEDS data file was downloaded from WebCASPAR,[1] providing data for the years 1966 through 1995. For this study, we used data from 1970 to 1995 and compared our calculations to available reports (1993, 1994, 1995) published in The Digest of Education Statistics to ensure accuracy. Since military personnel were not included in our labor data, military college data were excluded in the degrees calculations. Subgroups of the HEGIS/IPEDS data were defined in the following way:

California colleges and universities—

Public

University of California, California State Universities, and community colleges

Private

[1]http://caspar.nsf.gov/webcaspar.

Other U.S. schools—public and private

Degrees reported included the following categories: associate, bachelor's, master's, first-professional (J.D, M.B.A., etc.), and doctorates (Ph.D., Ed.D., etc.).

Variables

Education Variables

For education, we used two main variables: one continuous variable for years of education and one categorical variable to group people into five education categories for more generalized analysis. The information for years of education was not consistently available across all the different datasets. Data up to and including 1980 listed each person's years of schooling, but not their degrees.

The 1990 Census and the CPS 1996/97 data instead used categorical codes that typically covered a range of years of education. For specific K–12 grade spans in these latter datasets (which occur up to grade 9 only), we assigned the midpoint value of the range as the value for years of schooling. For people who finished grade 9 through grade 12, their exact number of years of education are known. For those with some postsecondary education, years of education were calculated using the following rules:

"Some college, but no degree": 13 years

Associate degree: 14 years

Bachelor's degree: 16 years

Master's degree: 17 years

Professional degree: 18 years

Doctorate degree: 20 years.

The 1970 and 1980 datasets provided precise values for years of education. Additionally, both datasets contained information on whether the person had finished that year of education. We subtracted one from the years of education if the value of that variable indicated that the person had not finished that grade. However, for people who graduated from high school but did not finish their first year of college, we did not subtract one from the years of education so that they would be grouped among those who had "some college."

Most of the report relies on a five-category description of educational attainment, derived from the continuous variable for years of education. These five categories are listed in Table A.1.

Table A.1

Education Categories

<12	Less than high school diploma
12	High school diploma
13–15	Some college (but less than a bachelor's, and possibly including an associate's degree)
16	Bachelor's degree
>16	More than bachelor's, or "postgraduate"

Earnings

In 1970, earnings values had to be recoded because of the reporting of earnings in ranges. In these cases, the midpoint of the earnings range was assigned. Topcoding done by the Census Bureau on earnings values may affect calculations for observations in the high earnings ranges. The range of earnings affected are: >$50,000 (1970 data), >$75,000 (1980 data), >$140,000 (1990 data), and >$183,748 (1996 and 1997 data).

Industry Codes

Information about industries was grouped into 33 consistently defined industries across years, defined in Table A.2.

Table A.2

Detailed Industry Groups

1	Agriculture, Forestry and Fisheries
2	Mining
3	Construction
4	Food, Kindred and Tobacco
5	Textile Mill Products
6	Apparel
7	Paper
8	Printing and Publishing
9	Chemicals
10	Petroleum and Coal
11	Rubber and Plastics
12	Leather
13	Lumber and Wood Products
14	Stone, Clay, Glass and Concrete
15	Metal
16	Machinery and Computing
17	Electrical Machinery
18	Transportation Equipment
19	Professional & Photographic Equipment and Watches
20	Other Manufacturing
21	Transportation
22	Communications
23	Utilities and Sanitary Services
24	Wholesale Trade
25	Retail Trade
26	Finance
27	Insurance
28	Real Estate
29	Business and Repair Services
30	Personal Services
31	Entertainment and Recreation Services
32	Professional and Related Services
33	Public Administration

For observations that had been allocated an industry group by the Census Bureau—(1) Finance, Insurance, and Real Estate, or (2) Telecommunications—we reassigned these people to a specific industry in the 33-industry aggregation using a randomized procedure based on the actual percentage of people who were known to be in each of those industries.

Ethnic Groups

Although the race and ethnic questions are not consistent throughout the different datasets, we coded everybody as completely as possible into the following ethnic groups: white, black, Asian, Hispanic, native American, and other non-Hispanic. People who identified themselves as "other" or "white" and Hispanic were coded as Hispanic. People not in "other" or "white" were left in their race groups regardless of their Hispanic response. For the 1970 datasets, please see the notes specific to 1970 below.

Immigration Cohorts

Across Census and CPS years, we were able to coordinate the years to produce a standard immigrant cohort measure. For people in the CPS dataset who had immigrated to the United States between 1984 and 1985, a time span that belonged in two different cohorts, we used a randomized procedure to split this group of people into two different cohorts. However, Chapter 3 uses immigrant cohort information from the 1990 Census only (see Table A.3).

Table A.3

Immigration Cohorts

1	Before 1950
2	1950–1959
3	1960–1964
4	1965–1969
5	1970–1974
6	1975–1979
7	1980–1984
8	1985–1990
9	1990–onwards

Data Specifics

1970 Census

The 1970 Census data had two questionnaires that each produced a 1 percent sample of the total population: one for a 5 percent sample of households and one for a 15 percent sample of households. The two questionnaires contain different questions for certain topics. In these cases, notes are made to distinguish which one of the 1970 Census samples was used. Questions on immigrant status were asked of one of the samples. Recodes of some characteristics had to be created based on several different questions from the respective questionnaires (see discussion of Hispanic identifiers below).

The two 1970 samples used—the 5 percent and the 15 percent questionnaires—did not have a standard way of identifying those with Hispanic heritage. To decide on how best to count the historically undercounted Hispanic population, we used a version of the criteria of Bean and Tienda,[2] using relevant variables available in the two different

[2]See Bean and Tienda (1987), Appendix A, pp. 404–405.

questionnaires. In the 15 percent questionnaire, people with the following criteria were identified as Hispanic: those who were born in Puerto Rico, Latin, and Central America; people whose parents were born in Puerto Rico, Latin, and Central America; people whose parents are identified as Hispanic; people who said they had Spanish as their mother tongue; and those who were coded by the Census as "Spanish-American." The 5 percent questionnaire had no parentage questions that would identify second-generation Hispanics. Thus, only people who were born in Puerto Rico, Latin, and Central America could be identified as Hispanic. Although these criteria help to identify who is Hispanic, those who are second-generation or who have been Americanized longer are identified with much less accuracy.

1980 Census

The 1980 Census was used as the reference point for standardizing variables across the different datasets.

1990 Census

The 1990 Census is different from the other decennial Census datasets primarily because it had assigned weights from the Census Bureau. We used these given weights in our calculation unless otherwise noted. We also had to make adjustments to the education and income variables for this dataset (see above) which may affect some calculations.

1996/97 CPS

The data derive from UNICON's standardized dataset for the CPS March data. The CPS questionnaire did not change between 1996 and 1997 for the variables we were using. The CPS is not fully comparable

to the more complete decennial Census. A comparison of the 1990 CPS data and the 1990 decennial Census yielded somewhat different means and standard deviations for years of education and income from earnings. However, the race and ethnic group distribution is comparable and not significantly different. The use of the 1996/97 CPS survey serves to give a recent snapshot of the population.

