Keeping California's Edge:

The Growing Demand for Highly Educated Workers

April 26, 2006

Prepared For:

California Business Roundtable
1212 K Street, Suite 1570
Sacramento, CA 95814

Campaign for College Opportunity
663 13th Street
Oakland, CA 94612

Prepared By:

California State University, Sacramento
Applied Research Center
College of Continuing Education
3000 State University Drive East
Sacramento, CA 95819-6103

Dr. Robert Fountain
Director

And

Marcia Cosgrove
Research Project Manager

With

Petra Abraham Laptalo
Senior Research Analyst

Embargoed until 10am PST

April 26th, 2006

Foreword and Acknowledgements

Acknowledgements

The following individuals have made significant personal contributions to the knowledge base and methodology of this report, and have shaped its form and content for the better.

Robert Brownstein, Working Partnerships USA and the South Bay Labor Council, for views about factors other than college education which affect worker productivity and economic growth.

Laura Coleman, Employment Development Department, Labor Force Information Division, for assistance in interpreting difficult data issues.

Julie Dunkle, Intel Corporation, and her associates Winjae Kang; Christopher Woide, Erv Thomas; Arving Iyer. and Grace Davis who explained the workings of the international labor market and what US firms are doing to assure their future skilled workforce.

W. Norton Grubb, Graduate School of Education, University of California, Berkeley, who is now the grandfather of education-industry-economic studies, and whose views about educational inflation, occupational skills substitution, and the politics of education in California kept us from becoming at all comfortable with any of the data or projection methodologies available.

Mark Irish and Julie Marfield, California Postsecondary Education Commission, for technical assistance in interpreting educational completion data.

Elias Lopez, Offices of the Chancellor and Provost, University of California who understands what the PUMS census data really says about the skilled labor force and why it is a completely different picture from the employer-based data sources.

Patrick Perry and Willard Hom at the California Community Colleges Chancellor's Office for the latest reports on economic evaluation of community college participation.

Jon Stiles, University of California Census Data Project, who explained a demographer's view of the future and helped us convert it to an economist's view.

Christopher Thornberg and Ed Leamer, UCLA Anderson Forecasting Project, who helped us reconcile what the labor market experts say with what the economic forecasters think.

Embargoed until 10am PST April 26th, 2006

Report Contents

Appendices

Embargoed until 10am PST April 26th, 2006

Embargoed until 10am PST April 26th, 2006

Introduction and Summary

California has benefited enormously as one of the top wealth-generating economies in the US and the world for decades. California's economy has one of the highest concentrations of the fastest growing industries compared to other states, and a high concentration of industries which require a higher educated workforce. It also has the largest higher educated population of any state in the Nation. California's stance with respect to its higher educated population and the labor force this population represents, has been supported not only by California's own superior higher educational system, but has also been enhanced by California's ability to attract skilled workers from domestic and international sources (a net immigration). There is nothing ordinary or average about California's economy.

Figure 1-1

California's Relative Position to the US Economy, 1980 - 2000

Economic Indicator	California Percent of US			CA Percent of US Change
	1980	1990	2000	1990-2000
Population	10.45%	11.97%	12.04%	12.57%
Employment	10.88%	11.75%	11.30%	9.12%
Per Capita Personal Income	118.16%	111.10%	108.78%	4.42%
Gross State Product	11.93%	13.89%	13.24%	12.34%

Sacramento State Applied Research Center
Data Source: U.S. Census Bureau; Bureau of Labor Statistics; U.S. Bureau of Economic Affairs

There is, however, uncertainty about whether California can maintain its current high share of the US economic activity in future decades. California's relative standing compared to other states is already declining, and it is now tending toward ordinary by many measures of economic success. Figure 1-1 shows that California has continued to increase its proportion of US population for the past two decades, from 10.45 percent in 1980 to 12.04 percent in 2000. Further, over the 1990-2000 decade, 12.6 percent of the increase in US population occurred in California.

Meanwhile, California's share of US employment peaked at 11.75 percent in 1990, and declined to 11.30 percent by 2000. Our employment is growing slower than our population. Over the 1990-2000 decade, California contributed only 9.1 percent of the growth in US employment.

California's per capita personal income has declined continuously over this period. In 1980 California's per capital personal income was slightly over 18 percent higher than the US, but by 2000 that had declined to only 8.8 percent higher than the US. (Since 2000, California's per capita personal income has been approximately 6.6 percent higher on average.) Between 1990 and 2000, only 4.4 percent of the increase in US per capita personal income occurred in California.

Some of the key factors affecting California's future are its demographic and educational compositions. The long-term views for California show a slowing in educational attainment of the population. This will have an impact on the educational attainment and skills of the labor force and could create substantial revisions to our expectations of economic achievement. A recent working paper published by the Population Division of the U.S. Census Bureau explains that throughout the 20th century, the U.S. has benefited from the increased levels of educational attainment of its population and labor force; however, cohort succession demonstrates that this progression is slowing (Cheeseman Day and Bauman: 2000).

Since each retiring cohort over time has been better educated than those before it, it's assumed that "It would take a great deal of growth at the postsecondary level for us to sustain the educational growth that has characterized the United States for the greater part of the 20th century" (2). Additionally, fairly recent shifts in ethnic composition, immigration, and the timing of when people pursue education will also alter the future levels of educational attainment of the population. Despite these changes in educational attainment of the population, the authors state that "attainment will continue to climb for nearly every segment of the population, at all levels of education" (1).

In recent history, California's education pipeline has always assured that the next cohort to enter the labor force would be better educated than current and previous cohorts. Employers could anticipate the ever-improving educational attainment of the labor force. Now, for the first time, projections of California's education pipeline indicates declining labor force quality compared to previous cohorts, which raises questions about our ability to supply the higher-educated labor force of the future.

California is struggling with low completion rates at all levels of education, including both secondary and postsecondary levels. This trend is just beginning to affect the quality of the labor force, causing alarm at shortages – both continuing and emerging – of skilled labor in key highly-educated occupations and in industry's struggle to replace retiring employees. To make matters even worse, we are seeing increasing business operating and housing costs beginning to affect our ability to attract highly skilled workers and firms from elsewhere.

This report was commissioned by the California Business Roundtable and the Campaign for College Opportunity to evaluate the economic implications of California's educational trends on future workforce composition. It is a companion study to other studies now underway or recently completed that provide new information on California's future demographic and educational trends (*Return on Investment: Educational Choices and Demographic Change in California's Future*, Brady et al.: 2005) and the options available in terms of educational strategies and policies (*Variations on a Theme: Higher Education Performance in California by Region and Race* and *Shared Solutions: A Framework for Discussing California Higher Education Finance*, Shulock: 2005).

In this report we review the structure and changes in the California economy, both in terms of industry sectors and occupational categories, and compare California's educational attainment to the US and international contexts. We then use the outcomes from this study and from industry and occupational projections by the US Bureau of Labor Statistics (BLS) and the California Employment Development Department (EDD), to evaluate scenarios showing how the demographic-educational attainment of the workforce is likely to affect California's economic future. The broadest definition of the economic impacts will be evaluated by using an input-output model which will show not only the reductions in employee compensation resulting from a less educated workforce, but also the overall loss of production attributed to affected industries, and the indirect effects on consumption and on State and local tax generation.

Ultimately, this report will provide a comprehensive view of the costs to the California economy and to specific industries of projected declines in the educational attainment of the higher-educated workforce in the year 2022. This horizon has been chosen as the greatest time interval for which forecasts and projections can reasonably be made for the economic variables analyzed, and the shortest time interval over which we can reasonably expect to make significant changes to the quality of California's workforce. It represents something of a "window of opportunity" to change the educational trends which threaten the level of economic quality of life in California.

Research Methods

Fortunately, recent research by others in projecting demographic trends and changes in the educational attainment of the population, and in projecting changes in industry and occupational compositions, allow us to make our unique contribution to the debate of the economic impacts of California's demographic and educational trends possible: the overall economic evaluation of possible outcomes. Throughout this report, we rely heavily on United States Bureau of Labor Statistics (BLS) studies of the US economy and California Employment Development Department (EDD) projections of the California economy, which identify the educational requirements for specific occupations and the occupational structure of specific industries; the UCLA Anderson Forecast project's industry employment projections; and the demographic and educational attainment projections developed by the UC Berkeley Survey Research Center.

Summary of Findings

California Industry Structure and Change

The structure of the California economy can be viewed in two ways: occupations and industries. Many occupations (like accountants) exist in almost every industry, but have a consistent requirement for education and training. Industries (like manufacturing) are defined by the type of good or service they provide, but contain many occupations (from accountants to scientists). We will first discuss the industry composition and change because that is the best known measure of structure, but the occupations are very important in this study because educational requirements for employees are directly related to the occupation, not to the industry.

The following discussion shows the industry structure of California's economy in 2000, the change in industry structure over the last decade, and the industries in which California is specialized compared to the US.

Figure 1-2

Employment by Major Industry Sectors, 2000

NAICS SECTOR	Number Employed	% Total Employment
Total All Industries	**14,896,700**	100%
Manufacturing	1,857,500	12.5%
Local Government	1,601,800	10.8%
Retail Trade	1,559,400	10.5%
Leisure & Hospitality	1,332,600	8.9%
Health Care & Social Assistance	1,168,800	7.8%
Administrative & Support Srvcs.	994,600	6.7%
Professional, Scientific & Technical Srvcs.	920,700	6.2%
Financial Activities	795,100	5.3%
Construction	731,000	4.9%
Wholesale trade	644,900	4.3%
Information Services	575,400	3.9%
Other Services	486,700	3.3%
Transportation & Warehousing	461,100	3.1%
State Government	443,400	3.0%
Farm Employment & Farm Services	408,500	2.7%
Management of Companies & Enterprises	330,700	2.2%
Federal Government	272,900	1.8%
Private Educational Services	229,200	1.5%
Utilities	56,000	0.4%
Natural Resources & Mining	26,500	0.2%

Sacramento State Applied Research Center
Data Source: California Employment Development Department
Data are for the major NAICSA industry sectors with largest employment.

Figure 1-2 shows that the largest industry is Manufacturing, which employs approximately 1.9 million or about 12.5 percent of the workforce. Manufacturing includes durable goods (such as lumber, metals, machinery, electronics, transportation

vehicles, aircraft) and non-durable goods (such as food processing, apparel, petroleum and chemicals, paper and printing). The top five industries – Manufacturing, Local Government, Retail Trade, Leisure and Hospitality, and Health Care and Social Assistance – account for approximately 50 percent of all jobs in California in 2000.

Looking at recent changes in employment by industry, Figure 1-3 shows the growth of employment by industry over the 1990 – 2000 decade. The greatest contributor to employment growth during the decade was Administrative and Support Services (which includes employment services, business support activities, facilities management, and other "outsourced" corporate activities), which alone contributed almost 18 percent of the entire net employment growth over the decade. Other top contributors to employment growth were Local Government (including education); Health Care and Social Assistance industries; Professional, Scientific, and Technical industries (such as lawyers, accountants, architects, research and consulting, computer systems design, and others) ; and Leisure and Hospitality (including lodging, arts, professional sports, entertainment, and food services). These five industries provided 66 percent of California's new jobs over the decade.

Figure 1-3

Employment by Major Industry Sectors
1990-2000 Change

NAICS SECTOR	Change: 1990-2000	Percent Change
Total All Industries	**2,033,300**	100%
Administrative & Support Srvcs.	361,300	17.8%
Local Government	271,100	13.3%
Health Care & Social Assistance	236,900	11.7%
Professional, Scientific & Technical Srvcs.	233,600	11.5%
Leisure & Hospitality	228,100	11.2%
Information Services	184,800	9.1%
Management of Companies & Enterprises	135,000	6.6%
Retail Trade	115,400	5.7%
Transportation & Warehousing	101,100	5.0%
Wholesale trade	94,500	4.6%
Construction	86,500	4.3%
Other Services	71,700	3.5%
State Government	61,400	3.0%
Farm Employment & Farm Services	44,900	2.2%
Private Educational Services	44,800	2.2%
Utilities	-9,200	-0.5%
Natural Resources & Mining	-9,800	-0.5%
Financial Activities	-26,800	-1.3%
Federal Government	-89,200	-4.4%
Manufacturing	-102,300	-5.0%

Sacramento State Applied Research Center
Data Source: California Employment Development Department
Note: Data does not add to total due to rounding and EDD data specifications.

Notice the low contribution over the last decade to the growth of employment made by Management of Companies and Enterprises industries, our most specialized industry (see Figure 1-4); and the net loss in Manufacturing, our largest industry in terms of employment. There were also only minor or negative contributions to growth in employment attributed to Construction, State Government, Farm Employment, and Private Educational Services industries.

Specialization in the California Economy

The following discussion focuses on how California is different from the US as a whole. While most industrialized state states have some similar proportions of employment in some sectors (retail trade, government, etc.), the purpose of this analysis is to show how specialized in some industries California is Specialization is shown by computing the percentage of each sector in California divided by the percentage of the same sector in the US. If that ratio is over 1, then California has a specialization or concentration in that industry. The higher the ratio, the more California is specialized in that industry. Ratios lower than 1.0 indicate that California is under-represented in that sector, and is likely a net importer of that good or service.

Figure 1-4

California's Industry Specialization

NAICS Industry Sector	Specialization in 2002
Management of Companies & Enterprises	1.43
Information	1.32
Professional, Scientific, & Technical Services	1.22
Arts, Entertainment, & Recreation	1.17
Admin. Support & Waste Mgmt. & Remediation Srvcs.	1.12
State & Local Government	1.06
Wholesale Trade	1.05
Construction	1.04
Accommodation & Food Services	1.03
Financial Activities	0.99
Manufacturing	0.97
Retail Trade	0.95
Transportation & Warehousing	0.94
Health Care & Social Assistance	0.84
Educational Services	0.84
Federal Government	0.83
Utilities	0.83
Other Services	0.75
Natural Resources & Mining	0.41

Sacramento State Applied Research Center
Data Sources: US Bureau of Labor Statistics; California Employment Development Department
Selected sector aggregations with high or low specialization.

Figure 1-4 shows California's relative specialization. The figure shows that California has over 10 percent more employment than the US in each of the following five

industries: Management of Companies and Enterprises, our most specialized sector, over 43 percent larger than its US counterpart; Information Services; Professional, Scientific and Technical Services; Arts, Entertainment and Recreation; and Administrative and Support Services.

Note that some of the largest industries in terms of overall employment are under-represented, or not specialized, in California: Manufacturing, Retail Trade, Health Care, and Educational Services. Of the top five specialized industries identified above, only one also represents a sector with considerable employment in California: Arts, Entertainment, and Recreation, which is part of the industry super-sector Leisure and Hospitality.

The Occupational Structure of the California Economy

Occupational structure provides another way to assess California's economic structure. This measure differs from industry structure discussed previously in that it describes not goods and services created, but the specific functions of the workforce. Note that any given occupation may be present in most or all of the industries previously discussed; prime examples include managers, accountants, production occupations, etc.

Figure 1-5.

Occupational Structure of California's Workforce, 2002

SOC	Major Occupational Category	Employment	% Total Workforce
00-0000	**Total All Occupations**	**14,457,800**	**100.00%**
43-0000	Office & Administrative Support Occupations	2,699,600	18.67%
41-0000	Sales & Related Occupations	1,494,200	10.33%
35-0000	Food Preparation & Serving Related	1,128,200	7.80%
51-0000	Production Occupations	1,098,500	7.60%
53-0000	Transportation & Material Moving Occupations	1,008,500	6.98%
25-0000	Education, Training, & Library Occupations	953,100	6.59%
11-0000	Management Occupations	786,300	5.44%
47-0000	Construction & Extraction Occupations	692,600	4.79%
13-0000	Business & Financial Operations Occupations	643,100	4.45%
29-0000	Healthcare Practitioners & Technical	564,900	3.91%
49-0000	Installation, Maintenance, & Repair	518,300	3.58%
37-0000	Building & Grounds Cleaning & Maintenance	474,400	3.28%
15-0000	Computer & Mathematical Occupations	395,900	2.74%
33-0000	Protective Service Occupations	359,800	2.49%
17-0000	Architecture & Engineering Occupations	329,800	2.28%
39-0000	Personal Care & Service Occupations	305,300	2.11%
31-0000	Healthcare Support Occupations	304,600	2.11%
27-0000	Arts, Design, Entertainment, Sports, & Media	227,600	1.57%
21-0000	Community & Social Services Occupations	189,900	1.31%
19-0000	Life, Physical, & Social Science Occupations	143,400	0.99%
23-0000	Legal Occupations	108,900	0.75%
45-0000	Farming, Fishing, & Forestry Occupations	31,900	0.22%

Sacramento State Applied Research Center
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
The table includes only the largest occupational aggregations for illustrative purposes, with the Farming, Fishing & Forestry added for comparative purposes, and does not add up to the employment total in the top row.