Supplementary Tables

Table A.4

Percentage Distribution of Adult Population by Years of Education for California Relative to the Rest of the Nation

Years of Education	1970	1980	1990	1996/97
<12	–10.1	–4.1	3.0	4.9
12	–2.1	–6.8	–9.7	–10.6
Some college (13–15)	9.6	8.1	4.5	3.0
16	0.6	0.3	1.6	2.3
>16	2.1	2.5	0.7	0.5

Table A.5

Distribution of Years of Education by Geographical Area, 1990

	Years of Education					
County/County Group	Mean	<12	12	13–15	16	>16
Del Norte, Siskiyou, Modoc, Lassen	12.50	0.21	0.31	0.35	0.09	0.04
Humboldt	12.93	0.17	0.25	0.38	0.14	0.06
Shasta	12.64	0.18	0.30	0.39	0.09	0.04
Mendocino, Lake	12.44	0.22	0.31	0.33	0.10	0.04
Colusa, Glenn, Tehama, Trinity	11.85	0.29	0.29	0.32	0.08	0.03
Butte	12.89	0.16	0.22	0.43	0.14	0.05
Plumas, Sierra, Nevada	13.21	0.11	0.28	0.39	0.15	0.06
Sutter, Yuba	11.98	0.28	0.25	0.36	0.09	0.03
Napa	12.83	0.18	0.24	0.37	0.15	0.07
Yolo	13.17	0.16	0.21	0.35	0.17	0.11
Placer	13.15	0.13	0.26	0.39	0.16	0.07
El Dorado	13.06	0.12	0.29	0.39	0.14	0.06
Sonoma	13.09	0.14	0.24	0.39	0.16	0.07
Marin	14.24	0.07	0.14	0.33	0.28	0.18
Solano	12.81	0.15	0.29	0.38	0.13	0.04
Contra Costa	13.46	0.12	0.22	0.35	0.21	0.10
San Francisco	13.30	0.17	0.17	0.28	0.24	0.13
Alameda	13.22	0.15	0.22	0.33	0.18	0.11
San Mateo	13.28	0.14	0.20	0.34	0.21	0.11
San Joaquin	11.83	0.28	0.27	0.33	0.09	0.04
Stanislaus	11.80	0.29	0.28	0.32	0.09	0.03
Amador, Calaveras, Tuolumne, Mariposa, Alpine, Mono, Inyo	12.84	0.14	0.34	0.36	0.12	0.04
Madera, San Benito	11.31	0.34	0.25	0.30	0.08	0.03
Sacramento	12.98	0.15	0.24	0.38	0.16	0.06
Merced	11.14	0.35	0.25	0.29	0.08	0.03
Kings	11.22	0.34	0.30	0.28	0.06	0.02
Santa Barbara	12.75	0.19	0.21	0.37	0.15	0.08
San Diego	12.88	0.18	0.22	0.37	0.16	0.08
Santa Clara	13.22	0.16	0.19	0.33	0.20	0.11
Tulare	10.94	0.37	0.25	0.26	0.08	0.03
Santa Cruz	12.94	0.17	0.18	0.38	0.18	0.09
Imperial	10.79	0.41	0.23	0.26	0.06	0.03
Monterey	11.86	0.29	0.22	0.31	0.12	0.07
Fresno	11.51	0.32	0.22	0.30	0.11	0.04
Orange	12.80	0.19	0.20	0.35	0.18	0.08
Kern	11.72	0.31	0.26	0.30	0.09	0.04
San Luis Obispo	13.05	0.13	0.22	0.44	0.15	0.06
Los Angeles	12.01	0.29	0.21	0.29	0.14	0.07
Ventura	12.67	0.20	0.22	0.37	0.14	0.07
Riverside	12.12	0.25	0.27	0.34	0.09	0.04
San Bernardino	12.26	0.24	0.27	0.35	0.09	0.05

Table A.6

Log Wage Regression Models for California

	1969	1979	1989	1995/96
Intercept	–2.3138	1.4612	–2.0256	0.5413
	(0.2231)	(0.1325)	(0.1325)	(1.1339)
Age	1.1106	0.7533	1.1214	0.8217
	(0.0253)	(0.0150)	(0.0150)	(0.1260)
Age^2	–0.0365	–0.0247	–0.0389	–0.0271
	(0.0010)	(0.0006)	(0.0006)	(0.0051)
$Age^3/1000$	0.5330	0.3710	0.6020	0.4050
	(0.0175)	(0.0105)	(0.0105)	(0.0869)
$Age^4/1000$	–0.0029	–0.0021	–0.0035	–0.0023
	(0.0001)	(0.0001)	(0.0001)	(0.0005)
Married	0.4030	0.3328	0.3104	0.3262
	(0.0060)	(0.0033)	(0.0030)	(0.0233)
Black	–0.2549	–0.2600	–0.2123	–0.3072
	(0.0104)	(0.0059)	(0.0059)	(0.0450)
Asian	–0.2412	–0.2556	–0.2853	–0.1968
	(0.0146)	(0.0063)	(0.0047)	(0.0342)
Hispanic	–0.1705	–0.1941	–0.2094	–0.2383
	(0.0073)	(0.0040)	(0.0036)	(0.0276)
Other	–0.2598	–0.1969	–0.1869	–0.2491
	(0.0327)	(0.0133)	(0.0136)	(0.1233)
Less than high school diploma	–0.2298	–0.2743	–0.3009	–0.3387
	(0.0063)	(0.0043)	(0.0044)	(0.0346)
Some college (13–15)	–0.0036	–0.0163	0.0862	0.1214
	(0.0064)	(0.0038)	(0.0038)	(0.0285)
Bachelor's degree	0.2192	0.1886	0.3560	0.3954
	(0.0092)	(0.0052)	(0.0045)	(0.0324)
More than bachelor's degree	0.2179	0.2180	0.5435	0.6673
	(0.0091)	(0.0050)	(0.0053)	(0.0397)
Number of observations	81599	286625	333233	5769
R-square	0.4169	0.3504	0.3859	0.3711
P-values for tests for changes in education coefficients between given year and subsequent period for education category				
Less than high school diploma	0.0001	0.0008	0.0001	
Some college (13–15)	0.0994	0.0001	0.0001	
Bachelor's degree	0.0050	0.0001	0.0001	
More than bachelor's degree	0.9904	0.0001	0.0001	
P-values for tests that education coefficients constant across time for given education category				
Less than high school diploma	0.0001			
Some college (13–15)	0.0001			
Bachelor's degree	0.0001			
More than bachelor's degree	0.0001			