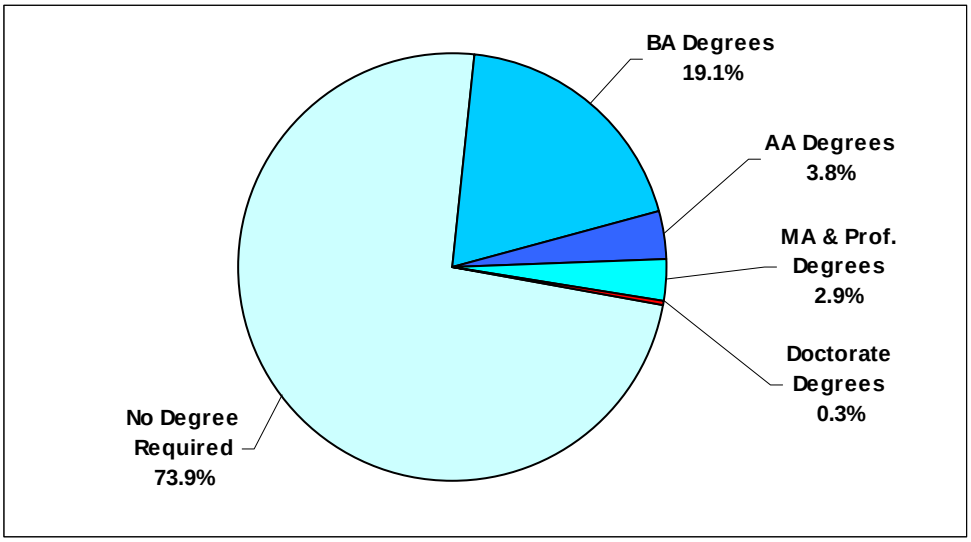
This topic is important because many occupations have specific educational requirements, a topic central to this study. Occupations are defined by the US Bureau of Labor Statistics (BLS) in the Standard Occupational Classification (SOC) system, which defines and organizes occupations into a semi-hierarchical structure. Statewide employment for 2002 by major occupational categories is shown in Figure 1-5.

The largest percentage of the California's workforce in 2002 was in the Office and Administrative Support occupations category, with almost 2.7 million employees, or 18.7 percent of the total workforce. The second largest category was Sales and Related Occupations with roughly 1.5 million employees, or 10.3 percent of the total workforce.

The Higher Educated Occupations and Projected Changes

Of greater importance to this study are the educational requirements for the occupations estimated to constitute California's workforce. An overview of the minimum educational requirements for the occupations composing California's workforce in 2002 is shown in Figure 1-6.

Figure 1-6
Percent of Workforce Requiring Higher Education, 2002



Sacramento State Applied Research Center
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
Note that the "no degree required" occupations may nevertheless require some post-secondary vocational education or on-the-job training.

In 2002, almost 74 percent of all jobs in California required no college degrees (though many of these jobs require other forms of experience such as on-the-job training, postsecondary vocational education, or previous work experience). Bachelor's degrees provided the largest college-educated occupational qualification, representing 19 percent of employment. Associate degrees ranked a distant second at 3.8 percent, followed by masters and professional degrees at 2.9 percent of employment. Only 0.3 percent of jobs require a doctorate degree.

Eight of the major occupational categories require highly educated workforces, creating a highly concentrated demand for higher educated workers in these occupations. Figure 1-7 shows that the occupational category that required the highest percent of its workforce to have higher education in 2002 was the Business and Financial Operations occupations, where over 89 percent of employees were required to have bachelor's degrees or higher. Seven additional major occupational categories require over 67 percent of employees to have bachelor's degrees or higher – Management Occupations (88%); Community and Social Services Occupations (86%); Computer and Mathematical Occupations (80%); Education, Training, and Library Occupations (75%); Architecture and Engineering Occupations (69%); and Legal Occupations (68%).

Figure 1-7

Occupations Requiring Higher Educated Workers, 2002

Major Occupational Category	% Employment Requiring BA+
Business & Financial Operations Occupations	89.2%
Management Occupations	87.8%
Community & Social Services Occupations	85.6%
Computer & Mathematical Occupations	79.9%
Education, Training, & Library Occupations	74.7%
Architecture & Engineering Occupations	69.4%
Life, Physical, & Social Science Occupations	69.3%
Legal Occupations	67.6%
Arts, Design, Entertainment, Sports, & Media Occupations	51.2%
Healthcare Practitioners & Technical Occupations	25.1%
Personal Care & Service Occupations	13.1%
Sales & Related Occupations	4.5%
Transportation & Material Moving Occupations	0.7%

Sacramento State Applied Research Center
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
Table is truncated to show only the highest occupational categories for illustrative purposes.

Projected Changes in the Demand for a Higher Educated Workforce in California

Two main factors are projected to influence demand for higher educated workers in California over the 2002 – 2022 period: (1) The net change in workforce composition resulting from overall growth and economic restructuring, and (2) The additional workforce demands which will result from workforce separations, that is, replacement demand due to the retirement of existing higher educated workers (i.e. the baby-boomers).

Net Workforce Demand from Growth and Restructuring

Figure 1-8 shows the average annual employment and net growth by level of education for 2002 and 2022. Looking at sheer numbers, occupations requiring a bachelor's degree

constitute the greatest bulk of total demand for higher educated occupations, or 73 percent of all occupations requiring an associates degree or higher.

At the same time, occupations requiring a bachelor's degree are projected to have the slowest growth rate between 2002 and 2022, growing 46.2 percent.

The greatest percent growth in higher educated occupations is expected in occupations requiring doctorate degrees (73.1 %), followed by associate degrees (52.8 %), and masters or professional degrees (50.2 %). Higher educated occupations overall are expected to increase by 47.9 percent, while occupations not requiring higher education are expected to increase only 33.5 percent.

Figure 1-8

Change in Employment by Level of Education, 2002 - 2022

Type of Degree	Average Annual Employment		Growth: 2002 to 2022	
	2002	2022	Absolute	Percent
Associates Degrees	545,200	832,800	287,600	52.75%
Bachelor's Degrees	2,759,200	4,033,200	1,274,000	46.17%
Master's & Professional Degrees	422,400	634,400	212,000	50.19%
Doctorate Degrees	47,900	82,900	35,000	73.07%
Total HE Employment	3,774,700	5,583,300	1,808,600	47.91%
Total <HE Employment	10,683,100	14,257,900	3,574,800	33.46%
Total Employment	14,457,800	19,841,200	5,383,400	37.24%

Sacramento State Applied Research Center
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
Note: Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

Gross Demand for Higher Educated Workers including Replacement Demand

A more comprehensive view of the demand for higher educated workers includes demand from both general growth and from workforce separations. Workforce separations occur when people retire from working in an occupation permanently, either to work in another occupation or to retire from working altogether. Both sources of workforce demand are included in Figure 1-9.

Figure 1-9

Workforce Demand by Required Level of Education
Growth and Replacement, 2002 - 2022

Type of Degree	2002 to 2022 Absolute Growth	2002 to 2022 WF Separations	Total Demand Growth & Replacement
Associates Degrees	287,600	204,400	492,000
Bachelor's Degrees	1,274,000	1,021,800	2,295,800
Master's & Professional Degrees	212,000	165,200	377,200
Doctorate Degrees	35,000	20,400	55,400
Total HE Employment	1,808,600	1,411,800	3,220,400
Total <HE Employment	3,574,800	5,521,600	9,096,400
Total Employment	5,383,400	6,933,400	12,316,800

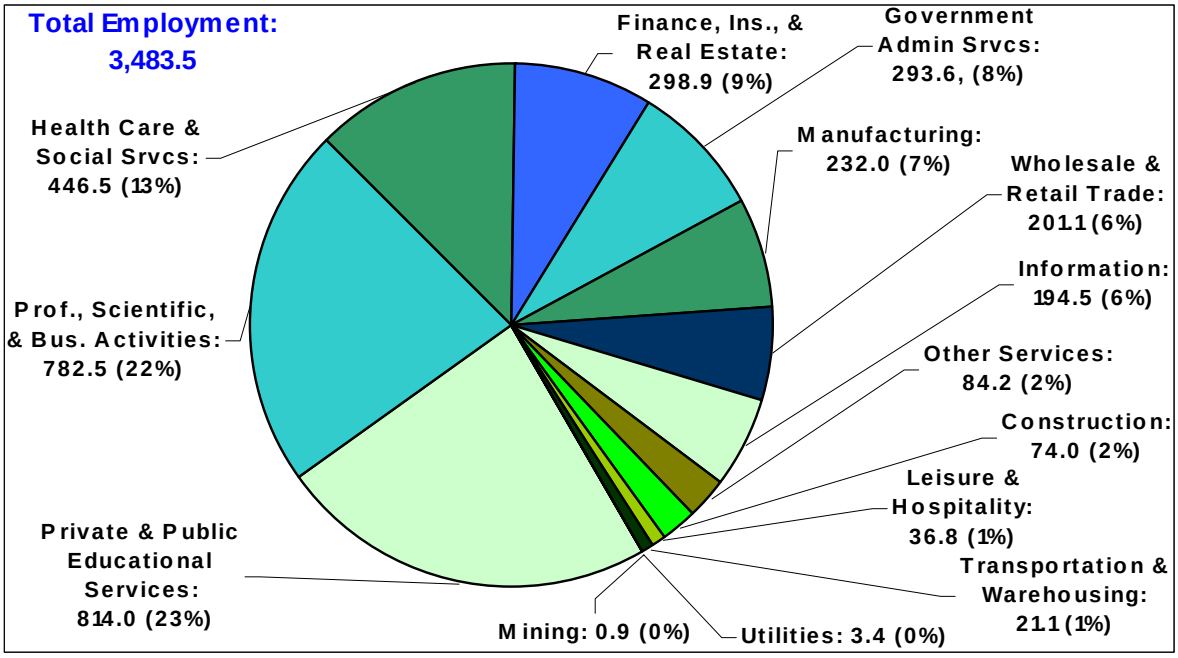
Sacramento State Applied Research Center
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
NOTE: Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

Overall, gross workforce demand for newly higher educated workers due to combined growth and separations will total slightly more than 3.2 million by 2022, with 1.8 million from growth and restructuring and 1.4 million from workforce separations. By far the highest number of new educated employees will be for BA degrees, with a total demand of 2,295,800 additional BA degree holders. Associate degrees rank next with a demand for 492,000 degrees, followed by MA and Professional Degrees, and finally Doctorate degrees.

Projected Industry Shares of Higher Educated Workforce in 2022

Previously discussed was the projected occupational composition of the higher educated workforce and details of occupational education requirements. However, changes in the occupational composition of the workforce ultimately create changes in specific industries. Figure 1-10 illustrates the share of higher educated occupations by industry projected for 2022.

Figure 1-10
Industry Composition of Higher Educated Occupations, 2022
(In Thousands)



Sacramento State Applied Research Center
Data Sources: California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012.*
Note: Based on the "39+5" higher educated workforce analysis. Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

The three industry sectors which will employ most of the higher educated occupations in 2022 include: Public and Private Education (23%); Professional, Scientific, and Business Activities (22%); and Health Care & Social Services (13%). These three sectors combined are projected to employ 58 percent of the higher educated occupations in 2022, making these industries highly vulnerable to the full effect of any deficiencies in California's ability to provide the higher educated workforce needed in 2022.

Other large industry consumers of higher educated occupations include the following industries: Finance, Insurance, and Real Estate, 9%; Government Administrative Services (excludes education), 8%; Manufacturing, including technology manufacturing 7%; Wholesale and Retail Trade 6%; and Information 6%, totaling 36% percent of estimated industry demand for higher educated occupations in 2022. However, these are not the largest users of higher educated employees, and will therefore be less vulnerable to deficiencies in California's higher education process.

Figure 1-11

Industry Employment for the Top 45 Occupations Requiring AAs and Postsecondary Vocational Education
Sorted by 2022 Employment

Industry Sector	Average Annual Employment 2002	2012	2022	Percent Total Employment 2002	2012	2022	% Growth 2002-2022
Healthcare & Social Assistance	357,200	457,300	557,400	34.43%	35.84%	36.81%	56.05%
Professional, Scientific, & Tech. Services	223,500	261,100	298,700	21.54%	20.46%	19.73%	33.65%
Wholesale & Retail Trade	66,300	82,400	98,500	6.39%	6.46%	6.50%	48.57%
Other Services (except Public Administration)	66,200	77,400	88,600	6.38%	6.07%	5.85%	33.84%
Admin, Support, Waste Mgmt, & Remediation Srvcs	49,400	68,200	87,000	4.76%	5.35%	5.75%	76.11%
Manufacturing	72,300	79,100	85,900	6.97%	6.20%	5.67%	18.81%
Government (Public Administration)	67,700	76,100	84,500	6.53%	5.96%	5.58%	24.82%
Arts, Entertainment, & Recreation	23,200	34,700	46,200	2.24%	2.72%	3.05%	99.14%
Management of Companies & Enterprises	24,400	30,100	35,800	2.35%	2.36%	2.36%	46.72%
Educational Services	20,800	25,900	31,000	2.00%	2.03%	2.05%	49.04%
Information	17,600	23,300	29,000	1.70%	1.83%	1.92%	64.77%
Construction	11,800	14,800	17,800	1.14%	1.16%	1.18%	50.85%
Accommodation & Food Services	11,400	13,700	16,000	1.10%	1.07%	1.06%	40.35%
Real Estate, Rental, & Leasing	9,200	11,800	14,400	0.89%	0.92%	0.95%	56.52%
Transportation & Warehousing	7,900	9,900	11,900	0.76%	0.78%	0.79%	50.63%
Finance & Insurance	7,700	9,200	10,700	0.74%	0.72%	0.71%	38.96%
Natural Resources and Mining	600	600	600	0.06%	0.05%	0.04%	0.00%
Utilities	300	300	300	0.03%	0.02%	0.02%	0.00%
Total Employment	1,037,500	1,275,900	1,514,300	100.00%	100.00%	100.00%	45.96%

Sacramento State Applied Research Center, October 2005
Data Sources: California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012*
Note: Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

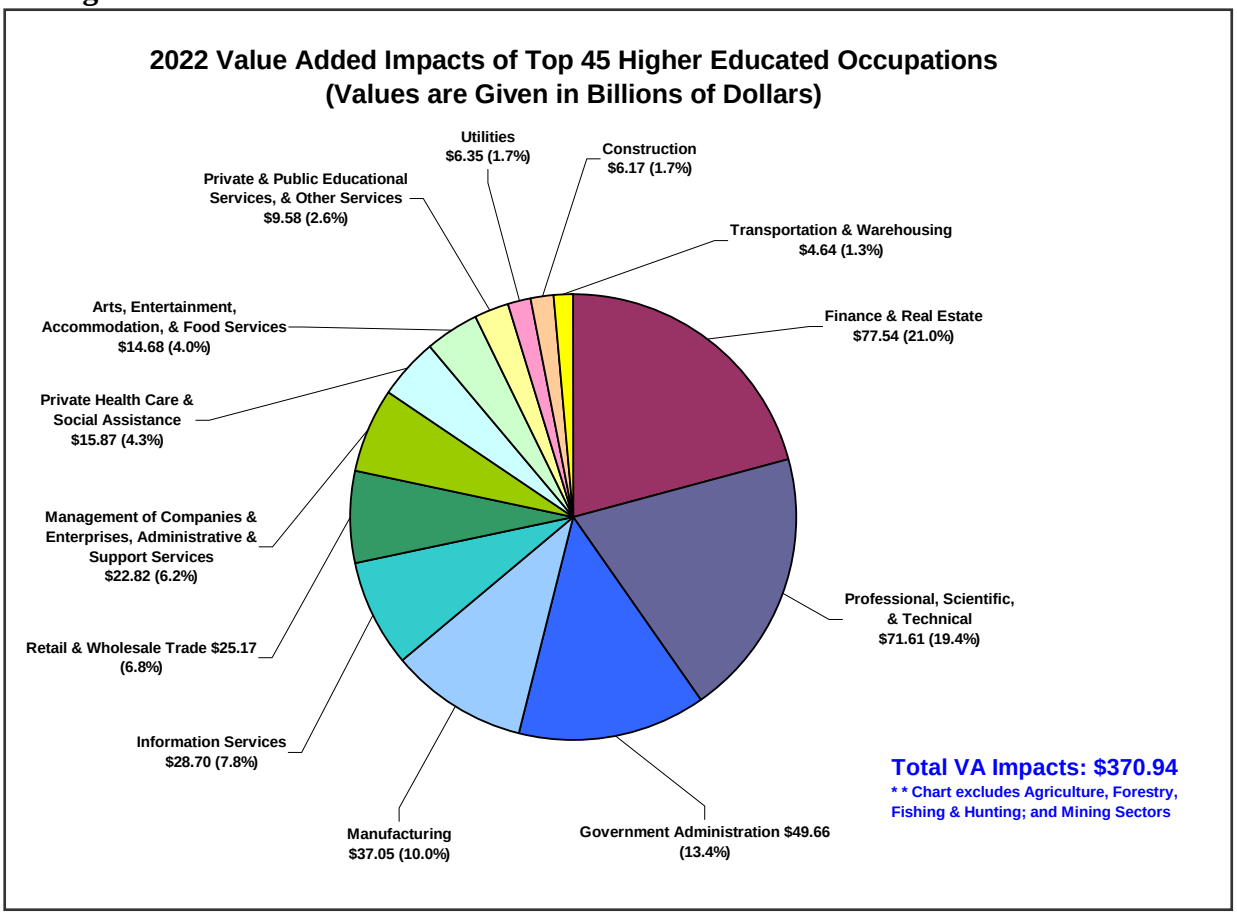
The current and projected industry demand for Associate and Vocational education is shown in Figure 1-11. Of the approximately 1.5 million positions which will require this level of education by 2022, about 57 % are in just two occupational categories, Healthcare with 36.8% of the total, and Professional, Scientific, & Technical Services with 19.7%. The third largest category, Wholesale & Retail Trade, has only 6.5% of the demand, a small percentage of the two industry leaders. Over the 2002-2022 time period, healthcare increases its share (with a growth rate of 56% over the 20 years) while the Professional, Scientific, & Technical category declines as a percentage (with a growth rate of 33.7 %).

Note that this data is for employees whose position requires postsecondary education. There may be many more employees in these industries that have postsecondary education but it is not required by employers for their positions. This is a result of the BLS/EDD database used throughout this report, which is based on employer surveys, and very few of all occupations (only about 3.8% of the workforce) specifically require AA degrees or vocational certificates.

The Economic Impacts of the Higher Educated Workforce

The economic impacts of the higher educated employment are illustrated in Figure 1-12. These impacts are estimated using the IMPLAN input-output econometric model which shows how value created by one sector of the economy affects other sectors which supply it with goods and services, and also includes the impact of consumer spending by employees of these sectors.

Figure 1-12.



The 3,483,000 higher educated employees projected for the California economy in 2022 will create a total value added (increase in value above the value of inputs) of $370.94 billion per year. Note that the Figure 1-12 value added graph is quite different by sector than the higher educated employee graph in Figure 1-10. Higher educated employees create different value in different industry sectors. They create higher value in occupations where their salaries are higher, where they are provided with a more capital-intensive work process, where their industry of employment creates higher-valued products, where a larger number of firms are involved in providing the inputs of goods and services for the product, and where a high percentage of the inputs are created here in California. These are fundamentals of economic linkages and economic multipliers which determine the high productivity and value of the California economy.

The highest value is created in Finance & Real Estate sector ($77.5 billion, 21% of the total); Professional, Scientific, & Technical ($71.6 billion, 19%); Government Administrative ($49.6 billion, 13%); and Manufacturing ($37 billion, 10%). These are the industries in which a relatively small but highly educated percentage of the workforce is creating the highest value for the California economy.

Note that the educational sector does not directly produce a high value, only about $9.56 billion, or 3% of the total. The value created by education is not realized within the education sector itself but is created when the educated employees apply their knowledge in economic sectors which use the knowledge to create value, which is the overall concept of this study. In fact, the entire value shown in the table is created by the education sector through the productivity of their graduates.

Economic Impacts of the Higher Education Attainment Scenarios

While previous sections of this chapter have reported on the changing industry and occupational structures of the California economy and projections of the future importance of the higher educated workforce, this section will provide a quantitative analysis of the economic impacts for California if the required higher educated workforce is not realized.

This analysis was based on the higher education attainment scenarios developed by the UC Berkeley Survey Research Center and published in their report "*Return on Investment: Educational Choices and Demographic Change in California's Future*" as part of their long-range projections of California's population. Three scenarios of the changes in population education attainment were tested, scenarios based on assumptions about the higher education system itself and on educational successes of a number of population components. The three higher education scenarios from the UC Berkeley Survey Research Center and examined in this study include: (1) Fixed Capacity of the educational system; (2) Increased College-Going; and (3) Increased College Completion (i.e. degree attainment) scenarios. The data obtained from the scenarios allowed us to test the economic implications of higher education attainment on the California economy.

Models of California's Aggregate Economic Structure

In order to test the economic impacts of the educational attainment scenarios, a base-case estimate of the structure of the California economy in 2022 is required. Two estimates of California's economic structure in 2022 were generated for this purpose. One model is based on the BLS/EDD employment projections, which is based on occupational data rather than industry data. The BLS/EDD model was developed from a combination of EDD's *California Occupational Projections 2002-2012* table and *California Industry-Occupational Matrix 2002-2012*. (The *Industry-Occupational Matrix* was necessary to converting employment by occupation to employment by industry.) The other model, the

UCLA Forecast model, is reported by industry rather than by occupation. It gives the more familiar industry structure explicitly.

Both base-case models required the conversion from NAICS industry inputs to IMPLAN industry inputs, which was accomplished by using the *2001 IMPLAN Sectoring Scheme for NAICS*, developed by Minnesota IMPLAN Group. The IMPLAN model outputs reported in this study include four measures of economic activity and change: (1) Total Output, which is equivalent to the total revenues of all firms and organizations in the State; (2) Value Added, which measures the value of production net of input costs, the aggregate of which is Gross State Product; (3) State and Local Tax Revenues, which measures the generation of taxes over all industries; and (4) Employment, which measures the number of annual full-time-equivalent jobs created.

(A more detailed discussion of the base-case impact models, the IMPLAN econometric modeling program, and the occupation-industry conversions is provided in Appendix B, which discusses the research methods used in this report.)

Comparing the EDD and UCLA models of the California economy in 2022 provides an interesting contrast in assumptions about how the economy will evolve. The second and third columns of Figure 1-13 show the aggregate value of California's economy in 2022 for both base-case models. The UCLA model predicts higher levels of economic activity in both total output and value added, but lower employment compared to the BLS/EDD model. Thus the UCLA model indicates an overall workforce with a higher level of productivity.

Figure 1-13

Base-Case Assumptions for the California Economy in 2022

Indicator	2022 California Economy		2022 Economic Contribution of the Higher Educated Workforce	
	BLS/EDD Model	UCLA Forecast Model	BLS/EDD Model	UCLA Forecast Model
Total Output	$ 2,842,904,751,648	$ 3,171,846,291,456	$ 582,065,502,738	$ 546,774,117,888
Value Added	$ 1,732,624,354,176	$ 1,914,358,556,672	$ 370,942,767,385	$ 333,309,816,064
Employment	36,264,069	29,068,683	4,749,626	4,956,607

Sacramento State Applied Research Center
Data Sources: IMPLAN Professional 2.0 (using 2002 econometric coefficients) and *2001 IMPLAN Sectoring Scheme for NAICS*; California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012*; UCLA Anderson Forecasts for 2022

The Scenarios

The UC Berkeley Survey Research Center's statewide educational attainment scenarios on which our workforce educational attainment scenarios are based are shown in Figure 1-14 below. The Current Conditions base-case scenario projects that 31.8 percent of the population will hold bachelor's degrees or higher in 2022, and 20.1 percent of the population will either hold associate degrees or have one or more years of college completed. The Fixed Capacity scenario shows lower levels of both educational attainment categories, while the Increased College-Going scenario shows a higher level

of both educational attainment categories. The Increased College Competitions scenario shows the greatest increase in percent of population with bachelor's degrees or higher, but the lowest percent of population with associate degrees and some college since in this scenario there is a greater rate of actual college completions attained, which presumes that those with associate degrees or some college go on to complete bachelor's degrees

Figure 1-14

Educational Attainment of California's Population, 2022				
Educational Attainment	**Fixed Capacity**	**Current Conditions**	**Increased College-Going**	**Increased College Completions**
BA +	31.14	31.80	32.02	36.05
AA & Some College	19.21	20.50	21.10	17.60

Sacramento State Applied Research Center
Data Source: UC Berkeley Survey Research Center, Statewide Educational Attainment Scenarios

Figure 1-15 shows the percent change in the educational attainment of the population relative to the Current Conditions base-case scenario from Figure 1-12. The Fixed Capacity scenario shows a decline of 2.09 percent for those with bachelor's degrees and higher, and a decline of 6.31 percent for those with associate degrees and some college. By contrast, the Increased College Completions scenario describes a more polarized attainment scenario, showing an increase of 13.38 percent in holders of bachelor's degrees or higher and a decline of 14.15 percent in holders of associate degrees and some college.

Figure 1-15

Percent Change in Educational Attainment from "Current Conditions" Scenario, 2022				
Educational Attainment	**Fixed Capacity**	**Current Conditions**	**Increased College-Going**	**Increased College Completions**
BA +	-2.09%	0.00	0.69%	13.38%
AA & Some College	-6.31%	0.00	2.93%	-14.15%

Sacramento State Applied Research Center
Data Source: UC Berkeley Survey Research Center, Statewide Educational Attainment Scenarios

Scenario Results

The economic impacts of the higher education scenarios based on the BLS/EDD base-case IMPLAN model are summarized in Figure 1-16. The economic consequences of differences in educational attainment for California's future higher educated workforce are great. The base-case model shows that the higher-educated workforce in 2022 is expected to create total economic impacts of $582.1 billion in business revenues (total output), which includes a contribution to gross state product of $370.9 billion (value added); generate $35.4 billion in state and local tax revenues; and contribute 4.75 million in employment.

Figure 1-16.

Economic Impacts of Higher Education Scenarios using the BLS/EDD Base-Case Model

Economic Measure (Dollars in Billions)	Economic Impacts of Higher Education Attainment Scenarios in 2022			
	Higher Educated Workforce (BLS/EDD Base-Case Scenario)	Fixed Capacity	Increased College-Going	Increased College Completions
Total Output	$582.066	-$14.861	$5.461	$60.224
Value Added (Gross State Product)	$370.943	-$9.432	$3.462	$38.623
State & Local Taxes	$35.373	-$0.873	$0.316	$3.858
Employment	4,749,626	-126,432	47,295	457,669

Sacramento State Applied Research Center
Data Sources: IMPLAN Professional 2.0 (using 2002 econometric coefficients) and *2001 IMPLAN Sectoring Scheme for NAICS*; California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012*; UC Berkeley Survey Research Center, Statewide Educational Attainment Scenarios. Analysis is based on the 45 largest higher educated occupations. Model estimates of state and local taxes are based on current tax structure and include corporate and personal taxes.

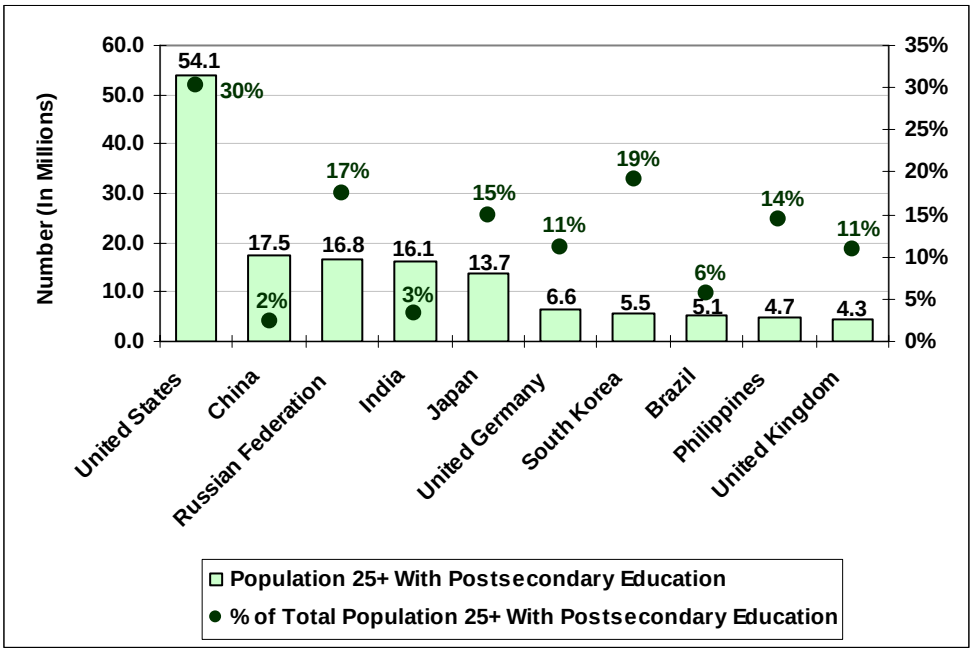
The Fixed Capacity higher education scenario will negatively impact the State's economy, posting decreases in business revenues by almost $15 billion per year, which includes a decrease in gross state product of $9.4 billion per year; decreasing state and local tax revenues by about $873 million per year; and decreasing employment by 126,432.

At the other extreme, the Increased College Completions scenario shows an increase over the base-case higher educated workforce scenario of over $60 billion per year in total output (business revenues) including an increase of $38.6 billion in gross state product (value added); an increase of $3.86 billion per year in state and local taxes generated; and an increase of 457,669 in employment.

Educational Attainment Comparisons

The education-intensive demands of California's economy are realized in part because the United States has achieved very high levels of educational attainment. Figure 1-17 shows that the US ranks number one compared to the world's national economies in terms of both the absolute number and percent of its population over the age of 25 with post-secondary education. Over 54 million residents in the US or approximately 30 percent of its total population have completed postsecondary educations. (In fact, the US contains about 26 percent of the world's higher educated population, with China second at 8.3 percent.)

Figure 1-17
Top Ten Educated Countries, 2000
Number and percent of population 25+ years of age with postsecondary education. (In Millions)



Sacramento State Applied Research Center, July 2005
Data Source: Center for International Development, Research Datasets, "International Data on Educational Attainment: Updates and Implications"

Figure 1-18 shows the top 20 states by absolute growth in higher educated population, 1990 to 2000. Though California ranks first by absolute growth, adding 1.04 million higher educated graduates between 1990 and 2000, the state ranked 42nd in percent growth (growing 26.5 %), which is slower growth than the national average of 35 percent during this period. Many states grew at rates considerably higher than the national average, including Georgia (61%), Arizona (61%), North Carolina (59%), and Colorado (58%).

Figure 1-18

Top 20 States by Absolute Increase in Higher Educated Population, 1990 - 2000

Population 25 to 64 years of age with a bachelor's degree or higher.

Rank	State	1990	2000	Growth: 1990-2000	
				Number	Percent
1	California	3,920,794	4,960,210	1,039,416	26.5%
2	Texas	1,903,464	2,646,909	743,445	39.1%
3	Florida	1,319,497	1,968,126	648,629	49.2%
4	New York	2,469,479	3,031,927	562,448	22.8%
5	Illinois	1,405,474	1,876,455	470,981	33.5%
6	Georgia	715,372	1,148,814	433,442	60.6%
7	North Carolina	658,552	1,044,025	385,473	58.5%
8	Pennsylvania	1,262,189	1,618,658	356,469	28.2%
9	Virginia	888,699	1,232,454	343,755	38.7%
10	New Jersey	1,178,203	1,510,429	332,226	28.2%
11	Ohio	1,050,515	1,375,311	324,796	30.9%
12	Michigan	919,153	1,242,388	323,235	35.2%
13	Colorado	518,874	819,906	301,032	58.0%
14	Washington	639,751	932,352	292,601	45.7%
15	Massachusetts	984,225	1,266,113	281,888	28.6%
16	Arizona	397,353	638,515	241,162	60.7%
17	Minnesota	554,517	783,613	229,096	41.3%
18	Maryland	754,444	979,588	225,144	29.8%
19	Tennessee	450,271	649,844	199,573	44.3%
20	Wisconsin	492,125	690,065	197,940	40.2%
	All Other States *	6,470,393	8,662,896	2,192,503	33.9%
	Nation	28,953,344	39,078,598	10,125,254	35.0%

Sacramento State Applied Research Center
Data Sources: National Center for Higher Education Management Systems; U.S. Census, Summary File 3
Note: * Includes the District of Columbia

California's high levels of educational attainment are partly due to the State's attraction of higher educated population from other states. Figure 1-19 shows the top 20 states which contribute the most to our net in-migration of higher-educated residents. The top five states – New York, Illinois, Massachusetts, Pennsylvania, and Michigan – provided over half (53%) of California's net domestic in-migration of higher educated population.

Figure 1-19

Top 20 US Sources of Net In-Migration of Higher Educated Residents, 1995-2000

Rank	State	Number	Percent
1	New York	20,214	16.24%
2	Illinois	16,775	13.48%
3	Massachusetts	11,352	9.12%
4	Pennsylvania	9,485	7.62%
5	Michigan	7,554	6.07%
6	Ohio	6,891	5.54%
7	New Jersey	5,935	4.77%
8	Indiana	4,690	3.77%
9	Texas	3,607	2.90%
10	District of Columbia	3,379	2.72%
11	Connecticut	3,232	2.60%
12	Virginia	3,049	2.45%
13	Wisconsin	2,852	2.29%
14	Hawaii	2,814	2.26%
15	Maryland	2,592	2.08%
16	Utah	2,569	2.06%
17	Iowa	2,388	1.92%
18	Minnesota	1,739	1.40%
19	Missouri	1,677	1.35%
20	Rhode Island	1,512	1.22%
	Totals	114,306	91.86%

Sacramento State Applied Research Center
Data Sources: National Center for Higher Education Management Systems; 2000 U.S. Census, 5% PUMS.

Industry Structure and Change in the California Economy

California enjoys a reputation for having an economy with very high value, high technology industries, and a high level of participation in new inventions and products. While we certainly have the usual retail, fast food, construction workers, elementary school teachers, and government workers just like all states, we also have high technology electronics firms, aerospace and aircraft companies, the human genome and stem cell research projects, the doorway to Asia and the Pacific Rim, some of the world's most productive farmland and supporting industries, and the nation's highest-educated workforce. The following section of this chapter gives a view of California's industry structure, how it is changing, and how it compares to the US economy overall.

California's Industry Structure

The industrial structures of the US and state economies are categorized by the North American Industry Classification System (NAICS), which is based on the types of products and services that industries create. The economy can generally be summarized into a few major industry sectors, but the classifications also contain great detail in sub-sectors of economic structure. For simplicity, the tables below exclude the details of sub-sectors in many sectors, such as "Computer Storage Device Manufacturing" under Manufacturing. A summary of California's economic industry structure, and its change over the past decade, is shown in Figures 2-1A and B below. There are over 140 NAICS sectors in the total, detailed summary by NAICS, which is shown in Appendix 2-1.

Figure 2-1A shows employment by major industry sectors in 2000. The largest sector is Manufacturing, with 1.858 million employees, or 12.5 percent of the State's total employment. The largest sub-sectors of manufacturing are Computer and Electronics, Transportation Equipment (includes autos, aircraft, rail equipment), Food Processing, and Apparel Manufacturing.

The second tier sectors are Local Government (including education) and Retail Trade, each at about 1.6 million or 10.5 percent of employment.