Table A.7

Log Wage Regression Models for the Rest of the Nation

	1969	1979	1989	1995/96
Intercept	–1.4041	–0.2717	–3.8271	–0.2155
	(0.0722)	(0.0435)	(0.0459)	(0.3306)
Age	1.0426	0.9433	1.2874	0.9039
	(0.0081)	(0.0050)	(0.0052)	(0.0372)
Age^2	–0.0348	–0.0321	–0.0450	–0.0302
	(0.0003)	(0.0002)	(0.0002)	(0.0015)
$Age^3/1000$	0.5140	0.4910	0.7000	0.4530
	(0.0056)	(0.0035)	(0.0036)	(0.0257)
$Age^4/1000$	–0.0028	–0.0028	–0.00406	–0.0026
	(0.0000)	(0.00002)	(0.00002)	(0.0002)
Married	0.4033	0.3516	0.3188	0.3092
	(0.0021)	(0.0012)	(0.0011)	(0.0072)
Black	–0.3185	–0.2631	–0.2290	–0.2147
	(0.0027)	(0.0016)	(0.0016)	(0.0105)
Asian	–0.1331	–0.2107	–0.2291	–0.1914
	(0.0104)	(0.0043)	(0.0033)	(0.0199)
Hispanic	–0.1999	–0.1785	–0.1898	–0.2227
	(0.0042)	(0.0023)	(0.0020)	(0.0121)
Other	–0.4170	–0.2848	–0.3257	–0.2322
	(0.0132)	(0.0059)	(0.0056)	(0.0374)
Less than high school diploma	–0.2844	–0.3062	–0.2696	–0.2931
	(0.0019)	(0.0013)	(0.0014)	(0.0106)
Some college (13–15)	–0.0410	–0.0787	0.0518	0.1033
	(0.0023)	(0.0013)	(0.0012)	(0.0080)
Bachelor's degree	0.2422	0.1846	0.3515	0.3785
	(0.0031)	(0.0017)	(0.0015)	(0.0093)
More than bachelor's degree	0.2644	0.2078	0.5329	0.6722
	(0.0033)	(0.0017)	(0.0018)	(0.0120)
Number of observations	722305	2338312	2441061	52955
R–square	0.3911	0.3653	0.4017	0.3647
F–tests for differences in returns to education between California and the rest of the nation (p-values)				
Rest*(< high school)=0	0.0001	0.0001	0.0001	0.1415
Rest*(some college)=0	0.0001	0.0001	0.0001	0.4739
Rest*(bachelor's degree)=0	0.0145	0.2866	0.3243	0.5564
Rest*(more than bachelor's degree)=0	0.0001	0.0195	0.0498	0.8909
Joint test	0.0001	0.0001	0.0001	0.3223

Appendix B

Details of the Analysis in Chapter 5

Regressions to Support Table 5.1 and Figures 5.1 Through 5.4

Table B.1 shows the regressions underlying the regional wage gaps shown in Table 5.1. The bottom of the table shows that for each level of education the hypothesis that the returns to education are identical across regions is strongly rejected. The table also shows that typically the differences in the returns to education between a given region and the Bay Area, which is the omitted region, are weakly to strongly significant. In this table, the coefficient for the Bay Area is the actual education coefficient listed. For all other regions, the coefficients show the difference in the returns to the stated level of education between the Bay Area and the listed region.

Table B.1

Returns to Education Relative to High School Graduates by Region, 1989

	Less Than High School Diploma	Some College (13–15)	Bachelor's Degree	More Than Bachelor's Degree
Northern	–0.0211	–0.1170	–0.1985	–0.0826
	(0.0284)	(0.0222)	(0.0292)	(0.0392)
Bay Area (base effect)	–0.2489	0.0848	0.3315	0.5117
	(0.0104)	(0.0081)	(0.0090)	(0.0103)
Greater Sacramento	–0.0249	–0.0080	–0.0157	–0.0290
	(0.0229)	(0.0173)	(0.0205)	(0.0254)
Central Valley	–0.1007	0.0064	0.0072	0.0333
	(0.0168)	(0.0148)	(0.0192)	(0.0250)
Central Coast	–0.1060	–0.1332	–0.1261	–0.1323
	(0.0253)	(0.0208)	(0.0252)	(0.0293)
Los Angeles	–0.0496	0.0203	0.0359	0.0452
	(0.0128)	(0.0106)	(0.0121)	(0.0140)
Orange	–0.0423	0.0105	0.0568	0.0359
	(0.0186)	(0.0152)	(0.0171)	(0.0201)
San Diego	–0.0157	–0.0486	–0.0278	–0.0350
	(0.0193)	(0.0152)	(0.0176)	(0.0210)
Inland Empire	–0.0509	0.0246	–0.0338	–0.1138
	(0.0172)	(0.0144)	(0.0190)	(0.0236)
Sierra Nevada/Foothills	0.0684	–0.0008	–0.1115	–0.1067
	(0.0684)	(0.0512)	(0.0701)	(0.1031)
F-tests				
Probability that returns to education are the same across regions:				
	0.0001	0.0001	0.0001	0.0001

NOTE: Region coefficients are the differences from the corresponding returns in the omitted region, the Bay Area.

Details on the Analysis Underlying Figures 5.5 Through 5.8

Figures 5.5 through 5.8 plot the predicted wage gaps related to various pairs of educational attainment against the relative number of

adults with the two levels of educational attainment. A brief review of the basic economics of supply and demand can illuminate the logic behind the figures. The theory of demand and supply has been widely applied and validated. It maintains that the market for any good or service can be characterized by demand and supply curves. Figure B.1 illustrates a hypothetical example for the market for steel. In a plot of the price of steel against the quantity of steel sold, the supply curve is positively sloped, indicating that as the price of steel rises, steel producers will increase production in response. Conversely, the quantity of steel demanded by the rest of the economy will fall as steel prices rise. (Firms will gradually switch to substitutes such as other alloys or plastic, and in general will produce less because of lowered profits.) In Figure B.1, this is illustrated by a negatively sloped demand curve. Given the supply and

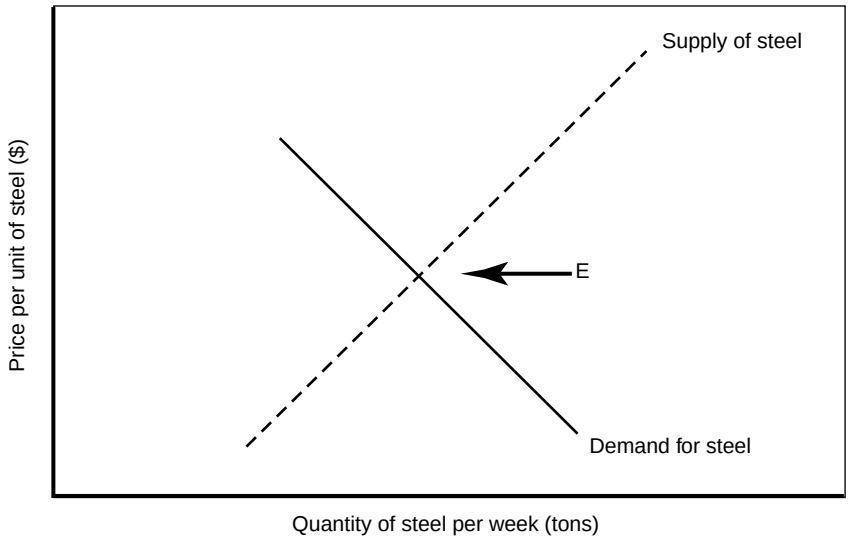
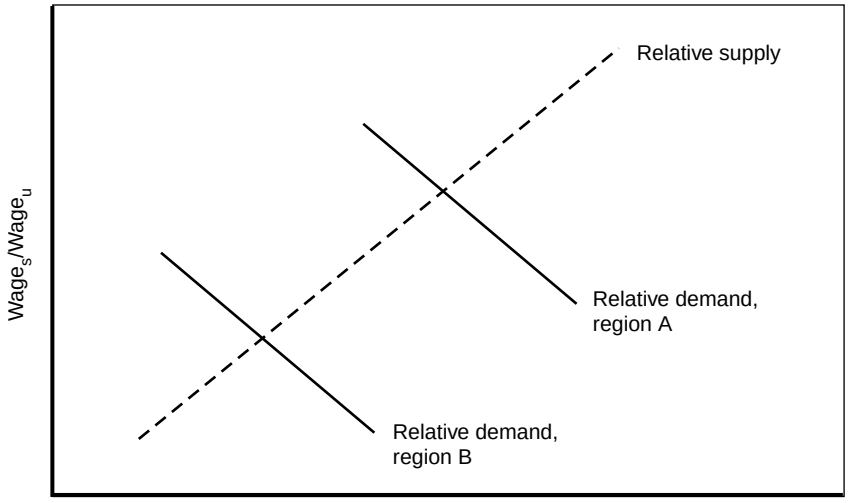