Other sectors with over 1 million employees are Leisure and Hospitality (includes Arts, entertainment, sports, accommodation, and food services) and Health Care and Social Assistance.
Together these five sectors provide about 7.5 million jobs, or about 50 percent of the State's employment.

Figure 2-1B shows the change in employment for each major sector over the 1990 to 2000 decade. Employment increased by 2.03 million over this time period, with the largest increase being in the Administration and Support sector, which added 361,300 new jobs or nearly 18 percent of the change in total employment.

Figure 2-1 A

Major California Industry Sectors in 2000 Sorted by Size

NAICS SECTOR	Number Employed 2000	Percent of Total Employment
Total All Industries	**14,896,700**	100%
Manufacturing	1,857,500	12.5%
Local Government	1,601,800	10.8%
Retail Trade	1,559,400	10.5%
Liesure & Hospitality	1,332,600	8.9%
Health Care and Social Assistance	1,168,800	7.8%
Administration & Support	994,600	6.7%
Professional, Scientific & Technical Serv.	920,700	6.2%
Financial Activities	795,100	5.3%
Construction	731,000	4.9%
Wholesale trade	644,900	4.3%
Information Services	575,400	3.9%
Other Services	486,200	3.3%
Transportation and Warehousing	461,100	3.1%
State Government	443,400	3.0%
Farm Employment and Farm Services	408,500	2.7%
Management of Companies and Enterprises	330,700	2.2%
Federal Government	272,900	1.8%
Private Educational Services	229,200	1.5%
Utilities	56,000	0.4%
Natural Resources and Mining	26,500	0.2%

Source: Employment Development Department.

Data does not add to total due to inclusion of sub-sectors for informative purposes.

Figure 2-1 B

Major California Sectors Sorted by Change 1990-2000

NAICS SECTOR	Change since 1990	Percent of Decade Change
Total All Industries	**2,033,300**	100%
Administration & Support	361,300	17.8%
Local Government	271,100	13.3%
Health Care and Social Assistance	236,900	11.7%
Professional, Scientific & Technical Serv.	233,600	11.5%
Liesure & Hospitality	228,100	11.2%
Information Services	184,800	9.1%
Management of Companies and Enterprises	135,000	6.6%
Retail Trade	115,400	5.7%
Transportation and Warehousing	101,100	5.0%
Wholesale trade	94,500	4.6%
Construction	86,500	4.3%
Other Services	71,700	3.5%
State Government	61,400	3.0%
Farm Employment and Farm Services	44,900	2.2%
Private Educational Services	44,800	2.2%
Utilities	-9,200	-0.5%
Natural Resources and Mining	-9,800	-0.5%
Financial Activities	-26,800	-1.3%
Federal Government	-89,200	-4.4%
Manufacturing	-102,300	-5.0%

Source: Employment Development Department.

Data does not add to total due to inclusion of sub-sectors for informative purposes.

Local Government (including education) ranked second, adding 271,100 jobs or 13.3 percent of the total change in employment. Health Care and Social Assistance; Professional, Scientific and Technical Services; and Leisure and Hospitality each added around 230,000 jobs or 11.5 percent of the total increase.

These five sectors provided 1.33 million additional jobs, or 66 percent of net employment growth, enough to offset the losses in the following five sectors: Utilities (-9,200 jobs); Natural Resources and Mining (-9,800); Financial Activities (-26,800); Federal Government (-89,200); and most of all, Manufacturing (-102,300), which together lost 237,300 jobs over the decade.

Most of the sectors in the top 10 according to size are also in the top ten according to absolute growth, with three notable exceptions: Manufacturing; Financial Activities; and Construction.

Three of the 10 sectors with the greatest absolute growth are not in the 10 largest sectors. These sectors include Information Services; Management of Companies and Enterprises; and Transportation and Warehousing.

Comparative Analysis of Specialization

The data presented in the previous section showed the industry structure of California's economy and its changes over time. Since the economy in California is similar to the US economy, and changes to the economy in California are likely to be similar to changes in the US economy, a different method of analysis is needed to answer the question about how California is different and how its differences are changing.

The analysis in this section is a comparative one that identifies the industry sectors in which the economy in California exhibits a comparative advantage or disadvantage when compared to the US economy. In this analysis, the percentage of California employment in each industry sector is compared to the percent for the same sector in the US, a comparative method called a "locational quotient" in economic literature. For example, if California has the same percentage in a sector as the US, the ratio of the percentages would be 1.0, indicating no relative specialization. If the ratio were 1.5, it would indicate that California has 1.5 times the US percentage or 50 percent more employment in this sector. It is generally assumed that areas of specialization identify goods and services which California exports to consumers outside the State. Ratios of less than 1.0 indicate that California is under-represented in the industry, and California probably imports some of this good or service from other states.

The advantage of this comparative method is that it allows comparisons of different industry structures or of the change in industry structure over time.

For this purpose, we will use employment projections for the US from the Bureau of Labor Statistics (BLS) and employment projections for California from the Employment Development Department (EDD). Both of these sources provide projections that include assumptions about the availability of skilled labor, which is the focus of this study. (The methodology of the underlying data is discussed in the Research Methods chapter, Appendix A of this report.)

Figure 2-2A shows the specialization of the California economy for 2002 and the projected specialization for 2022, while Figure 2-2B shows the projected change in specialization over the 20-year period.

Figure 2-2A
California Industry Specialization and Change
2002 (Actual) vs. 2022 (Projected)
Ranked by 2002 Specialization

NAICS Industry Sector	California Specialization in 2002 (actual)	Projected California Specialization in 2022
Management of companies and enterprises	1.43	1.47
Information	1.32	1.24
Professional, Scientific, and Technical Services	1.22	1.07
Arts, entertainment, and recreation	1.17	1.07
Administrative and support and waste management and remediation services	1.12	1.08
State and local government	1.06	1.11
Wholesale trade	1.05	1.13
Construction	1.04	1.24
Accomodation and food services	1.03	1.07
Financial activities	0.99	1.01
Manufacturing	0.97	0.99
Retail trade	0.95	0.97
Transportation and warehousing	0.94	0.87
Health care and social assistance	0.84	0.75
Educational services	0.84	0.88
Federal government	0.83	0.85
Utilities	0.83	1.08
Other services	0.75	0.71
Natural Resources & Mining	0.41	0.50

Specialization coefficients are the ratio between CA and US percentages of employment in each sector. A ratio of 1.0 indicates no difference in the US and CA relative percentages, or no specialization for CA. Ratios higher than 1.0 indicate that CA is specialized in this sector, while ratios lower than 1.0 means CA has less-than-average employment in this sector. The high ratio of 1.43 for Private Management in 2002 indicates that CA has 1.43 times as much of its employment in this sector as the US (or 43% more). CA has only .41 (41%) as much of its employment in Natural Resources & Mining as the US.

Sources: Industry composition data for 2002: EDD, BLS.
Projected 2022 data is a linear projection of the 2002-2012 forecasts by EDD and BLS.

Figure 2-2 B
Projected Specialization Change 2002-2022
Ranked by Absolute Change

NAICS Industry Sector	Projected Change in Specialization 2002 - 2022
Utilities	0.25
Construction	0.20
Natural Resources & Mining	0.09
Wholesale trade	0.08
State and local government	0.05
Educational services	0.04
Accomodation and food services	0.04
Management of companies and enterprises	0.04
Manufacturing	0.02
Financial activities	0.02
Federal government	0.02
Retail trade	0.01
Administrative and support and waste management	-0.04
Other services	-0.04
Transportation and warehousing	-0.07
Information	-0.08
Health care and social assistance	-0.09
Arts, entertainment, and recreation	-0.10
Professional, Scientific, and Technical Services	-0.15

Highly Specialized Sectors

In 2002 five sectors accounted for most of California's specialized activities. They are discussed below (with their specialization coefficient in parentheses):

- Management of Companies and Enterprises. This sector had a specialization of 1.43 in 2002, or 43 percent more than the US average. The firms in this sector are those which provide management to other enterprises, but the sector does not include management employees employed in other sectors.
- Information Services (1.32) which includes data services, information processing, communications, media broadcasting and publications.
- Professional, Scientific, and Technical Services (1.22) which includes legal, accounting, scientific, advertising and marketing companies.
- Arts, Entertainment, and Recreation (1.17) include sports, performing arts, entertainment, and casinos.
- Administrative and Support (1.12), which includes office administration and employment placement services, call centers, telemarketing, travel agencies, and tour operators.

The Typical Sectors

Many of California's industry sectors are about the same relative size as the US, indicating no relative specialization for California. Those within 10 percent more or less than the US are listed below in decreasing order of specialization:

- State and Local Government (1.06)
- Wholesale Trade (1.05)
- Construction (1.04)
- Accommodation and Food Services (1.03)
- Financial Activities (0.99)
- Manufacturing (0.97)
- Retail Trade (0.95)
- Transportation and Warehousing (0.94)

Under-represented Sectors

At the other end of the spectrum are the sectors in which California has a substantially lower percent of its employment than the US average. These include:

- Health Care and Social Assistance (0.84)
- Private Educational Services (0.84)
- Federal Government (0.83)
- Utilities (0.83)
- Other Services (0.75)
- Natural Resources and Mining (0.41)

The data supports the reputation of California as having comparatively high levels of employment in some of the key economic sectors of the nation. Such as the specialization in Management of Companies and Enterprises; Information Services; Professional,

Scientific and Technical Services; Arts and Entertainment; and Administrative and Support Services.

If there are any real surprises in this characterization of the California economy for most readers, they probably include:

- California is not very specialized in State and Local Government; Construction; Financial Activities; Manufacturing; or Retail Trade employment.
- California has only a small degree of specialization in Public Sector Education, with a specialization coefficient of 1.09 and about 1.2 million employees.
- California is actually under-represented in Health Care; Private Educational Services; Federal Government; and Utilities.

Projected Changes in Specialization

Figure 2-2B shows the projected change in California's industry specialization between 2002 and 2022. The projected change is shown in the right-hand column, which is an absolute change in specialization coefficient over the 20-year period, not a percent or rate of change. Sectors with a negative change indicate that California will be loosing some of its competitive position in those sectors, while sectors with positive change will be gaining relative position.

The two sectors with the greatest projected gains in specialization are:

- Utilities (+.22)
- Construction (+0.20)

Other sectors with projected increases in specialization include:

- Natural Resources and Mining (+0.09)
- Wholesale Trade (+0.08)
- State and Local Government (+.05)
- Education Services (+.04)
- Accommodation and Food Service (+.04)
- Management of Companies and Enterprises (+.04)

The sectors which will loose the most in specialization include:

- Professional and Business Services, (-.15)
- Arts, Entertainment, and Recreation (-.10)
- Health Care and Social Assistance (-.09)
- Information Services (-.08)
- Transportation and Warehousing (-.07)

It appears that we will loose specialization in some of the dominant areas of specialization at present, or in the areas which involve much of California's highest educated and highest income workforce. That implication will be explored further in the rest of this report.

Appendix 2-1
California Industry Structure and Change, 1990 – 2002

California Employment and Change by NAICS Sectors, 1990 - 2000						
NAICS SECTOR	1990 Data		2000 Data		Decade Change	
	Employment	Composition	2000	Composition	Employment Change	Percent Change
Total, All Industries	12,863,400	100%	14,896,700	100.0%	2,033,300	15.8%
Total Farm	363,600	3%	408,500	2.7%	44,900	12.3%
Natural Resources & Mining	36,300	0%	26,500	0.2%	-9,800	-27.0%
Const.	644,500	5%	731,000	4.9%	86,500	13.4%
Mfg.	1,959,800	15%	1,857,500	12.5%	-102,300	-5.2%
Durable Goods	1,319,800	10%	1,212,100	8.1%	-107,700	-8.2%
Wood Product Mfg.	46,200	0%	44,400	0.3%	-1,800	-3.9%
Nonmetallic Mineral Product Mfg.	54,400	0%	48,100	0.3%	-6,300	-11.6%
Primary Metal Mfg.	35,100	0%	30,900	0.2%	-4,200	-12.0%
Fabricated Metal Product Mfg	154,500	1%	173,300	1.2%	18,800	12.2%
Machinery Mfg.	99,200	1%	108,500	0.7%	9,300	9.4%
Computer & Electronic Product Mfg.	447,000	3%	429,700	2.9%	-17,300	-3.9%
Electrical Equipment & Appliance Mfg.	50,200	0%	44,100	0.3%	-6,100	-12.2%
transp. Equipment Mfg.	275,500	2%	153,200	1.0%	-122,300	-44.4%
Furniture & Related Product Mfg.	73,700	1%	76,700	0.5%	3,000	4.1%
Medical Equipment & Supplies Mfg.	44,100	0%	51,800	0.3%	7,700	17.5%
Food Mfg.	173,800	1%	157,200	1.1%	-16,600	-9.6%
Beverage & Tobacco Product Mfg	28,000	0%	33,000	0.2%	5,000	17.9%
Textile Mills	11,200	0%	17,900	0.1%	6,700	59.8%
Textile Product Mills	17,800	0%	19,700	0.1%	1,900	10.7%
Apparel Mfg.	116,400	1%	122,600	0.8%	6,200	5.3%
Leather & Allied Products Mfg.	7,700	0%	7,000	0.0%	-700	-9.1%
Paper Mfg.	37,700	0%	35,400	0.2%	-2,300	-6.1%
Printing & Related Support Activities	87,600	1%	81,600	0.5%	-6,000	-6.8%
Petroleum & Coal Products Mfg.	26,000	0%	16,300	0.1%	-9,700	-37.3%
Chemical Mfg.	68,400	1%	81,600	0.5%	13,200	19.3%
Plastics & Rubber Products Mfg.	65,300	1%	73,100	0.5%	7,800	11.9%
Trade, transp. & Utilities	2,419,600	19%	2,721,400	18.3%	301,800	12.5%
Wholesale Trade	550,400	4%	644,900	4.3%	94,500	17.2%
Retail Trade	1,444,000	11%	1,559,400	10.5%	115,400	8.0%
Motor Vehicle & Parts Dealer	170,100	1%	199,900	1.3%	29,800	17.5%
Furniture & Home Furnishings Stores	50,800	0%	59,700	0.4%	8,900	17.5%
Electronics & Appliance Stores	63,400	0%	90,700	0.6%	27,300	43.1%
Build Material & Garden Equip Stores	101,200	1%	108,300	0.7%	7,100	7.0%
Food & Beverage Stores	287,300	2%	300,600	2.0%	13,300	4.6%
Health & Personal Care Stores	91,000	1%	100,500	0.7%	9,500	10.4%
Gasoline Stations	62,900	0%	58,400	0.4%	-4,500	-7.2%
Clothing & Clothing Accessories Stores	164,700	1%	158,700	1.1%	-6,000	-3.6%
Sport Gds, Hobby, Book & Music Stores	85,300	1%	89,000	0.6%	3,700	4.3%
Department Stores	201,100	2%	200,000	1.3%	-1,100	-0.5%
Nonstore Retailers	28,800	0%	38,300	0.3%	9,500	33.0%
transp., Warehousing & Utilities	425,200	3%	517,200	3.5%	92,000	21.6%
Utilities	65,200	1%	56,000	0.4%	-9,200	-14.1%
transp. & Warehousing	360,000	3%	461,100	3.1%	101,100	28.1%
Air transp.	72,600	1%	68,400	0.5%	-4,200	-5.8%
Rail transp.	16,900	0%	14,000	0.1%	-2,900	-17.2%
Water transp.	6,300	0%	4,200	0.0%	-2,100	-33.3%
Truck transp.	89,800	1%	118,700	0.8%	28,900	32.2%
Transit & Ground Passenger transp.	27,000	0%	35,700	0.2%	8,700	32.2%
Pipeline, Scenic & Sightseeing transp.	1,100	0%	6,300	0.0%	5,200	472.7%
Support Activities for transp.	51,800	0%	74,400	0.5%	22,600	43.6%
Warehousing & Storage	43,200	0%	62,000	0.4%	18,800	43.5%
Information	390,600	3%	575,400	3.9%	184,800	47.3%
Publishing Industries (except Internet)	88,800	1%	117,400	0.8%	28,600	32.2%
Motion Picture & Sound Recording	112,500	1%	170,000	1.1%	57,500	51.1%
Broadcasting (except Internet)	32,600	0%	46,300	0.3%	13,700	42.0%
Telecommunications	124,500	1%	143,800	1.0%	19,300	15.5%
Internet Serv Provid, Web Portals & Data P	29,200	0%	81,800	0.5%	52,600	180.1%
Financial Activities	821,900	6%	795,100	5.3%	-26,800	-3.3%
Finance & Insurance	575,800	4%	533,000	3.6%	-42,800	-7.4%
Credit Intermediation & Related Activities	306,600	2%	235,700	1.6%	-70,900	-23.1%
Securities, Commodity Contracts & Invest	50,200	0%	87,700	0.6%	37,500	74.7%
Insurance Carriers & Related	205,900	2%	200,900	1.3%	-5,000	-2.4%
Real Estate & Rental & Leasing	246,100	2%	262,100	1.8%	16,000	6.5%

Appendix 2-1 (Continued)

Continued

NAICS SECTOR	1990 Data		2000 Data		Decade Change	
	Employment	Composition	2000	Composition	Employment Change	Percent Change
Professional, Scientific & Technical Serv.	687,100	5%	920,700	6.2%	233,600	34.0%
Legal Serv.	126,700	1%	127,400	0.9%	700	0.6%
Acct, Tax Prep. & Bookkeeping Serv.	106,000	1%	99,000	0.7%	-7,000	-6.6%
Architectural, Engineering & Related Serv.	126,200	1%	155,000	1.0%	28,800	22.8%
Specialized Design Serv.	17,000	0%	23,300	0.2%	6,300	37.1%
Computer Systems Design & Related Serv	66,100	1%	204,800	1.4%	138,700	209.8%
Mgmt, Scientific & Tech Consulting Serv.	63,900	0%	94,900	0.6%	31,000	48.5%
Scientific Research & Development Serv.	86,800	1%	89,100	0.6%	2,300	2.6%
Advertising & Related Serv.	54,000	0%	71,600	0.5%	17,600	32.6%
Other Prof., Scientific & Technical Serv.	40,500	0%	55,600	0.4%	15,100	37.3%
Management of Companies & Enterprises	195,700	2%	330,700	2.2%	135,000	69.0%
Administrative & Support & Waste Serv.	633,300	5%	994,600	6.7%	361,300	57.1%
Administrative & Support Serv.	602,800	5%	960,000	6.4%	357,200	59.3%
Office Administrative Serv.	31,300	0%	33,700	0.2%	2,400	7.7%
Facilities Support Serv.	4,600	0%	7,700	0.1%	3,100	67.4%
Employment Serv.	225,300	2%	493,300	3.3%	268,000	119.0%
Business Support Serv.	48,600	0%	55,200	0.4%	6,600	13.6%
Travel Arrangement & Reservation Serv.	37,900	0%	40,800	0.3%	2,900	7.7%
Investigation & Security Serv.	81,300	1%	107,100	0.7%	25,800	31.7%
Serv. to Builds & Dwellings	142,500	1%	191,200	1.3%	48,700	34.2%
Other Support Serv.	31,300	0%	30,900	0.2%	-400	-1.3%
Waste Management & Remediation Serv.	30,500	0%	34,600	0.2%	4,100	13.4%
Waste Treatment & Disposal	15,200	0%	16,100	0.1%	900	5.9%
Waste Collection & Remediation Serv.	15,300	0%	18,500	0.1%	3,200	20.9%
Educational & Health Serv.	1,116,300	9%	1,398,000	9.4%	281,700	25.2%
Educational Serv.	184,400	1%	229,200	1.5%	44,800	24.3%
Elementary & Secondary Schools	55,000	0%	70,000	0.5%	15,000	27.3%
Junior Colleges	4,200	0%	7,200	0.0%	3,000	71.4%
Colleges, Univ. & Professional Schools	83,900	1%	92,000	0.6%	8,100	9.7%
Bus., Tech. Schools & Support Training	25,500	0%	29,600	0.2%	4,100	16.1%
Other Schools & Instruction	15,900	0%	28,900	0.2%	13,000	81.8%
Health Care & Social Assistance	931,900	7%	1,168,800	7.8%	236,900	25.4%
Ambulatory Health Care Serv.	364,900	3%	463,000	3.1%	98,100	26.9%
Offices of Physicians	179,800	1%	212,300	1.4%	32,500	18.1%
Offices of Dentists	71,500	1%	96,300	0.6%	24,800	34.7%
Offices of Other Health Practitioners	41,000	0%	48,200	0.3%	7,200	17.6%
Outpatient Care Centers	25,600	0%	36,600	0.2%	11,000	43.0%
Medical & Diagnostic Laboratories	17,600	0%	18,800	0.1%	1,200	6.8%
Home Health Care Serv.	17,200	0%	34,400	0.2%	17,200	100.0%
Other Ambulatory Health Care Serv.	12,300	0%	16,400	0.1%	4,100	33.3%
Hospitals	297,900	2%	326,700	2.2%	28,800	9.7%
Nursing & Residential Care Facilities	154,700	1%	208,500	1.4%	53,800	34.8%
Social Assistance	114,400	1%	170,700	1.1%	56,300	49.2%
Individual & Family Serv.	41,800	0%	63,700	0.4%	21,900	52.4%
Community Emerg & Other Relief Serv.	8,800	0%	12,800	0.1%	4,000	45.5%
Vocational Rehabilitation Serv.	24,700	0%	36,000	0.2%	11,300	45.7%
Child Day Care Serv.	39,000	0%	58,200	0.4%	19,200	49.2%
Leisure & Hospitality	1,104,500	9%	1,332,600	8.9%	228,100	20.7%
Arts, Entertainment, & Recreation	187,500	1%	216,100	1.5%	28,600	15.3%
Amusement, Gambling, & Recreation	107,300	1%	146,300	1.0%	39,000	36.3%
Accommodation & Food Service	917,000	7%	1,116,500	7.5%	199,500	21.8%
Accommodation	195,700	2%	196,400	1.3%	700	0.4%
Food Serv. & Drinking Places	721,300	6%	920,100	6.2%	198,800	27.6%
Other Services	551,300	4%	645,100	4.3%	93,800	
Repair & Maintenance	135,700	1%	158,300	1.1%	22,600	16.7%
Auto Repair & Maintenance	94,400	1%	119,000	0.8%	24,600	26.1%
Electronic & Precision Equipment	14,400	0%	13,700	0.1%	-700	-4.9%
Commercial & Industrial Machinery	14,700	0%	15,200	0.1%	500	3.4%
Personal & Household Goods Repair	12,200	0%	10,500	0.1%	-1,700	-13.9%
Personal & Laundry Serv.	119,600	1%	130,900	0.9%	11,300	9.4%
Religious, Grants, Civic, Pro. & Like Org.	160,300	1%	197,500	1.3%	37,200	23.2%
Government	2,074,800	16%	2,318,100	15.6%	243,300	11.7%
Federal Government	362,100	3%	272,900	1.8%	-89,200	-24.6%
Department of Defense	130,600	1%	60,700	0.4%	-69,900	-53.5%
Other Federal Government	231,500	2%	212,200	1.4%	-19,300	-8.3%
State & Local Government	1,712,700	13%	2,045,200	13.7%	332,500	19.4%
State Government	382,000	3%	443,400	3.0%	61,400	16.1%
State Government Education	168,500	1%	194,300	1.3%	25,800	15.3%
Other State Government	213,500	2%	249,100	1.7%	35,600	16.7%
Local Government	1,330,700	10%	1,601,800	10.8%	271,100	20.4%
Local Government Education	721,500	6%	916,000	6.1%	194,500	27.0%
County	274,800	2%	314,100	2.1%	39,300	14.3%
City	233,700	2%	252,000	1.7%	18,300	7.8%
Special Districts	100,600	1%	100,400	0.7%	-200	-0.2%

Source: California Employment Development Department

Appendix 2-2
Specialization Data

Specialization Computations for 2002

Industry	US Jobs	US % of Total	CA Jobs	CA % of Total	LQ
	2002	2002	2002	2002	2002
Total Non-Farm Wage & Salary Jobs	131,064,000	100.00%	14,457,800	100.00%	
Natural Resources & Mining	512,000	0.39%	23,100	0.16%	0.41
Utilities	600,000	0.46%	54,800	0.38%	0.83
Construction	6,732,000	5.14%	773,500	5.35%	1.04
Manufacturing	15,307,000	11.68%	1,638,200	11.33%	0.97
Wholesale trade	5,641,000	4.30%	652,100	4.51%	1.05
Retail trade	15,047,000	11.48%	1,581,700	10.94%	0.95
Transportation and warehousing	4,205,000	3.21%	436,200	3.02%	0.94
Information	3,420,000	2.61%	497,300	3.44%	1.32
Financial activities	7,843,000	5.98%	852,800	5.90%	0.99
Professional, Scientific, and Technical Services	6,715,000	5.12%	905,000	6.26%	1.22
Management of companies and enterprises	1,711,000	1.31%	270,500	1.87%	1.43
Administrative and support and waste management and reme	7,584,000	5.79%	938,800	6.49%	1.12
Educational services	2,651,000	2.02%	245,500	1.70%	0.84
Health care and social assistance	13,533,000	10.33%	1,253,400	8.67%	0.84
Arts, entertainment, and recreation	1,778,000	1.36%	229,800	1.59%	1.17
Accomodation and food services	10,191,000	7.78%	1,152,600	7.97%	1.03
Other services	6,105,000	4.66%	505,700	3.50%	0.75
Federal government	2,767,000	2.11%	253,800	1.76%	0.83
State and local government	18,722,000	14.28%	2,193,300	15.17%	1.06

Specialization Coefficients for 2022

Industry	US Jobs	US % of Total	CA Jobs	CA % of Total	LQ
	2022	2022	2022	2022	2022
Total Non-Farm Wage & Salary Jobs	174,317,000	100.00%	19,841,200	100.0%	
Natural Resources & Mining	390,000	0.22%	22,300	0.1%	0.50
Utilities	531,000	0.30%	65,000	0.3%	1.08
Construction	8,759,000	5.02%	1,233,100	6.2%	1.24
Manufacturing	14,991,000	8.60%	1,691,800	8.5%	0.99
Wholesale trade	6,917,000	3.97%	888,100	4.5%	1.13
Retail trade	19,211,000	11.02%	2,110,700	10.6%	0.97
Transportation and warehousing	6,034,000	3.46%	596,600	3.0%	0.87
Information	4,684,000	2.69%	659,700	3.3%	1.24
Financial activities	9,770,000	5.60%	1,118,200	5.6%	1.01
Professional, Scientific, and Technical Services	10,443,000	5.99%	1,268,000	6.4%	1.07
Management of companies and enterprises	2,101,000	1.21%	351,300	1.8%	1.47
Administrative and support and waste management and reme	13,198,000	7.57%	1,624,800	8.2%	1.08
Educational services	4,169,000	2.39%	418,900	2.1%	0.88
Health care and social assistance	22,305,000	12.80%	1,904,800	9.6%	0.75
Arts, entertainment, and recreation	2,772,000	1.59%	337,800	1.7%	1.07
Accomodation and food services	13,467,000	7.73%	1,635,700	8.2%	1.07
Other services	8,025,000	4.60%	644,900	3.3%	0.71
Federal government	2,791,000	1.60%	270,200	1.4%	0.85
State and local government	23,758,000	13.63%	2,998,700	15.1%	1.11

Sources: 2002 data from the US Bureau of Labor Statistics; California Employment Development Department

2022 Projections based on 2012 projections from the above sources, extended to 2022 using linear sector growth assumptions.

Occupational Structure and Change in the California Economy

California's Occupational Structure

Another way to understand California's economic structure is by analyzing its occupational structure, which differs from the industry structure discussed previously in that it describes not goods and services created, but the specific functions of workers. While some occupations are directly linked to industries (such as nurses and doctors to hospitals or aeronautical engineers to aircraft manufacturing), other occupations such as bookkeepers, maintenance workers, and managers are found in virtually every industry sector. One of the essential characteristics of the BLS/EDD occupational data used for this study is that it includes the prevailing educational qualifications for occupations, thereby relating the occupational structure directly to workforce education, the primary topic of this study. The BLS/EDD data also includes the median wage for each occupation.

The occupations included in our analysis are defined by the Standard Occupational Classification system (SOC) of the Bureau of Labor Statistics and are organized into a semi-hierarchical structure. The Major Occupational Categories are shown in Figure 3-1 below; however, each category contains Minor Occupational Categories, Broad Occupational Categories, and Detailed Occupational Categories. The 820 detailed occupations range from Chief Executives (there are 42,000 in California, with a median wage of $70 per hour and requiring a BA/BS + Experience) to Material Moving Workers not otherwise classified (6,000 employed at $14.79 per hour with only Short Term OJT required).

Figure 3-1

Occupational Structure of California's Workforce, 2002			
SOC	**Major Occupational Category**	**Employment**	**% Total Workforce**
00-0000	**Total All Occupations**	**14,457,800**	**100.00%**
43-0000	Office & Administrative Support Occupations	2,699,600	18.67%
41-0000	Sales & Related Occupations	1,494,200	10.33%
35-0000	Food Preparation & Serving Related	1,128,200	7.80%
51-0000	Production Occupations	1,098,500	7.60%
53-0000	Transportation & Material Moving Occupations	1,008,500	6.98%
25-0000	Education, Training, & Library Occupations	953,100	6.59%
11-0000	Management Occupations	786,300	5.44%
47-0000	Construction & Extraction Occupations	692,600	4.79%
13-0000	Business & Financial Operations Occupations	643,100	4.45%
29-0000	Healthcare Practitioners & Technical	564,900	3.91%
49-0000	Installation, Maintenance, & Repair	518,300	3.58%
37-0000	Building & Grounds Cleaning & Maintenance	474,400	3.28%
15-0000	Computer & Mathematical Occupations	395,900	2.74%
33-0000	Protective Service Occupations	359,800	2.49%
17-0000	Architecture & Engineering Occupations	329,800	2.28%
39-0000	Personal Care & Service Occupations	305,300	2.11%
31-0000	Healthcare Support Occupations	304,600	2.11%
27-0000	Arts, Design, Entertainment, Sports, & Media	227,600	1.57%
21-0000	Community & Social Services Occupations	189,900	1.31%
19-0000	Life, Physical, & Social Science Occupations	143,400	0.99%
23-0000	Legal Occupations	108,900	0.75%
45-0000	Farming, Fishing, & Forestry Occupations	31,900	0.22%

Sacramento State Applied Research Center
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
Note: Data does not add to total due to rounding and EDD data specifications.

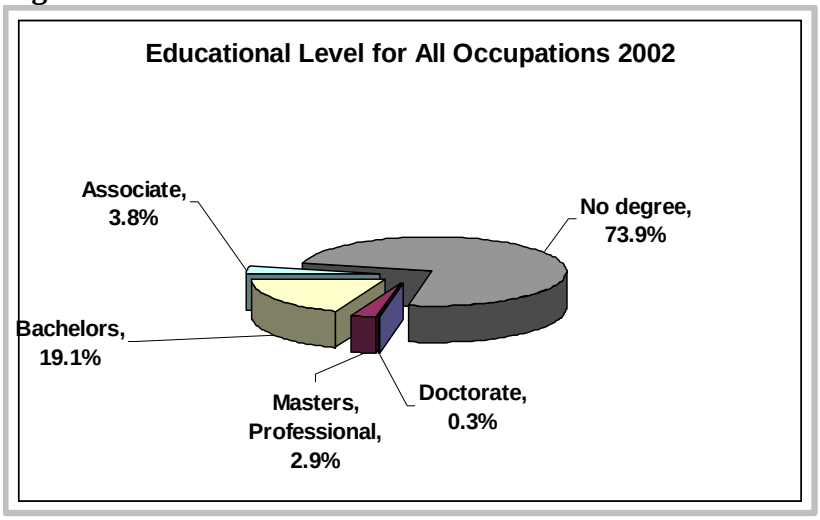
The largest percentage of the California workforce employed in 2002 was in the Office and Administrative Support Occupations major category, with about 2.7 million or 18.7 percent of the workforce, followed by the second largest category in Sales and Related Occupations at about 1.5 million employees or 10.3 percent of the total workforce. The smallest category is Farming, Fishing, and Forestry with 31,900 employees or 0.22 percent of the total workforce.

Higher -Educated Occupations

Of great importance to this study are the educational requirements for occupations. An overview of the educational requirements for all occupations of the California economy is shown in Figure 3-2. In 2002, 73.9 percent of all jobs in California required no college degrees (though many of these jobs require other forms of preparation such as on-the-job training, postsecondary vocational education, or previous work experience). Bachelor's degrees provided the largest college-educated qualification for employment, required for 19.1 percent of all occupations. Associate degrees ranked a distant second at 3.8 percent,

followed by occupations requiring masters or professional degrees at 2.9 percent. Only 0.3 percent of occupations in California require doctorate degrees.

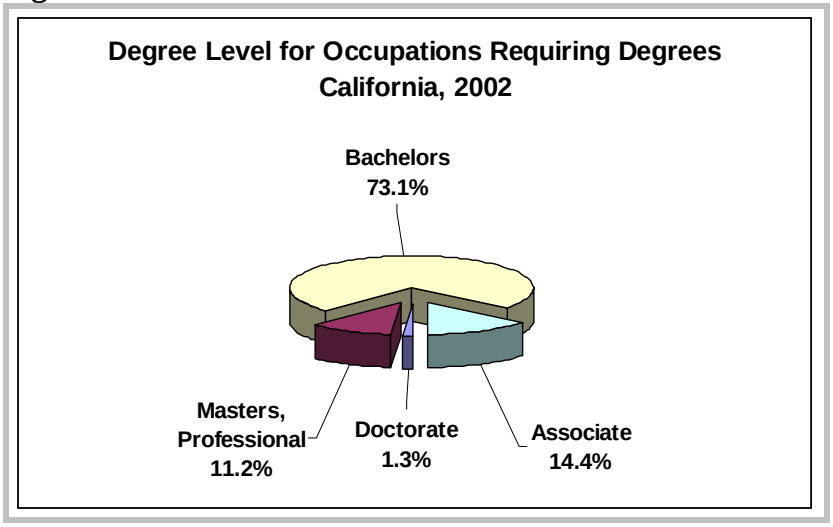
Figure 3-2



Source: California Employment Development Department.
Note that some occupations which do not require degrees do require some post-secondary certificates or on-the-job training.

Another way to look at the occupational data is the distribution of educational requirements for the 36.1 percent of occupations which do require a higher educated degree, which is shown in Figure 3-3. Bachelor's degrees account for 73.1 percent of occupations requiring higher education. Associate degrees account for 14.4 percent, masters and professional degrees 11.2 percent, and doctorates degrees 1.3 percent.

Figure 3-3



Sources: Same as above.