Figure B.1—Hypothetical Supply and Demand Model for Steel

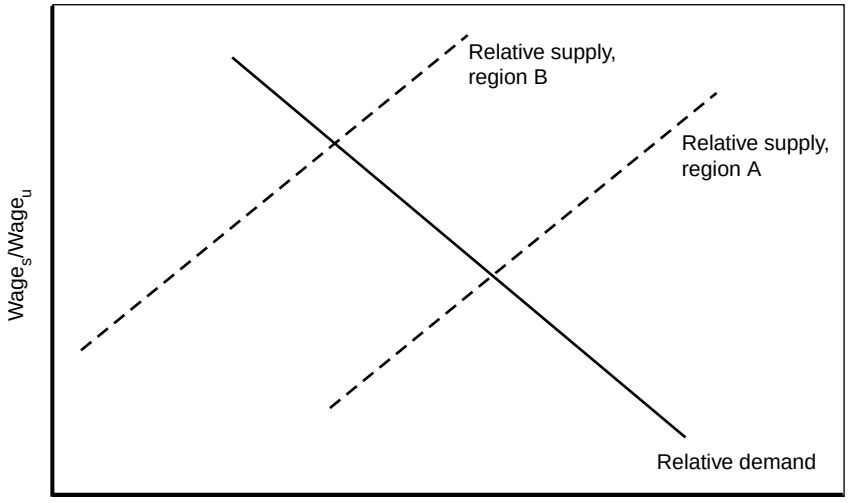
demand curve, what will the price and quantity of steel sold be? There is one price at which the quantity demanded just equals the quantity supplied. This is at the intersection of the curves, marked as point E in the diagram. Next, consider what happens if demand for steel rises, for instance as a result of a boom in the auto industry. At any price the quantity demanded rises, meaning that the demand curve moves right. The result is that rising demand leads to an increase in both the price and quantity sold. Conversely, if a new steelmaking facility comes on line, the quantity supplied at current prices rises, shifting the supply curve to the right, driving down prices.

This basic model can be applied to labor markets, because firms demand not only steel but also workers, both skilled and unskilled. Now, instead of discussing the price of steel, we are dealing with the wage of workers that will equate the supply and demand of workers. Since our concern in this appendix and the last chapter has been not the actual wages earned by workers so much as the *relative* wages earned by workers, instead of discussing supply and demand for one type of worker, say, college graduates, we can discuss the relative supply and demand for different types of workers. In other words, we can study what determines the *ratio* of earnings of skilled to unskilled workers, and the *ratio* of employment levels between these two types of workers.

A relative supply and demand graph, such as in the example in the upper panel of Figure B.2, plots the ratio of earnings of two types of workers against the ratio of the number of workers of the two types. The positively or upwardly sloped line in the box is the relative supply curve, showing the ratio of skilled to unskilled workers willing to work for a given relative wage. In our context, the theory would say that if the relative earnings of skilled to unskilled workers rises in California, the



A. Relative Supply Curve Is Identical Between the Two Regions



B. Relative Demand Curve Is Identical Between the Two Regions

Figure B.2—Hypothetical Relative Supply and Relative Demand for Skilled (S) and Unskilled (U) Workers in Two Regions

relative quantity of labor supplied by skilled workers will rise in response, as skilled workers migrate to California and unskilled workers already in California may decide that the rise in the relative earnings of skilled workers makes it worthwhile to go back to school. This accounts for the positive slope of the relative supply curve.

But supply is only half the story. What are firms willing to pay workers? This is shown by the negatively sloped relative demand curve. The upper panel in Figure B.2 shows two possible relative demand curves. Relative demand curves are negatively sloped for the following reason. We would expect that if the relative earnings of skilled workers rise, and nothing else in the economy changes, firms' relative quantity demanded of skilled workers would fall. In other words, firms will now find it profitable to switch to other ways of running their businesses that will use relatively less skilled labor. In general, then, we should expect the relative quantity demanded for skilled labor to fall when the relative earnings of skilled workers rise.

There will be one relative wage between skilled and unskilled workers where relative quantity supplied just equals relative quantity demanded. This occurs where the relative supply and demand curves cross.

Figure B.2 considers two hypothetical cases in which the returns to college differ between two regions. The top panel of the figure illustrates a situation in which the relative supply of skilled to unskilled workers, measured by the ratio of skilled to unskilled workers, is identical in the two regions. Again, the relative supply curve is positively sloped, indicating that a rise in the relative wage of skilled workers induces an increase in the relative number of skilled workers who choose to work in the region. In this example, what distinguishes the two regions is the relative demand for skilled workers. As shown, employers in region A are

willing to pay skilled workers a higher relative wage at any ratio of employment between the two types of workers. Note that as a result in the graph the two data points are situated along a positively sloped line. In other words, the result is a positive correlation between the relative earnings of skilled workers and the relative number of skilled workers employed in the region.

The bottom panel of the figure shows the opposite case, in which the two regions share an identical relative demand curve but have different relative supply curves. At any given relative wage, in region A relatively more skilled workers will be attracted to region A than to region B. The result is a negative correlation between relative wages and relative employment levels.

In practice, both relative supply and demand are likely to vary across areas. However, if variations in relative demand are the more important source of variation between regions, then we should expect to see a positive relation between relative wages and relative employment levels. In contrast, we should expect the relation to be negative if variations in relative supply dominate. If no clear pattern emerges it suggests that variations in both relative supply and demand have contributed to regional variations.

The rationale for Figures 5.5 through 5.8 in the main text derives from the above analysis of relative demand and supply. The figures show the plots of the predicted percentage wage gaps between workers at various levels of education and workers with a high school diploma and the actual ratio of employment between the two skill classes. Relative earnings are calculated as the percentage difference in predicted earnings between workers at the given level of education and workers with a high school diploma. On the horizontal axis of each graph, the relative

quantity of each level of worker is calculated as the ratio of employment at the given education level to employment of high school graduates, expressed in percentage terms.

Testing Whether the Industrial Mix Can Explain Regional Variations in Returns to Education

Chapter 5 briefly refers to a test of the hypothesis that variations in the types of industries employing workers generates the observed geographical variations in returns to education. To test this idea, we reran the wage models underlying Figures 5.5 to 5.8 after adding a set of dummy variables for the industry in which the worker was employed. The results are shown in Table B.2. The F-tests suggest that even after controlling for industry, highly significant differences in the returns to education emerge among California's regions. A comparison of the original regressions and the regressions that control for industry, in Tables B.1 and B.2, respectively, suggests that the overall variation in the returns to a given level of education among regions does not systematically fall after controlling for variations in industrial mix among regions. One dramatic exception was the gap in earnings between dropouts and high school graduates. Roughly speaking, this wage gap varied by about 17 percent among regions in the basic regressions but only by about 10 percent in the regressions that controlled for industry.