The higher educated workers are concentrated into a relatively few occupations. Figure 3-4 shows the largest occupational categories which require any college degree. The largest single category is the General and Operations Managers with 224,100 employees, or 11.7 percent of occupations requiring a college degree. Registered nurses are second, followed by Elementary School Teachers. (Note that several teaching occupations appear in the table; if all categories of teachers were added together, the total would be about 23 percent of the higher educated workforce. See Figure 3-10 for this level of aggregation.)

Figure 3-4

Largest California Higher Educated Occupations 2002

Detailed Educational Category	*Number*	Percent of Higher Educated Occupations
General and Operations Managers	224,100	11.7%
Registered Nurses	201,600	10.5%
Elementary School Teachers	175,000	9.1%
Business Operations Specialists, All Other	173,300	9.0%
Secondary School Teachers	118,900	6.2%
Accountants and Auditors	108,000	5.6%
Teachers, Primary, Secondary, and Adult, All Other [5]	79,400	4.1%
Computer Software Engineers, Applications	79,100	4.1%
Financial Managers	58,700	3.1%
Lawyers	57,800	3.0%
Computer Support Specialists	57,600	3.0%
Management Analysts	53,300	2.8%
Computer Systems Analysts	52,800	2.8%
Middle School Teachers	52,500	2.7%
Computer Software Engineers, Systems Software	52,100	2.7%
Preschool Teachers	50,400	2.6%
Computer Programmers	48,200	2.5%
Chief Executives	42,400	2.2%
Sales Managers	41,000	2.1%
Recreation Workers	39,900	2.1%
Computer and Information Systems Managers	36,000	1.9%
Property, Real Estate, and Community Association Managers	35,700	1.9%
Electrical and Electronic Engineering Technicians	27,700	1.4%
Paralegals and Legal Assistants	25,200	1.3%
Health Professionals and Technicians, All Other [5]	25,000	1.3%
Total	1,915,700	100.0%

Largest occupations requiring any college degree.
Percentage of this total.

While the figure above shows the occupations which have the highest number and the highest percentage of all higher-educated occupations, it is also valuable to view the occupations in which the highest percentage of employees have degrees. These represent very high concentrations of college educated employees.

Eight major occupational categories have very high concentrations of highly educated workers. Figure 3-5 shows that the highest educated occupational category is the Business and Financial Operations occupations category, where over 89 percent of employees are required to have college degrees. Over 66 percent of employees in seven additional major occupational categories are required to have college degrees as well.

Figure 3-5

Highest Educated Occupations

Major Occupational Category	Percent Requiring College Degree
Business and Financial Operations Occupations	89.2%
Management Occupations	87.8%
Community and Social Services Occupations	85.6%
Computer and Mathematical Occupations	79.9%
Education, Training, and Library Occupations	74.7%
Architecture and Engineering Occupations	69.4%
Life, Physical, and Social Science Occupations	69.3%
Legal Occupations	67.6%
Arts, Design, Entertainment, Sports, and Media Occupations	51.2%
Healthcare Practitioners and Technical Occupations	25.1%
Personal Care and Service Occupations	13.1%
Sales and Related Occupations	4.5%
Transportation and Material Moving Occupations	0.7%

Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
Table contains occupations requiring any college degree, Associate through Doctorate.

For occupations requiring Associate Degrees and Post-Secondary Vocational education, the largest occupation is health care practitioners (includes nurses), with a dominant 39.5% of all occupations requiring this level of education. A wide variety of maintenance, computer services, office support, and other professional occupations also have AA and Vocational educational requirements, as shown in Figure 3-6.

Figure 3-6

Employment by Occupaiton for the Top 45 Occupations Requiring AAs and Postsecondary Vocational Education
Sorted by 2022 Employment

Major Occupational Group	Average Annual Employment			Percent Total Employment			% Growth
	2002	2012	2022	2002	2012	2022	2002-2022
Healthcare Practitioners & Technical	377,100	488,000	598,900	36.35%	38.25%	39.55%	58.82%
Installation, Maintenance, & Repair	141,200	169,400	197,600	13.61%	13.28%	13.05%	39.94%
Computer & Mathematical	94,900	124,300	153,700	9.15%	9.74%	10.15%	61.96%
Office & Administrative Support	107,700	120,000	132,300	10.38%	9.41%	8.74%	22.84%
Architecture & Engineering	94,900	106,800	118,700	9.15%	8.37%	7.84%	25.08%
Personal Care & Service	51,600	67,500	83,400	4.97%	5.29%	5.51%	61.63%
Legal	42,500	52,300	62,100	4.10%	4.10%	4.10%	46.12%
Production	38,700	44,500	50,300	3.73%	3.49%	3.32%	29.97%
Life, Physical, & Social Science	32,900	39,200	45,500	3.17%	3.07%	3.00%	38.30%
Healthcare Support	17,400	22,000	26,600	1.68%	1.72%	1.76%	52.87%
Sales & Related	22,100	22,200	22,300	2.13%	1.74%	1.47%	0.90%
Food Preparation & Serving Related	11,300	13,500	15,700	1.09%	1.06%	1.04%	38.94%
Arts, Design, Entertainment, Sports, & Media	5,200	6,200	7,200	0.50%	0.49%	0.48%	38.46%
Total Employment	1,037,500	1,275,900	1,514,300	100.00%	100.00%	100.00%	45.96%

Sacramento State Applied Research Center, October 2005
Data Sources: California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012*
Note: Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

This occupational distribution has been fairly stable over time, with the largest increases in relative share in Computer & Mathematical, Healthcare, and Healthcare Support; and relative declines in Sales, Office, Administrative Support, and Architecture & Engineering.

It is difficult to provide historical time-series comparisons for this analysis on occupations. The definitions of detailed occupations have changed substantially over the past decade, and the surveyed employers have changed the educational specifications of many existing occupations. Attempts to describe the changes over recent decades would be more influenced in changing data definitions than actual changes in occupational composition.

Fortunately, the BLS and EDD have projected the occupational composition for California to the year 2012 using a methodology which allows the tracking of occupations requiring college degrees and their industry sectors. The BLS/EDD occupational data and projected changes are discussed in the following section and in detail in the chapter on Research Methods (Appendix A).

Future Changes in Demand for a Higher Educated Workforce in California

The section to follow addresses two views of the changing demand for educated workers in California over the period 2002 to 2022. The first view is the net workforce change resulting from overall growth and economic restructuring. The second view includes the additional workforce demands which will result from separations, that is, replacement demand due to retirement of existing higher educated workers as the baby boomers reach retirement age.

Based on linear projections, the distribution of demand for specific higher educated occupations will change very little between 2002 and 2022. All but three occupations remain in the top higher educated occupations over this term. Those occupations which will drop out of the top higher educated occupations in 2022 include Educational, Vocational, and School Counselors; Electrical Engineers; and Mechanical Engineers. Replacing these occupations will be demand for Network Systems and Data Communications Specialists; Pharmacists; and Elementary and Secondary Education Administrators.

Net Workforce Demand from Growth and Restructuring

The following several figures estimate the potential demand for a higher educated workforce based on projections on the EDD *California Occupational Projections 2002 – 2012*, and our extension of this data to 2022. Figure 3-7 shows the average annual employment and growth rates by level of education for 2002 and 2022. Looking at sheer numbers, occupations requiring a bachelor's degree constitute the greatest bulk of total demand for higher educated occupations. At the same time, occupations requiring a bachelor's degree are projected to have the slowest growth rate between 2002 and 2022, growing 46.2 percent. The greatest percent growth in higher educated occupations is expected in occupations requiring doctorate degrees (73.1 percent), followed by associate degrees (52.8 percent), and masters or professional degrees (50.2 percent). In total, occupations requiring higher education are expected to grow 47.9 percent between 2002 and 2022, which is faster than growth in both occupations requiring less than a higher education and in total employment.

Figure 3-7

Change in Employment by Level of Education, 2002 - 2022

Type of Degree	Average Annual Employment		Growth: 2002 to 2022	
	2002	2022	Absolute	Percent
Associates Degrees	545,200	832,800	287,600	52.75%
Bachelor's Degrees	2,759,200	4,033,200	1,274,000	46.17%
Master's & Professional Degrees	422,400	634,400	212,000	50.19%
Doctorate Degrees	47,900	82,900	35,000	73.07%
Total HE Employment	3,774,700	5,583,300	1,808,600	47.91%
Total <HE Employment	10,683,100	14,257,900	3,574,800	33.46%
Total Employment	14,457,800	19,841,200	5,383,400	37.24%

CSUS Applied Research Center, August 2005
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
NOTE: Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

Between 2002 and 2022, all higher educated occupations are expected to grow 7.8 percent and total employment in occupations requiring less than a higher education expected to decline by 2.8 percent (Figure 3-8). Despite the low growth in employment of occupations requiring less than a college education, this segment of workforce demand remains the largest, comprising 74 percent in 2002 and 72 percent in 2022. Regardless, it is a declining percentage, indicating that California's total workforce is expected to become more educated.

Figure 3-8
Composition of California's Workforce by Level of Education

Degree Type	% California Work Force 2002	% California Work Force 2022	Growth: 2002 to 2022 Absolute	Growth: 2002 to 2022 Percent
Associates Degrees	3.77%	4.20%	0.43%	11.31%
Bachelor's Degrees	19.08%	20.33%	1.24%	6.51%
Master's & Professional Degrees	2.92%	3.20%	0.28%	9.44%
Doctorate Degrees	0.33%	0.42%	0.09%	26.11%
Total HE Employment	26.11%	28.14%	2.03%	7.78%
Total <HE Employment	73.89%	71.86%	-2.03%	-2.75%
Total Employment	100.00%	100.00%	- - -	- - -

CSUS Applied Research Center, August 2005
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
NOTE: Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

.

Gross Demand for Higher Educated Workers including Replacement Demand

The next section shows the gross increase in workforce demand expected to arise from both general growth in industry and from workforce separations. Workforce separations occur when people retire from working in an occupation permanently, that is they may leave an occupation for another occupation, or retire from working altogether. BLS/EDD data does not factor separations directly into their occupational projections, but do provide estimates of the number of separations. Figure 3-9 shows both growth and separations to isolate the share of workforce demand not filled by incumbent employees, but which represent total job openings for new occupational entrants.

Figure 3-9
Workforce Demand by Level of Education:
Growth and Replacement, 2002 to 2022

Degree Type	2002 to 2022 Absolute Growth	2002 to 2022 WF Separations	Total Demand Growth & Replacement
Associates Degrees	287,600	204,400	492,000
Bachelor's Degrees	1,274,000	1,021,800	2,295,800
Master's & Professional Degrees	212,000	165,200	377,200
Doctorate Degrees	35,000	20,400	55,400
Total HE Employment	1,808,600	1,411,800	3,220,400
Total <HE Employment	3,574,800	5,521,600	9,096,400
Total Employment	5,383,400	6,933,400	12,316,800

CSUS Applied Research Center, August 2005
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
NOTE: Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

Occupations requiring higher education are expected to have separations equaling 70 to 80 percent of net growth, with the exception of demand for occupations requiring doctorate degrees (58 percent of net growth).

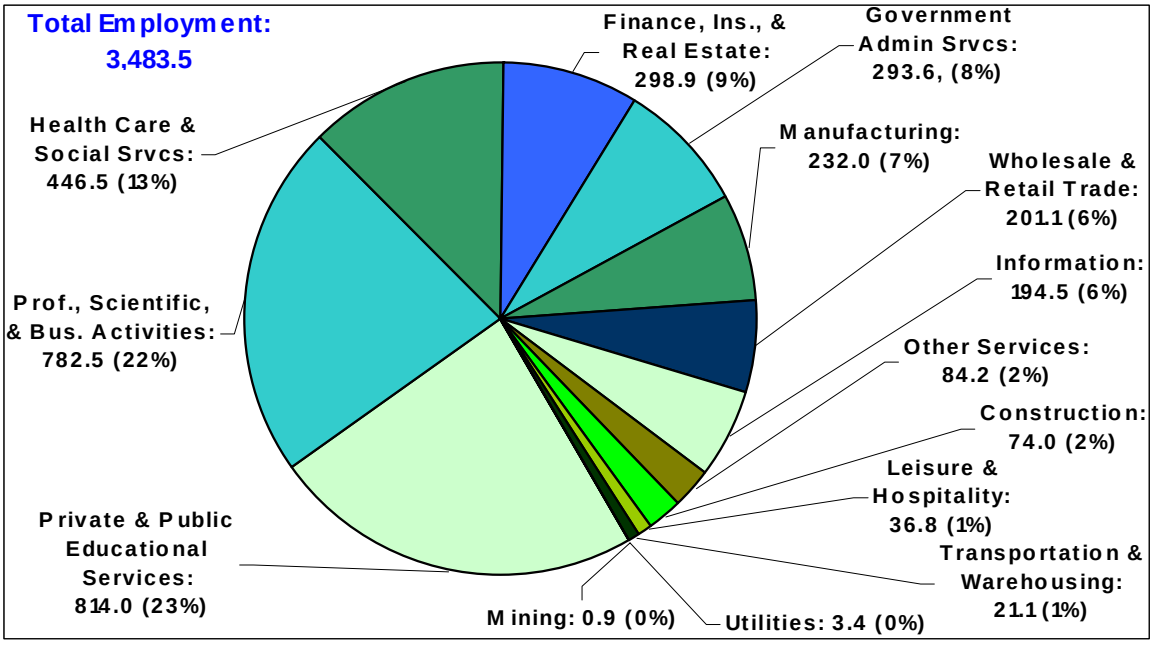
Projected Industry Shares of Higher Educated Workforce in 2022

The previous discussion described the educational requirements for occupations, but the ultimate effects of these changes will fall upon specific California industries. In the following section, employment by occupation is converted into employment by industries to show which industries will be affected most by occupational changes in the higher educated workforce. (This analysis is based on our 39+5 higher educated workforce analysis that is described in detail in Appendix B on Research Methods.)

Figure 3-10 shows that three industry sectors will employ most of the higher educated occupations in 2022: Education (23%), Professional, Scientific, and Business Activities (22%), and Health Care and Social Services (13%). These three sectors combined will employ approximately 58 percent of all higher educated employees, and will absorb most of the effects of deficiencies in the education process in providing the higher educated workforce required in California's future.

Smaller users of higher educated occupations include the following industries: Finance; Government; Manufacturing (including technology manufacturing); and Trade. However, these industries are not the fastest growing sectors or the largest users of college-educated employees, and will be less vulnerable to deficiencies in California's education process.

Figure 3-10
Projections of 2022 Industry Composition of the Higher Educated Workforce



Sacramento State Applied Research Center, September 2005. Data Source: California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012.* Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change. Note: Based on the 39+5 higher educated workforce analysis.

The current and projected industry demand for Associate and Vocational education is shown in Figure 3-11. Of the approximately 1.5 million positions which will require this level of education by 2022, about 57 % are in just two industry sectors, Healthcare with 36.8% of the total, and Professional, Scientific, & Technical Services with 19.7%. The third largest category, Wholesale & Retail Trade, has only 6.5% of the demand, a small percentage of these two industry leaders.

Figure 3-11

Industry Employment for Occupations Requiring AA Degree or Vocational Education

Industry Employment for the Top 45 Occupations Requiring AAs and Postsecondary Vocational Education
Sorted by 2022 Employment

	Average Annual Employment			Percent Total Employment			% Growth
Industry Sector	2002	2012	2022	2002	2012	2022	2002-2022
Healthcare & Social Assistance	357,200	457,300	557,400	34.43%	35.84%	36.81%	56.05%
Professional, Scientific, & Tech. Services	223,500	261,100	298,700	21.54%	20.46%	19.73%	33.65%
Wholesale & Retail Trade	66,300	82,400	98,500	6.39%	6.46%	6.50%	48.57%
Other Services (except Public Administration)	66,200	77,400	88,600	6.38%	6.07%	5.85%	33.84%
Admin, Support, Waste Mgmt, & Remediation Srvcs	49,400	68,200	87,000	4.76%	5.35%	5.75%	76.11%
Manufacturing	72,300	79,100	85,900	6.97%	6.20%	5.67%	18.81%
Government (Public Administration)	67,700	76,100	84,500	6.53%	5.96%	5.58%	24.82%
Arts, Entertainment, & Recreation	23,200	34,700	46,200	2.24%	2.72%	3.05%	99.14%
Management of Companies & Enterprises	24,400	30,100	35,800	2.35%	2.36%	2.36%	46.72%
Educational Services	20,800	25,900	31,000	2.00%	2.03%	2.05%	49.04%
Information	17,600	23,300	29,000	1.70%	1.83%	1.92%	64.77%
Construction	11,800	14,800	17,800	1.14%	1.16%	1.18%	50.85%
Accommodation & Food Services	11,400	13,700	16,000	1.10%	1.07%	1.06%	40.35%
Real Estate, Rental, & Leasing	9,200	11,800	14,400	0.89%	0.92%	0.95%	56.52%
Transportation & Warehousing	7,900	9,900	11,900	0.76%	0.78%	0.79%	50.63%
Finance & Insurance	7,700	9,200	10,700	0.74%	0.72%	0.71%	38.96%
Natural Resources and Mining	600	600	600	0.06%	0.05%	0.04%	0.00%
Utilities	300	300	300	0.03%	0.02%	0.02%	0.00%
Total Employment	1,037,500	1,275,900	1,514,300	100.00%	100.00%	100.00%	45.96%

Note that this data is for employees whose position requires postsecondary education. There may be many more employees in these industries that may have postsecondary education, but it is not required by employers for their positions. This is a result of the BLS/EDD database used throughout this report, which is based on employer surveys, and very few of all occupations (only about 3.8% of the workforce) specifically require AA degrees or vocational certificates.