Testing for a Relation Between Immigration and Regional Variations in the Wage Gap Between Dropouts and High School Graduates

Given the observation that immigrants constitute a majority of high school dropouts, it seems logical to ask whether differences among regions in immigrant shares of the population are correlated with

Table B.2

Returns to Education Relative to High School Graduates by Region After Controlling for Industry, 1989

	Less Than High School Diploma	Some College (13–15)	Bachelor's Degree	More Than Bachelor's Degree
Northern	–0.0106	–0.1044	–0.1199	–0.0235
	(0.0282)	(0.0222)	(0.0291)	(0.0388)
Bay Area (base effect)	–0.1814	0.0871	0.1942	0.2548
	(0.0187)	(0.0149)	(0.0200)	(0.0361)
Greater Sacramento	–0.0136	–0.0106	0.0118	0.0203
	(0.0225)	(0.0170)	(0.0203)	(0.0252)
Central Valley	–0.0536	0.0110	0.0528	0.0815
	(0.0169)	(0.0147)	(0.0191)	(0.0248)
Central Coast	–0.0512	–0.1338	–0.1012	–0.1006
	(0.0250)	(0.0205)	(0.0248)	(0.0288)
Los Angeles	–0.0559	0.0222	0.0414	0.0632
	(0.0126)	(0.0105)	(0.0120)	(0.0140)
Orange	–0.0535	0.0106	0.0401	0.0487
	(0.0183)	(0.0149)	(0.0168)	(0.0198)
San Diego	–0.0146	–0.0463	–0.0120	–0.0073
	(0.0190)	(0.0149)	(0.0174)	(0.0207)
Inland Empire	–0.0445	0.0255	0.0026	–0.0595
	(0.0169)	(0.0142)	(0.0187)	(0.0234)
Sierra Nevada/Foothills	0.0545	0.0195	–0.0188	–0.0455
	(0.0672)	(0.0503)	(0.0689)	(0.1012)
F-tests				
Probability that returns to education are the same across regions:				
	0.0006	0.0001	0.0001	0.0001

NOTE: Region coefficients are the differences from the corresponding returns in the omitted region, the Bay Area.

variations in the returns to graduating from high school. First, recall that Figure 5.5 shows that across regions the difference in wages between dropouts and high school graduates is strongly negatively correlated with

the ratio of dropouts to graduates. The simple correlation between these two variables is –0.77. (A correlation of –1 would mean that the dots in Figure 5.5 would lie along a straight line; a correlation of 0 would mean no relation whatsoever.) Perhaps the most direct way to investigate whether variations in immigrant population shares have contributed to regional variations in the dropout-graduate wage gap is to calculate the correlation between the wage gap in Figure 5.5 and the share of immigrants in the local population. This correlation is also negative and quite strong, at –0.45.

A second exercise that is closer in spirit to the relative supply and demand analysis in Figure 5.5 is to replace the ratio of high school dropouts to high school graduates on the horizontal axis of that figure with a similar ratio specific to immigrants. That is, one can use the ratio of immigrants who are high school dropouts to immigrants who are high school graduates. Figure B.3 shows the results. Among regions there appears to be a strong negative relation between the overall wage gap between dropouts and graduates and the relative supply of immigrants who are dropouts. The correlation between these two variables is –0.86. Note that this correlation is stronger than the correlation between the wage gap and the overall measure of relative supply of dropouts. These findings suggest that immigration contributes substantially to the relative supply shocks that are apparent in Figure 5.5.

Explaining Overall Wage Variations Across Regions Using Variations in Educational Attainment

Chapter 5 focused on explaining variations in returns to education across regions. It makes sense to pose the question again, in a slightly different way: How much of the observed variation in earnings between

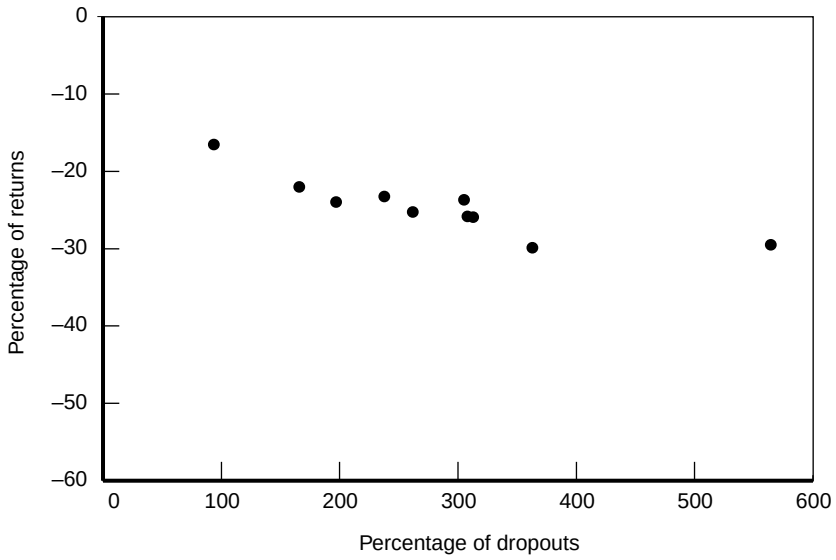
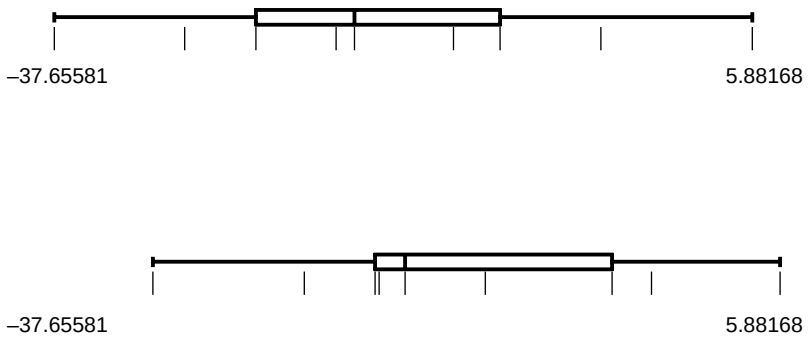


Figure B.3—Returns to Education for Dropouts Relative to High School Graduates Plotted Against Ratio of Immigrant Dropouts to Immigrant High School Graduates by Region, 1990

California's regions can be explained by variations in educational attainment? To answer this, we estimated wage models using 1989 wage data that included dummy variables for all regions but the San Francisco Bay Area, and with all the measures of personal traits used earlier, *except for education.* The coefficients on the region dummies indicate the variations in earning across areas that cannot be accounted for by personal traits such as age, marital status, and race. We then re-estimated these models after adding dummy variables for educational attainment. By comparing the predicted variations in wages across regions before and after controlling for education, we can learn about the extent to which education "matters."

Figure B.4 shows the predicted percentage wage variations before and after controlling for workers' level of education (in the top and bottom panels, respectively). The horizontal boxes in the figure are referred to as "box-and-whisker" plots.[1] A comparison of the top and bottom panels shows that accounting for differences in educational attainment across regions reduces the unexplained variation in wages modestly. That is, the range of wage gaps shrinks moderately. Educational differences can account for some of the observed variations in wages across regions, but by no means all.



NOTES: The top panel shows the percentage wage gaps in a model that does not control for education; the bottom panel shows the corresponding gaps after controlling for education. The omitted category in both models is the San Francisco Bay Area.

Figure B.4—Percentage Wage Gaps Between Regions of California Before and After Controlling for Workers' Level of Education, 1989

[1]The left and right ends of the box indicate the 25th and 75th percentile region, whereas the vertical line drawn approximately through the middle of the box indicates the median region, that is, the region in the middle of the rankings. The lines, or "whiskers," extending to the left and right of the box show the regions with the smallest and the largest wage gaps. Below the box-and-whisker plot, the vertical lines show the predicted gaps in mean earnings for each region relative to the Bay Area.

Variations in Returns to Education Across California's Industries

This section repeats the analysis and commentary from the section of Chapter 5 that bears the same title as that above, providing the underlying regressions and a much more detailed exploration of results.

A natural starting point is to ask: "Is it true that the returns to education in California have increased in all industries, or only in a select few?" We ran separate regressions for each of 31 industries, combining observations about prior year employment from the 1980 and 1990 Censuses for California. The specification was identical to that used earlier in the chapter, so that the wage gap between high school graduates and those with other levels of education was allowed to vary in 1979 and 1989. The coefficients and standard errors on the education variables interacted with a dummy variable for 1989 are shown in Tables B.3 and B.4. A positive coefficient indicates that between 1979 and 1989, the difference in earnings of workers with the stated level of education and of high school graduates became larger (or in the case of negative initial gaps, became smaller).[2]

The first column in Table B.3 shows that in many industries, no statistically significant change in the earnings gap between dropouts and high school graduates occurred over the decade, but in all of the cases with a significant change, the gap widened. In other words, the returns to graduating from high school in some industries, notably utilities and

[2]We restrict this exercise to 1980–1990 because of small sample sizes in 1970 and 1996/97. (Once the data are divided by industry sample size drops appreciably.) In addition, because of a lack of workers in some education levels in these industries, we combined textile mill products and apparel and leather industries into one for this exercise.

Table B.3

Change in Coefficients on High School Dropout and Some College Coefficients by Industry, 1979–1989

	Less Than High School Diploma			Some College (13–15)		
	Coef.	(SE)	sig-level	Coef.	(SE)	sig-level
Agriculture, Forestry and Fisheries	0.0208	(0.0310)	0	0.1769	(0.0359)	***
Mining	–0.0813	(0.0648)	0	0.0389	(0.0599)	0
Construction	–0.0504	(0.0172)	***	0.0878	(0.0164)	***
Food and Kindred and Tobacco	–0.0254	(0.0365)	0	0.0802	(0.0379)	**
Textile Mills/Apparel/Leather	–0.0632	(0.0619)	0	0.0419	(0.0715)	0
Paper	–0.0166	(0.0605)	0	0.0852	(0.0598)	0
Printing and Publishing	0.0152	(0.0508)	0	0.1393	(0.0395)	***
Chemicals	–0.0104	(0.0570)	0	0.1279	(0.0519)	***
Petroleum and Coal	0.0590	(0.0907)	0	0.0646	(0.0669)	0
Rubber and Plastics	0.0168	(0.0646)	0	0.1113	(0.0669)	*
Lumber and Wood Products	–0.0034	(0.0366)	0	0.0820	(0.0402)	**
Stone, Clay, Glass and Concrete	–0.0514	(0.0534)	0	0.0168	(0.0532)	0
Metal	–0.0019	(0.0312)	0	0.1565	(0.0320)	***
Machinery and Computing	0.0390	(0.0315)	0	0.1023	(0.0265)	***
Electrical Machinery	0.0324	(0.0352)	0	0.1262	(0.0275)	***
Transportation Equipment	–0.0539	(0.0227)	**	0.0714	(0.0185)	***
Professional/Photographic Equipment and Watches	–0.0073	(0.0711)	0	–0.0071	(0.0513)	0
Other Manufacturing	0.0282	(0.0525)	0	0.0367	(0.0538)	0
Transportation	–0.0762	(0.0218)	***	0.0696	(0.0180)	***
Communications	–0.0174	(0.0603)	0	–0.0006	(0.0312)	0
Utilities and Sanitary Services	–0.1272	(0.0372)	***	–0.0012	(0.0270)	0
Wholesale Trade	–0.0185	(0.0242)	0	0.0525	(0.0203)	***
Retail Trade	0.0104	(0.0156)	0	0.1166	(0.0134)	***
Finance	0.1322	(0.0806)	0	0.0969	(0.0454)	**
Insurance	0.0836	(0.0962)	0	0.0263	(0.0510)	0
Real Estate	–0.0547	(0.0730)	0	0.1314	(0.0556)	**
Business and Repair Services	–0.0405	(0.0265)	0	0.1077	(0.0234)	***
Personal Services	0.0155	(0.0466)	0	0.1008	(0.0435)	**
Entertainment/Recreation Services	–0.0506	(0.0584)	0	0.0192	(0.0461)	0
Professional and Related Services	0.0122	(0.0287)	0	0.0816	(0.0218)	***
Public Administration	–0.0300	(0.0324)	0	0.0775	(0.0194)	***

Table B.3 (continued)

	Less Than High School Diploma			Some College (13–15)		
	Coef.	(SE)	sig-level	Coef.	(SE)	sig-level
Number of industries with significant change						
positive change at ≤ 1%***			0			14
positive change at ≤ 5%**			0			5
positive change at ≤ 10%*			0			1
not a significant change at > 10%			27			11
negative change at ≤ 1%***			3			0
negative change at ≤ 5%**			1			0
negative change at ≤ 10%*			0			0

NOTE: To the right of the coefficients appear the standard error (SE) and an indicator of the significance level of the change, where 0 indicates no significant difference at > 10%, and *, **, and *** indicate a statistically significant change at 10%, 5%, and 1%, respectively.

sanitary services, transportation and construction, rose. The fact that in some industries the gap did not widen in a statistically significant fashion may simply indicate that small sample sizes of dropouts in some industries make it difficult to identify trends. Nevertheless, it seems prudent to note that the regressions indicate some variations across industries.

The second column of Table B.3 shows the changes in the wage premium from attending "some college" between 1979 and 1989. About two-thirds of industries experienced a statistically significant increase in the returns to this level of education. In no industry did the returns to education drop significantly between 1979 and 1989.

Table B.4 shows the changes between 1979 and 1989 in the returns to a bachelor's degree and postgraduate education. In these cases, 25 and 28 industries out of 31 show an increase in the returns to these two levels of education, respectively. The coefficients for the remaining industries

Table B.4

Change in Coefficients on Coefficients for Bachelor's Degree and More Than Bachelor's Degree by Industry, 1979–1989