Economic Impacts of Higher Educated Scenarios

Previous sections of this study have reported on the changes in industry and occupational structure of the California economy and projections of future demands for a higher educated workforce. This section will provide a quantitative analysis of the economic impacts of changes in population and workforce educational attainment for three scenarios of the year 2022.

The scenarios used here were developed by the UC Berkeley Survey Research Center as part of their report, "*Return on Investment: Educational Choices and Demographic Change in California's Future*." The higher education attainment scenarios were developed as a component of their long-range projections of California's population. Their methodology included a number of disaggregations of demographic components, one of which was educational attainment. Three scenarios of the changes in educational attainment were tested, based on assumptions about the higher education system itself, and on educational successes of a number of population segments. The three scenarios used in our economic impact analysis are (1) the Fixed Capacity scenario of the education system; (2) the Increased College-Going scenario of population segments; and (3) the Increased College Completion scenario based on increase college-going and degree attainment. The data obtained from these scenarios allowed us to test the economic implications of educational attainment.

Impact Models of California's Economic Structure

Models of the California Economic Structure

In order to assess the economic impacts of the educational attainment scenarios, a base-case estimate of the structure of California's economy in 2022 is required. Two estimates of California's economic structure in 2022 were generated for this purpose. One model is based on the BLS/EDD projections, which is employment data rather than industry data. The other model, the UCLA Anderson Forecast model, is reported by industry sector rather than employment. It is our view that by using two models derived from different perspectives we can arrive at two realistic, but different estimates of the economic impacts of the higher educated workforce and its effect on the California economy.

The BLS/EDD model is based on detailed occupational/employment data that is organized according to the Standard Occupational Classification (SOC) and derived from employer survey data. The advantage of using BLS/EDD data is that it contains educational qualifications for occupational categories, which allowed identification of the occupations requiring higher education. The BLS/EDD 2022 model used in this report was developed from EDD's *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix, 2002-2012* tables. Since IMPLAN requires inputs based on industry structure, it was necessary to translate the EDD data obtained from the *Occupational Projections* table into industries, which was accomplished using the *Industry-Occupation Matrix*.

The UCLA Anderson Forecast model is reported by industry structure, not occupational structure. It gives the more familiar industry structure explicitly, and was converted to the IMPLAN industry categories directly using the *2001 IMPLAN Sectoring Scheme for NAICS* by the Minnesota IMPLAN Group.

(For a detailed discussion on the base-case models (BLS/EDD and UCLA), occupation selection for the "higher educated workforce" analysis, industry conversions, and the IMPLAN econometric program and definition of economic outputs, please see Appendix A on Research Methods.)

Comparing the economic structures of the two base-case models of the California economy in 2022 (Figure 4-1 below) shows that the two models give slightly different outcomes about internal structure of industry sectors. The UCLA model predicts higher levels of economic activity in both Total Output and Value Added, but a lower number of employees, than the EDD model. Thus the UCLA model indicates an overall workforce with a higher level of productivity, and assumedly, education.

Figure 4-1

Base-Case Assumptions for the California Economy in 2022

Indicator	2022 California Economy		2022 Economic Contribution of the Higher Educated Workforce	
	BLS/EDD Model	UCLA Forecast Model	BLS/EDD Model	UCLA Forecast Model
Total Output	$ 2,842,904,751,648	$ 3,171,846,291,456	$ 582,065,502,738	$ 546,774,117,888
Value Added	$ 1,732,624,354,176	$ 1,914,358,556,672	$ 370,942,767,385	$ 333,309,816,064
Employment	36,264,069	29,068,683	4,749,626	4,956,607

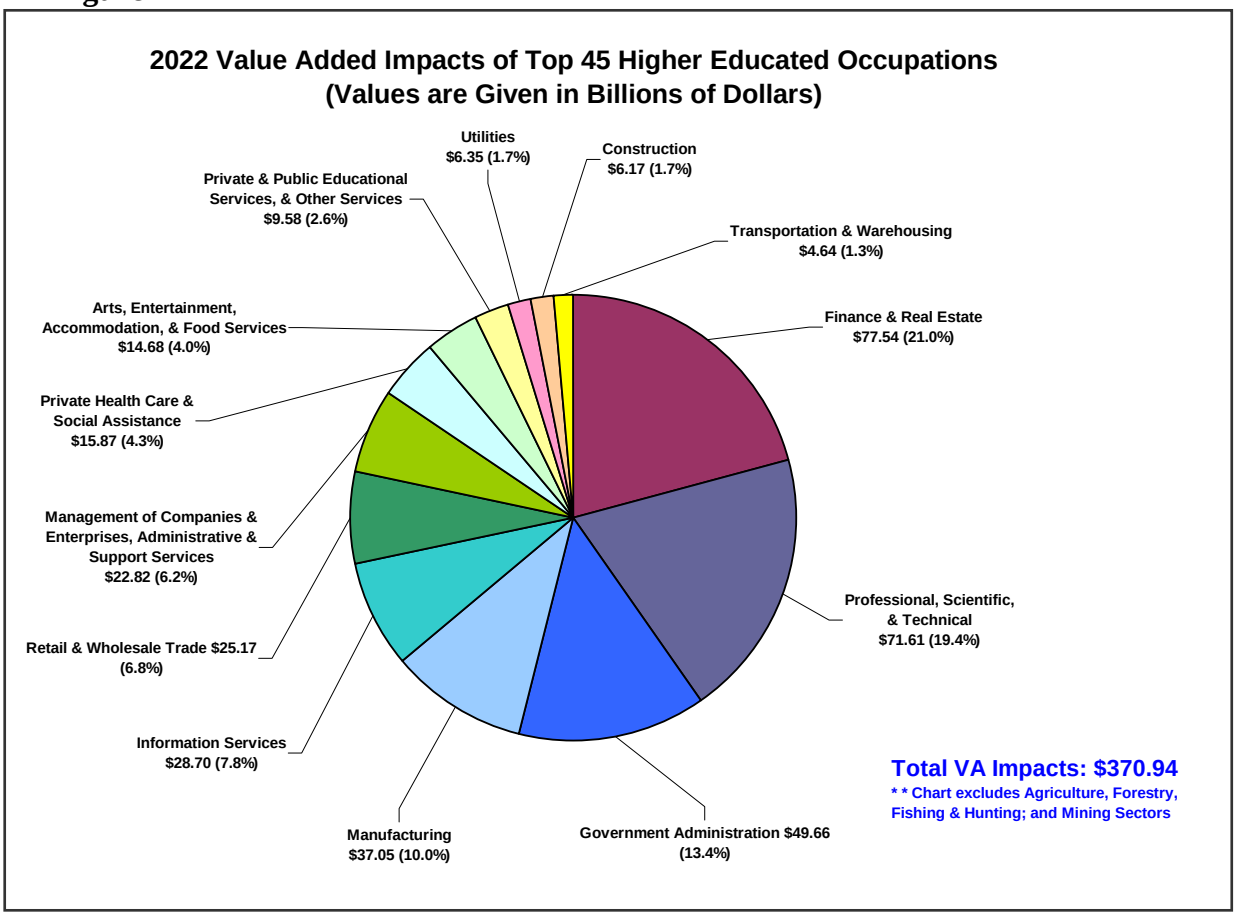
Sacramento State Applied Research Center
Data Sources: IMPLAN Professional 2.0 (using 2002 econometric coefficients) and *2001 IMPLAN Sectoring Scheme for NAICS*; California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012*; UCLA Anderson Forecasts for 2022

On the other hand, the economic impacts of the higher educated workforce (our 39+5 analysis) in the right columns of the table are lower in the UCLA model than for the BLS/EDD model. In order to reconcile this with the economic description in the left columns of the table, based on total economic structure, one would have to assume that the UCLA model infers a broader dispersion of productivity into new occupations or industries not as dependent on higher education (and therefore not in our 39+5 occupations chosen for analysis).

The Economic Value of the Higher Educated Employees in California

The economic impacts of the higher educated employment are illustrated in Figure 4-2. These impacts are estimated using the IMPLAN input-output econometric model which shows how value created on one sector of the economy affects other sectors which supply it with goods and services, and also includes the impact of consumer spending by employees of these sectors.

Figure 4-2



The higher educated employees projected for the California economy in 2022 will create a total value added (increase in value above the value of inputs) of $370.94 billion per year. Note that the Figure 4-2 value added graph is quite different by sector than the higher educated employee graph in Figure 3-10. Higher educated employees create different value in different industry sectors. They create higher value in occupations where their salaries are higher, where they are provided with a more capital-intensive work process, where their industry of employment creates higher-valued products, where a larger number of firms are involved in providing the inputs of goods and services for the product, and where a high percentage of the inputs are created here in California.

These are fundamentals of economic linkages and economic multipliers which determine the high productivity and value of the California economy.

The highest value is created in Finance & Real Estate sector ($77.5 billion, 21% of the total); Professional, Scientific, & Technical ($71.6 billion, 19%); Government Administrative ($49.6 billion, 13%); and Manufacturing ($37 billion, 10%). These are the industries in which a relatively small but highly educated percentage of the workforce is creating the highest value for the California economy.

Note that the educational sector does not directly produce a high value, only about $9.56 billion, or 3% of the total. The value created by education is not realized within the education sector itself but is created when the educated employees apply their knowledge in economic sectors which use the knowledge to create value, which is the overall concept of this study. In fact, the entire value shown in the table is created by the education sector through the productivity of their graduates.

Economic Impacts of the Higher Educational Attainment Scenarios

The University of California Survey Research Center's scenarios describe the effects of population education attainment on a number of fiscal and social outcomes. Our contribution here is to use the scenarios to show the economic impacts created in the California economy for various levels of workforce educational attainment.

Since the Survey Research Center's outputs are for population education attainment, and our economic analysis is based on workforce educational composition, we had to make an assumption about the long-term relationship between population and workforce levels of educational attainment.

Our approach was to compare each of the three scenarios to our base-case higher educated workforce models, which we equated to the Survey Research Center's "Current Conditions" scenario. The Fixed Capacity, Increased College-Going, and Increased College Completions scenarios were then compared to the base-case workforce scenarios to measure the relative economic impacts of the three scenarios.

It is not clear from available data sources how the population and workforce educational attainment relationships are changing over time. Attempts to measure the trend of changes in these relationships are not productive because of the short time series during which there is consistent data for comparing these two measures. Census educational attainment data on the population has been modified from years of education to specific degree attainment and shows apparent misspecification of the population-derived data. The BLS occupational definitions have been frequently redefined due to changing employer expectations, occupational definitions, and the Standard Industrial Classification (SIC) to NAICS industry composition change.

The levels of population education attainment implied by the Survey Research Center's scenarios are shown in Figure 4-3 below. According to the Current Conditions base-case scenario, 31.8 percent of the population is expected to have bachelor's degrees or higher under this scenario, and 20.1 percent of the population is expected to have associate degrees or at least one year of college completed. The Fixed Capacity scenario shows lower levels of both degree sectors, while the Increased College-Going scenario shows a higher level of both degree sectors. The Increased College Competitions scenario shows a sharp increase in the percent of population with bachelor's degrees or higher, but a decrease in the percent with associate degrees or at least one year of college completed.

Figure 4-3

Educational Attainment of California's Population, 2022				
Educational Attainment	**Fixed Capacity**	**Current Conditions**	**Increased College-Going**	**Increased College Completions**
BA +	31.14	31.80	32.02	36.05
AA & Some College	19.21	20.50	21.10	17.60

Sacramento State Applied Research Center
Data Source: UC Berkeley Survey Research Center, Statewide Educational Attainment Scenarios

Figure 4-4 shows how these levels of attainment convert to changes from the Current Condition base-case. The Fixed Capacity scenario shows a decline of 2.09 percent in holders of bachelor's degrees or higher and a decline of 6.31 percent in holders of AA+/- degrees. By contrast, the Increased College Completions scenario shows an increase (over the Current Condition base-case) of 13.38 percent in holders of BA+ degrees, but a decline of 14.15 percent in holders of AA+/- degrees.

Figure 4-4

Percent Change in Educational Attainment from "Current Conditions" Scenario, 2022				
Educational Attainment	**Fixed Capacity**	**Current Conditions**	**Increased College-Going**	**Increased College Completions**
BA +	-2.09%	0.00	0.69%	13.38%
AA & Some College	-6.31%	0.00	2.93%	-14.15%

Sacramento State Applied Research Center
Data Source: UC Berkeley Survey Research Center, Statewide Educational Attainment Scenarios

These changes in population educational attainment were converted to workforce educational attainment by externally changing the underlying higher educated workforce employment numbers in 2022 for both BLS/EDD and UCLA base-case model parameters. Thus, employment in our 39+5 higher educated workforce aggregates (both BLS/EDD and UCLA models) were increased or decreased according to the scenario changes in Figure 4-3.

Results of the Economic Impact Analysis

The results of the economic impact analyses are discussed below. In each case, the basis for analysis was the knowledge-intensive economic sectors of the California economy, defined by our 39+5 higher educated workforce aggregate, or the industry sectors that contain the highest concentration or occupations requiring higher education.

Figure 4-5 shows the relative impacts of the three scenarios of workforce educational attainment compared to the Current Conditions base-case scenario, our BLS/EDD model.

Figure 4-5

Economic Impacts of Higher Education Scenarios using the BLS/EDD Base-Case Model

Economic Measure (Dollars in Billions)	Economic Impacts of Higher Education Attainment Scenarios in 2022			
	Higher Educated Workforce (BLS/EDD Base-Case Scenario)	Fixed Capacity	Increased College-Going	Increased College Completions
Total Output	$582.066	-$14.861	$5.461	$60.224
Value Added (Gross State Product)	$370.943	-$9.432	$3.462	$38.623
State & Local Taxes	$35.373	-$0.873	$0.316	$3.858
Employment	4,749,626	-126,432	47,295	457,669

Sacramento State Applied Research Center

All data in this table are imputed to the higher-educated workforce, not the total economy. The shaded column is the base-case scenario, based on the BLS/EDD forecast previously discussed. The other columns are scenarios of economic impact of the higher-educated population based on assumptions about the growth of the higher-educated labor force.

Data Sources: IMPLAN Professional 2.0 (using 2002 econometric coefficients) and *2001 IMPLAN Sectoring Scheme for NAICS*; California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012*; UC Berkeley Survey Research Center, Statewide Educational Attainment Scenarios. Analysis is based on the 45 largest higher educated occupations. Model estimates of state and local taxes are based on current tax structure and include corporate and personal taxes.

The estimated impacts for the base-case educational attainment scenario show that the higher educated workforce in 2022 would generate $582.1 billion in total business revenues, contribute $370.9 billion to the Gross State Product (GSP), add $35.4 billion in state and local taxes, and create 4.750 million jobs.

The impacts for the Fixed Capacity scenario are reduced for all measures of economic activity. Total output (business revenues) decreases by $14.9 billion relative to the base-case scenario, GSP decreases by $9.4 billion, state and local tax revenues decrease by $873 million, and employment decreases by 126,400.

The Increased College-Going scenario increases all measures of economic activity somewhat above the base-case. Total output (business revenues) increases by $5.5 billion, GSP increases by $3.5 billion, and employment increases by 47.3 thousand. State and local tax generation increases by $316 million.

The Increased Completions scenario creates very large increases in all economic measures. Total output (business revenues) increases by over $60 billion. Gross State Product increases by nearly $39 billion. Employment increases by almost 458 thousand and state and local tax revenues increase by $3.9 billion.

Figure 4-6 shows the relative impacts of the three scenarios of workforce educational attainment compared to the UCLA base-case model. The scenario analysis using the UCLA model for 2022 results in only marginally different outcomes from the BLS/EDD model.

Figure 4-6

Economic Impacts of Higher Education Scenarios using the UCLA Base-Case Model

Economic Measure (Dollars in Billions)	Economic Impacts of Higher Education Attainment Scenarios in 2022			
	Higher Educated Workforce (UCLA Base-Case Scenario)	Fixed Capacity	Increased College-Going	Increased College Completions
Total Output	$546.77	-$13.73	$5.01	$58.06
Value Added (Gross State Product)	$333.31	-$8.39	$3.06	$35.27
State & Local Taxes	$31.336	-$0.770	$0.278	$3.436
Employment	4,956,607	-130,606	48,651	486,274

Sacramento State Applied Research Center
Data Sources: IMPLAN Professional 2.0 (using 2002 econometric coefficients) and *2001 IMPLAN Sectoring Scheme for NAICS*; California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012*; UCLA Anderson Forecast for 2022. Analysis is based on the 45 largest higher educated occupations. Model estimates of state and local taxes are based on current tax structure and include corporate and personal taxes.

The UCLA base-case model shows that the knowledge-intensive sectors of the economy will generate approximately $546.8 billion in total output (business revenues), $333.3 billion in GSP, $31.3 billion in state and local tax revenues, and slightly under 5 million jobs.

The Fixed Capacity scenario reduces the economic measures relative to the base-case scenario by $13.7 billion in total output (business revenues), $8.39 billion in GSP, $770 million in tax revenues, and a loss of 130,606 jobs.

The Increased College-Going scenario creates increases of $5 billion in total output (business revenues), $3.1 billion in GSP, $278 million in tax revenues, and 48,651 more jobs compared to the base-case scenario.

The Increased Completions scenario shows the highest level of increases in all economic measures compared to the base-case scenario. This includes $58.1 billion more in total output (business Revenues), $35.3 billion in GSP, $3.4 billion in tax revenues, and 486,274 more jobs.