	Bachelor's Degree			More Than Bachelor's Degree		
Industry	Coef.	(SE)	sig-level	Coef.	(SE)	sig-level
Agriculture, Forestry and Fisheries	0.2740	(0.0518)	***	0.4645	(0.0644)	***
Mining	0.0746	(0.0753)	0	0.3452	(0.0993)	***
Construction	0.1951	(0.0271)	***	0.2228	(0.0375)	***
Food and Kindred and Tobacco	0.1578	(0.0527)	***	0.3154	(0.0753)	***
Textile Mills/Apparel/Leather	0.0836	(0.0929)	0	0.2787	(0.1312)	**
Paper	0.1112	(0.0820)	0	0.3994	(0.1339)	***
Printing and Publishing	0.1045	(0.0492)	**	0.2325	(0.0674)	***
Chemicals	0.1376	(0.0593)	**	0.2648	(0.0692)	***
Petroleum and Coal	0.2166	(0.0818)	***	0.3994	(0.1015)	***
Rubber and Plastics	0.0662	(0.0955)	0	0.3112	(0.1293)	**
Lumber and Wood Products	0.0577	(0.0712)	0	0.0265	(0.1185)	0
Stone, Clay, Glass and Concrete	0.1751	(0.0864)	**	0.0216	(0.1326)	0
Metal	0.1607	(0.0491)	***	0.2008	(0.0715)	***
Machinery and Computing	0.2492	(0.0329)	***	0.2837	(0.0369)	***
Electrical Machinery	0.1986	(0.0317)	***	0.3239	(0.0343)	***
Transportation Equipment	0.1484	(0.0218)	***	0.1881	(0.0243)	***
Professional/Photographic Equipment and Watches	0.1620	(0.0592)	***	0.3236	(0.0642)	***
Other Manufacturing	0.2556	(0.0712)	***	0.0954	(0.0924)	0
Transportation	0.0960	(0.0272)	***	0.1621	(0.0427)	***
Communications	0.1424	(0.0417)	***	0.3667	(0.0558)	***
Utilities and Sanitary Services	0.0426	(0.0385)	0	0.1094	(0.0471)	**
Wholesale Trade	0.1407	(0.0257)	***	0.3014	(0.0355)	***
Retail Trade	0.1802	(0.0209)	***	0.3713	(0.0302)	***
Finance	0.1938	(0.0482)	***	0.4074	(0.0532)	***
Insurance	0.1276	(0.0523)	**	0.1855	(0.0620)	***
Real Estate	0.2457	(0.0607)	***	0.4009	(0.0679)	***
Business and Repair Services	0.1659	(0.0308)	***	0.3021	(0.0375)	***
Personal Services	0.2782	(0.0641)	***	0.3612	(0.0885)	***
Entertainment/Recreation Services	0.1504	(0.0570)	***	0.3636	(0.0721)	***
Professional/Related Services	0.0481	(0.0235)	**	0.2426	(0.0210)	***
Public Administration	0.0630	(0.0224)	***	0.1539	(0.0246)	***

Table B.4 (continued)

Industry	Bachelor's Degree Coef.	(SE)	sig-level	More Than Bachelor's Degree Coef.	(SE)	sig-level
Number of industries with significant change						
positive change at ≤ 1%***			20			25
positive change at ≤ 5%**			5			3
positive change at ≤ 10%*			0			0
not a significant change at > 10%			6			3
negative change at ≤ 1%***			0			0
negative change at ≤ 5%**			0			0
negative change at ≤ 10%*			0			0

NOTE: To the right of the coefficients appear the standard error (SE) and an indicator of the significance level of the change, where 0 indicates no significant difference at > 10%, and *, **, and *** indicate a statistically significant change at 10%, 5%, and 1% respectively.

are positive, indicating an increase in the returns to education, but they are not statistically significant.

Overall, these results strongly indicate that in California between 1979 and 1989 the phenomenon of increasing returns to schooling is in no way limited to one or a handful of industries; the effects are widespread.

Testing Whether California and the Rest of the Country Exhibit Similar Variations Across Industries in Returns to Education

Figures 5.9 through 5.12 plot predicted returns to education by industry in California versus the same returns estimated for workers in the rest of the country. These predicted returns come from wage regressions using 1990 Census data separately for each of the 31 industries appearing in Tables B.3 and B.4, allowing for a full set of

interactions between every variable and an indicator of whether the worker lived outside California. As discussed in the chapter, variations in returns to college education in general were quite closely related between California and the rest of the country, especially at the bachelor's and higher levels of education.

More formally, the correlation coefficients between the returns to each level of education in California's industries and the corresponding industries elsewhere rose with the level of education considered. These correlation coefficients were 0.11 for high school dropouts, 0.59 for "some college," 0.83 for workers with a college degree, and 0.81 for workers with more than a college degree.

Tables B.5 and B.6 list the coefficients on each education variable interacted with a dummy variable indicating whether the person lived outside California. The tables also indicate whether the difference in the returns to the stated level of education between the rest of the nation and California are significant. For all four education variables, about one-half to two-thirds of the industries suggest no significant differences in the returns to education between California and elsewhere.

A secondary but notable finding from these tables and the accompanying figures in the main text is that in percentage terms industries vary more in the wage premium they pay to workers with a bachelor's degree or higher than they do at lower levels of education. Interindustry variations in the wage gap between high school dropouts and graduates are especially small.

The most important conclusion from these results is that the returns to education in California's industries match those in the same industries in other states fairly well, but that the interindustry patterns in wages in

Table B.5

Coefficients on Interactions Between Dummies for High School Dropouts, Some College, and Residents Outside California, 1989

	Less Than High School Diploma			Some College (13–15)		
	Coef.	(SE)	sig-level	Coef.	(SE)	sig-level
Agriculture, Forestry and Fisheries	–0.0376	(0.0235)	0	–0.1385	(0.0271)	***
Mining	–0.0412	(0.0460)	0	–0.0005	(0.0419)	0
Construction	0.0444	(0.0114)	***	–0.0165	(0.0109)	0
Food and Kindred and Tobacco	0.0596	(0.0263)	**	–0.0050	(0.0265)	0
Textile Mill Products/Apparel/Leather	–0.0096	(0.0366)	0	–0.0467	(0.0428)	0
Paper	–0.0222	(0.0434)	0	0.0039	(0.0420)	0
Printing and Publishing	–0.0130	(0.0365)	0	–0.0264	(0.0277)	0
Chemicals	0.0206	(0.0407)	0	–0.0239	(0.0361)	0
Petroleum and Coal	–0.1420	(0.0717)	**	0.0683	(0.0502)	0
Rubber and Plastics	–0.0248	(0.0438)	0	–0.0387	(0.0451)	0
Lumber and Wood Products	–0.0268	(0.0265)	0	–0.0069	(0.0285)	0
Stone, Clay, Glass and Concrete	0.0452	(0.0376)	0	–0.0296	(0.0364)	0
Metal	–0.0317	(0.0225)	0	–0.0695	(0.0226)	***
Machinery and Computing	–0.0462	(0.0223)	**	–0.0468	(0.0186)	**
Electrical Machinery	–0.0128	(0.0258)	0	–0.0237	(0.0201)	0
Transportation Equipment	0.0467	(0.0188)	***	–0.0046	(0.0147)	0
Professional/Photographic Equipment & Watches	0.0557	(0.0509)	0	0.0007	(0.0364)	0
Other Manufacturing	–0.0566	(0.0336)	*	–0.0502	(0.0346)	0
Transportation	0.0208	(0.0161)	0	–0.0119	(0.0130)	0
Communications	–0.0006	(0.0477)	0	0.0300	(0.0253)	0
Utilities and Sanitary Services	0.0815	(0.0288)	***	0.0429	(0.0202)	**
Wholesale Trade	0.0146	(0.0173)	0	0.0357	(0.0143)	***
Retail Trade	0.0497	(0.0109)	***	–0.0485	(0.0094)	***
Finance	–0.1725	(0.0635)	***	–0.0763	(0.0345)	**
Insurance	–0.0583	(0.0762)	0	0.0688	(0.0403)	*
Real Estate	0.0675	(0.0517)	0	–0.1315	(0.0396)	***
Business and Repair Services	–0.0025	(0.0187)	0	0.0020	(0.0165)	0
Personal Services	0.0286	(0.0331)	0	–0.0017	(0.0303)	0
Entertainment/Recreation Services	0.0892	(0.0390)	**	–0.0326	(0.0304)	0
Professional/Related Services	0.0126	(0.0210)	0	–0.0028	(0.0153)	0
Public Administration	–0.0773	(0.0260)	***	–0.1000	(0.0145)	***
Number of industries with significant (U.S.-California) difference:						
Positive difference of coefficients at ≤ 1%***			4			1
Positive difference of coefficients at ≤ 5%**			2			1
Positive difference of coefficients at ≤ 10%*			0			1
Not a significant change at > 10%			20			21
Negative difference of coefficients at ≤ 1%***			2			5
Negative difference of coefficients at ≤ 5%**			2			2
Negative difference of coefficients at ≤ 10%*			1			0

NOTE: To the right of the coefficients appear the standard error (SE) and an indicator of the significance level of the difference, where 0 indicates no significant difference at > 10%, and *, **, and *** indicate a statistically significant change at 10%, 5%, and 1%, respectively.

Table B.6

Coefficients on Interactions Between Dummies for Bachelor's Degree, More Than Bachelor's Degree, and Residents Outside California, 1989

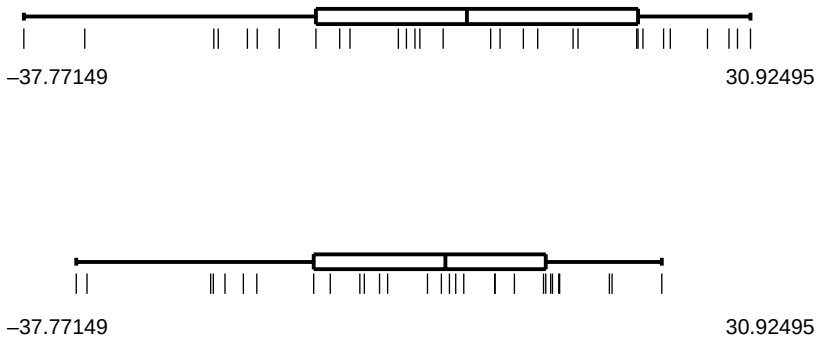
	Bachelor's Degree			More Than Bachelor's Degree		
Industry	Coef.	(SE)	sig-level	Coef.	(SE)	sig-level
Agriculture, Forestry and Fisheries	–0.1588	(0.0370)	***	–0.0433	(0.0526)	0
Mining	0.0916	(0.0504)	*	0.0269	(0.0750)	0
Construction	0.0656	(0.0167)	***	0.1187	(0.0282)	***
Food and Kindred and Tobacco	0.0806	(0.0344)	**	0.1377	(0.0577)	**
Textile Mill Products/Apparel/Leather	0.0034	(0.0536)	0	–0.0474	(0.0864)	0
Paper	0.0112	(0.0563)	0	–0.0475	(0.0992)	0
Printing and Publishing	0.0558	(0.0326)	*	0.0247	(0.0513)	0
Chemicals	0.0367	(0.0394)	0	0.0665	(0.0482)	0
Petroleum and Coal	–0.0282	(0.0592)	0	–0.0679	(0.0780)	0
Rubber and Plastics	0.0075	(0.0609)	0	–0.0339	(0.0949)	0
Lumber and Wood Products	0.1198	(0.0493)	**	0.2878	(0.1014)	***
Stone, Clay, Glass and Concrete	0.1085	(0.0550)	**	0.2565	(0.1045)	**
Metal	–0.0160	(0.0327)	0	0.0836	(0.0556)	0
Machinery and Computing	–0.0466	(0.0212)	**	0.0159	(0.0261)	0
Electrical Machinery	–0.0069	(0.0218)	0	–0.0077	(0.0256)	0
Transportation Equipment	–0.0070	(0.0162)	0	0.0178	(0.0203)	0
Professional/Photographic Equipment & Watches	–0.0075	(0.0399)	0	–0.0155	(0.0471)	0
Other Manufacturing	–0.0669	(0.0425)	0	0.1220	(0.0623)	*
Transportation	0.0598	(0.0185)	***	0.0351	(0.0351)	0
Communications	0.0484	(0.0304)	0	0.0817	(0.0443)	*
Utilities and Sanitary Services	0.0905	(0.0259)	***	0.1491	(0.0361)	***
Wholesale Trade	0.0736	(0.0170)	***	0.1116	(0.0268)	***
Retail Trade	0.0021	(0.0136)	0	–0.0407	(0.0240)	*
Finance	–0.0334	(0.0355)	0	–0.0003	(0.0409)	0
Insurance	0.0860	(0.0404)	**	0.1473	(0.0511)	***
Real Estate	–0.1237	(0.0412)	***	–0.0842	(0.0503)	*
Business and Repair Services	0.0296	(0.0206)	0	–0.0160	(0.0310)	0
Personal Services	0.0243	(0.0406)	0	–0.0132	(0.0661)	0
Entertainment/Recreation Services	–0.0536	(0.0358)	0	–0.1813	(0.0547)	***
Professional/Related Services	0.0539	(0.0156)	***	0.0483	(0.0152)	***
Public Administration	–0.0408	(0.0160)	***	–0.0119	(0.0191)	0
Number of industries with significant (U.S.–California) difference:						
Positive difference of coefficients at ≤ 1%***			5			6
Positive difference of coefficients at ≤ 5%**			5			2
Positive difference of coefficients at ≤ 10%*			2			2
Not a significant change at > 10%			16			18
Negative difference of coefficients at ≤ 1%***			3			1
Negative difference of coefficients at ≤ 5%**			0			0
Negative difference of coefficients at ≤ 10%*			0			2

NOTE: To the right of the coefficients appear the standard error (SE) and an indicator of the significance level of the difference, where 0 indicates no significant difference at > 10%, and *, **, and *** indicate a statistically significant change at 10%, 5%, and 1%, respectively.

California and other states match particularly well at the college and higher levels.

Finally, this section addresses the following question: "How much of the observed wage variations across California's industries can be explained by variations in educational attainment of workers?" To investigate this question, using 1990 Census data we ran wage regressions for all workers that included dummies for all but one industry, and the standard set of background variables used above, such as marital status and age. We ran this regression twice, with and without dummy variables for education. Examination of the extent to which the predicted wage gaps between industries disappear after the addition of controls for education provides a measure of the importance of education in explaining wage gaps between industries.

Figure B.5 provides a box-and-whisker plot. The vertical lines show the predicted wage gap between the given industry and the omitted industry (transportation). The top panel shows the predicted wage gaps without controls for education, and the bottom panel shows the predicted gaps after controlling for the "educational mix" of workers in each industry. Both the range of the wage gaps and the interquartile range of the wage gaps (as indicated by the length of the "box") drop considerably once we take account of workers' education. As with regional wage gaps, some, but by no means all, of the variations in earnings across industries reflect variations in the educational attainment of workers. Comparison of Figures B.4 and B.5 suggests that the educational composition of the workforce does more to explain interindustry wage variations than it does to explain interregional wage variations.



NOTES: The top panel shows the percentage wage gaps in a model that does not control for education; the bottom panel shows the corresponding gaps after controlling for education. The omitted category in both models is the transportation industry.

Figure B.5—Percentage Wage Gaps Between Industries of California Before and After Controlling for Workers' Level of Education, 1989

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Julian Betts is a senior fellow at PPIC and an associate professor of economics at the University of California, San Diego. Much of his research over the past eight years has focused on the economic analysis of public schools. He has written extensively on the link between student outcomes and measures of school spending, including class size, teachers' salaries, and teachers' level of education. More recently, he has examined the role that standards and expectations play in student achievement. His other main areas of research include higher education; immigration; technology, skills, and the labor market; and the economics of unions. He holds an M.Phil. degree in economics from Oxford University, England, and a Ph.D. in economics from Queen's University, Kingston, Ontario, Canada.