Using two different forecast/projection models for evaluating the impacts of the educational attainment scenarios allows us to cross-check the validity of the different approaches to the models – in this case, one model based on occupations/employment

(BLS/EDD) and one based on industry output (UCLA). Figure 4-7 shows the differences in impacts resulting from the two models. On average, the overall simple differences average 6.0%, with the highest differences in the tax impacts and value added impacts, and the lowest differences in the employment impacts. The differences are relatively small given differences in model sources (BLS/EDD and UCLA) and measurement of inputs (occupation/employment and industry output), and they are well within accepted variation. In deference to the relative appropriateness of the data of origin, it is better to focus on the BLS/EDD projection model, which will be the only one cited elsewhere in this report.

Figure 4-7

Differences in Impacts between UCLA and BLS/EDD Projection Models

Scenario	Economic Impact Measures			
	Total Output	Value Added	State/Local Taxes	Employment
Current Condition	-6.1%	-10.1%	-11.4%	4.4%
Fixed Capacity	-7.6%	-11.1%	-11.7%	3.3%
Increased College-Going	-8.3%	-11.5%	-12.0%	2.9%
Increased College Completion	-3.6%	-8.7%	-10.9%	6.3%
Average	-6.4%	-10.4%	-11.5%	4.2%

Summary of the Results

The results of the scenario analysis summarized in Figure 4-8 show that there are great economic consequences of differences in educational attainment of California's future workforce. Not shown in Figure 4-7, but summarized here, are the impacts for the "Current Condition" base-case scenario for 2022, which estimate that the higher-educated workforce will create a total impact on business revenues of around $582 billion, a contribution to Gross State Product of around $371 billion, contribute $35.4 billion in state and local tax revenues, and generate around 4.75 million jobs for the California economy.

Figure 4-8

Economic Impacts of the Higher Education Attainment Scenarios

Economic Measure (Dollars in Billions)	Summary of Results		
	Fixed Capacity	Increased College-Going	Increased College Completions
Total Output	-$14.861	$5.461	$60.224
Value Added (Gross State Product)	-$9.432	$3.462	$38.623
State & Local Taxes	-$0.873	$0.316	$3.858
Employment	-126,432	47,295	457,669

Sacramento State Applied Research Center
Data Sources: IMPLAN Professional 2.0 (using 2002 econometric coefficients) and *2001 IMPLAN Sectoring Scheme for NAICS*; California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012*; UC Berkeley Survey Research Center, Statewide Educational Attainment Scenarios. Analysis is based on the 45 largest higher educated occupations. Model estimates of state and local taxes are based on current tax structure and include corporate and personal taxes.

The assumption of a Fixed Capacity higher education system lowers the economic impact of the higher-educated workforce considerably, creating decreases in all economic measures, including a decrease in total output (business revenues) by almost $15 billion per year; a decrease in GSP by about $9.4 billion; a decrease in state and local tax revenue generation by about $873 million, and decreasing employment by about 126,432.

By contrast, the Increased Completions scenario shows increases in all economic measures over the base-case scenario, increasing total output by $60 billion, GSP by $38.6 billion, state and local tax revenue by $3.9 billion, and employment by 457,669 per year.

International and National Comparisons of Educational Attainment

Modern economic, technological, and social changes are increasing the need for a workforce with higher levels of educational preparation. With the rise of information and communications technology over the last half of the twentieth century, and specifically the 1990s, industrial and production work are declining in importance and being replaced by knowledge based information and service work (Klotz 2). The shift away from industrial and production work toward knowledge based information and service work is fundamentally changing the composition of the economy, the types of occupations demanded by the economy, and the level of workforce skills needed to fill the occupations in demand. In an economy dominated by knowledge based information services, economic value is created from the application of knowledge and intellectual content, which requires a workforce capable of working with intangible systems and the "ability to understand information, react to it, manage it and use it…" (Klotz 3-4). Furthermore, the evolving nature of knowledge based services touches across industry sectors, where changing production systems are becoming more computerized and inclined toward systems and processes that rely heavily on information and its dissemination. It is evident the future will demand an educated workforce, which will be paramount to our ability to remain competitive in the global economy.

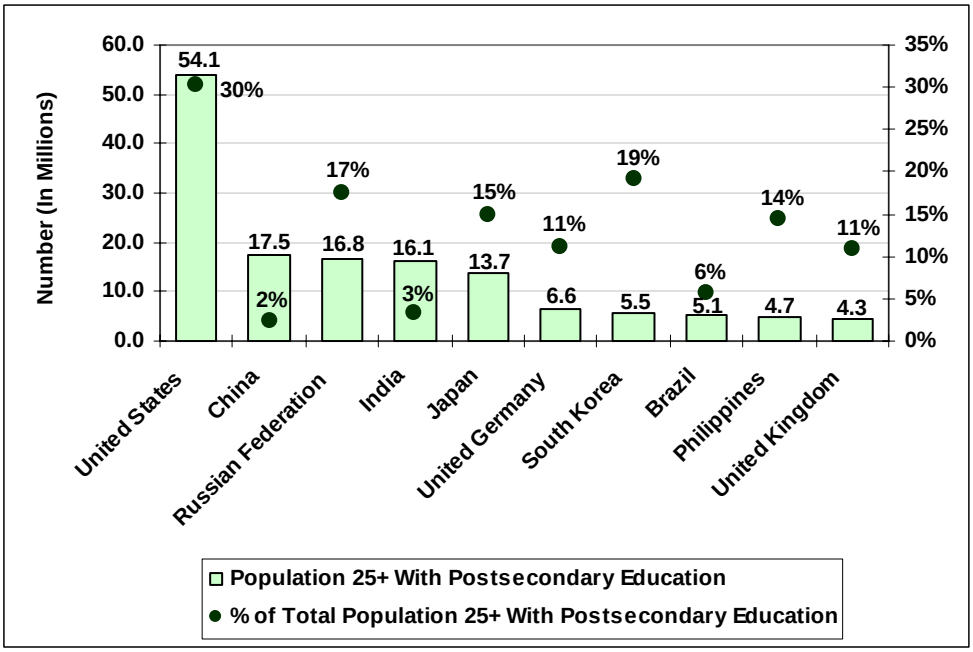
Overview of Current Educational Attainment

International Comparisons

California and the United States are not alone in these emerging economic and social trends. Every industrialized country also faces similar workforce issues with respect to the changing economic conditions of the twenty-first century. The purpose of this section is to provide an international, comparative context for evaluating the postsecondary educational attainment of the United States. However, it is important to note that because countries differ in their postsecondary education systems and types of degrees offered, the descriptive label "postsecondary" is used to reference those having completed a degree beyond secondary education in their respective countries. This label has a slightly different and more generalized meaning than the label "higher educated" used throughout this report to reference those with a bachelor's degree or higher.

Figure A-1 shows the projected, top-ten educated countries in 2000 using data from the Center for International Development (CID) at Harvard University (Barro and Lee). The dataset uses the perpetual inventory method in estimating postsecondary educational attainment using census and survey data from the United Nations Educational, Scientific and Cultural Organization (UNESCO) and other sources as benchmark stocks and new school enrollments as flows added with suitable time-lags on 138 countries worldwide (Barro and Lee 3). Though most of the data provided in the dataset are estimates, data for the year 2000 are projections. Not included in this analysis were countries reporting only partial data and for whom no projections for 2000 were provided.

Figure A-1
Top Ten Educated Countries in 2000
Number and percent of population 25+ years of age with postsecondary education (in millions).

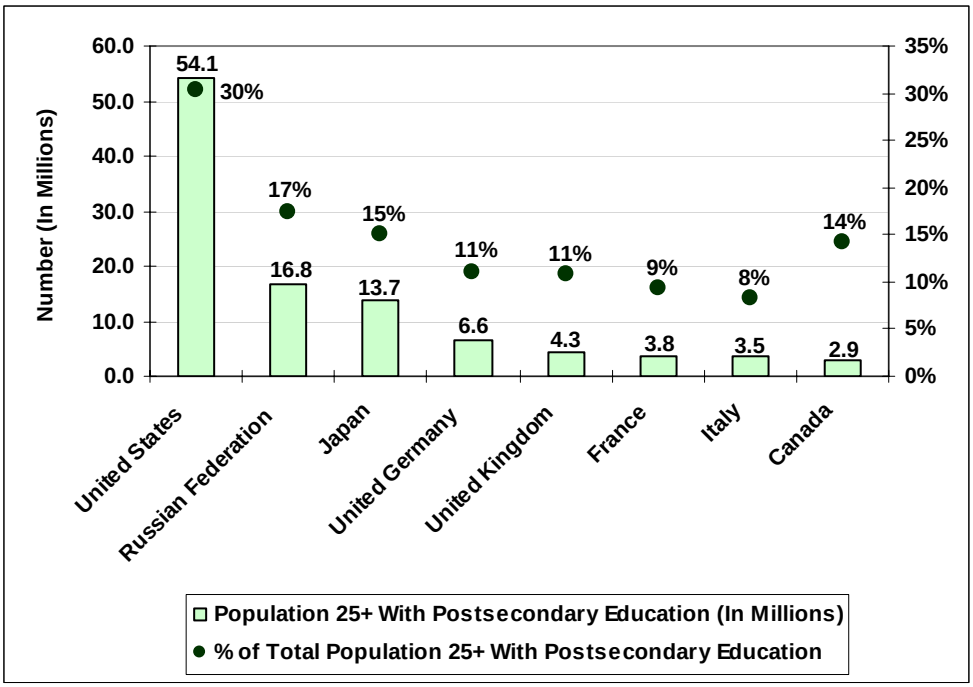


CSUS Applied Research Center, July 2005
Data Source: Center for International Development, Research Datasets, "International Data on Educational Attainment: Updates and Implications"

Figure A-1 shows that the United States ranks first in both the number and percent of total population age 25 and older that hold postsecondary degrees. About 54 million people in the U.S. were estimated to have postsecondary degrees in 2000, which constitutes 30.3 percent of the total population age 25 and older. China is second to the U.S. in terms of absolute numbers of postsecondary educated people with approximately 18 million people projected to have postsecondary degrees in 2000; though China ranks lowest among the top ten educated countries in percent of the total population to hold postsecondary degrees. South Korea ranks second to the U.S. in terms of percentage, with 19.1 percent of its total population holding postsecondary degrees.

Figure A-2 illustrates the same information as the previous figure, but compares the "Group of Eight" (or "G8") most industrialized countries: Canada, France, Japan, Italy, the Russian Federation, United Germany, United Kingdom, and the United States.

Figure A-2
Postsecondary Education of G8 Countries in 2000
Number and percent of population 25+ years of age with postsecondary education (in millions).



CSUS Applied Research Center, July 2005
Data Source: Center for International Development, Research Datasets, "International Data on Educational Attainment: Updates and Implications"

Again, the United States ranks first in both the number and percent of total population 25 and older that have postsecondary degrees. In most cases, the percentage of the total population that have postsecondary degrees is more than twice as high in the U.S. than any other major industrialized country. In absolute numbers, the U.S. has 3 to 18 times the number of postsecondary educated people than other G8 industrialized countries.

Figure A-3 shows the top 20 countries sorted by their percent share of the world's postsecondary educated population. In this case, the "world" consists of only those countries included in the CID dataset with projections for 2000. Yet again - but not surprising given the previous analysis - the United States ranks first in percent share of the world's population with postsecondary education, with 25.5 percent, which is considerably higher than any other country reported in the dataset. However, since the dataset partially uses census data in constructing its estimates and projections, it is important to remember that this percentage does not indicate an entirely native postsecondary educated population, but also includes educated immigrants from other countries that have migrated to the U.S.

Figure A-3

Top 20 Countries by World Share* of Educated Population

Top 20 Countries in 2000 by Percent of World Share of Postsecondary Educated Population, 25+ Years of Age

Rank	Country	Population 25+	Pop. 25+ with Postsec. Educ.	% Total Pop. 25+ with Postsec. Educ.	% World Pop. 25+ with Postsec. Educ.
1	United States	178,443,000	54,068,229	30.3%	25.5%
2	China	761,566,000	17,516,018	2.3%	8.3%
3	Russian Federation	96,348,000	16,764,552	17.4%	7.9%
4	India	487,730,000	16,095,090	3.3%	7.6%
5	Japan	91,033,000	13,654,950	15.0%	6.4%
6	United Germany	59,944,000	6,593,840	11.0%	3.1%
7	South Korea	28,989,000	5,536,899	19.1%	2.6%
8	Brazil	89,021,000	5,074,197	5.7%	2.4%
9	Philippines	32,596,000	4,693,824	14.4%	2.2%
10	United Kingdom	40,211,000	4,342,788	10.8%	2.0%
11	Thailand	34,017,000	3,809,904	11.2%	1.8%
12	France	40,157,000	3,774,758	9.4%	1.8%
13	Italy	42,189,000	3,501,687	8.3%	1.7%
14	Mexico	47,996,000	3,167,736	6.6%	1.5%
15	Canada	20,613,000	2,947,659	14.3%	1.4%
16	Egypt	30,969,000	2,911,086	9.4%	1.4%
17	Spain	28,237,000	2,597,804	9.2%	1.2%
18	Argentina	20,012,000	2,381,428	11.9%	1.1%
19	Poland	24,307,000	2,333,472	9.6%	1.1%
20	Indonesia	105,121,000	2,312,662	2.2%	1.1%

CSUS Applied Research Center, July 2005

Data Source: Center for International Development, Research Datasets, "International Data on Educational Attainment: Updates and Implications"

* NOTE: The "world" consists of only those countries included in the CID datasets with projections given for 2000.

Also included in the top 20 in Figure A-3 are the G8 countries: the United States ranking first; the Russian Federation ranking third; Japan standing in fifth; United Germany in at sixth; United Kingdom at tenth; France and Italy ranking twelfth and thirteenth respectively; and Canada in fifteenth place. In addition to the G8 countries, several developing countries also made the top 20 listing, including the U.S.'s major economic contender for the twenty-first century, China, placing second in percent share of the world's postsecondary educated population. The top 5 countries demonstrate that the bulk of the world's postsecondary educated population, 55.7 percent, is situated in the following world regions: North America, Eastern Asia, Eastern Europe, and South Central Asia placed in respective order of percent shares.

Figure A-4

Top 20 Countries by Number and Percent Growth of Population with Postsecondary Education, 1980-2000

Rank	Country	1980		2000		Absolute Growth: 1980 - 2000	
		Number	Percent	Number	Percent	Number	Percent
1	South Korea	1,082,466	6.60%	5,536,899	19.10%	4,454,433	12.5%
2	United States	24,068,160	18.00%	54,068,229	30.30%	30,000,069	12.3%
3	Russian Federation *	11,970,554	7.90%	16,764,552	17.40%	4,793,998	9.5%
4	Peru	455,538	6.90%	1,873,179	15.30%	1,417,641	8.4%
5	Thailand	526,727	2.90%	3,809,904	11.20%	3,283,177	8.3%
6	Argentina	560,550	3.70%	2,381,428	11.90%	1,820,878	8.2%
7	Venezuela	275,136	4.80%	1,370,426	12.20%	1,095,290	7.4%
8	South Africa	128,304	1.10%	1,666,737	8.10%	1,538,433	7.0%
9	Netherlands	545,856	6.40%	1,394,000	12.50%	848,144	6.1%
10	Italy	810,819	2.30%	3,501,687	8.30%	2,690,868	6.0%
11	Japan	6,581,160	9.00%	13,654,950	15.00%	7,073,790	6.0%
12	Spain	860,200	4.00%	2,597,804	9.20%	1,737,604	5.2%
13	Malaysia	65,112	1.20%	645,120	6.30%	580,008	5.1%
14	France	1,467,268	4.40%	3,774,758	9.40%	2,307,490	5.0%
15	Taiwan	384,319	4.70%	1,350,143	9.70%	965,824	5.0%
16	Australia	1,009,680	12.00%	2,125,006	16.90%	1,115,326	4.9%
17	United Germany	3,174,090	6.20%	6,593,840	11.00%	3,419,750	4.8%
18	Poland	1,020,866	4.90%	2,333,472	9.60%	1,312,606	4.7%
19	Egypt	803,845	4.90%	2,911,086	9.40%	2,107,241	4.5%
20	Philippines	1,793,385	9.90%	4,693,824	14.40%	2,900,439	4.5%

CSUS Applied Research Center, July 2005
Data Source: Center for International Development, Research Datasets, "International Data on Educational Attainment: Updates and Implications"
* NOTE: Data for 1980 is for the U.S.S.R, which dissolved in 1990. Data for 2000 is for the Russian Federation and does not include Armenia; Azerbaijan; Belarus; Estonia; Georgia; Kazakhstan; Latvia; Lithuania; Moldova; Tajikistan; Turkmenistan; Ukraine; Uzbekistan, which were all part of the U.S.S.R. in 1980.

Figure A-4 shows the countries with the greatest growth in percent of total population with postsecondary education between 1980 and 2000. Topping the list is South Korea with growth of 12.5 percent. The United States placed second with growth of 12.3 percent.

In terms of absolute numbers, the U.S. ranks first in having added 30 million postsecondary graduates between 1980 and 2000.

Once again appearing in the top 20 countries are the G8 countries, showing that the most industrialized countries are among those making the greatest gains in numbers of postsecondary educated population.

In conclusion, this analysis supports that the United States is the most educated country in terms of absolute numbers, in percent of the total population with postsecondary education, and in percent of the world's share of postsecondary educated population. The U.S. consistently ranks first in the area of postsecondary education even among the most industrialized countries. However, it is likely that the U.S.'s stance with regard to postsecondary education is enhanced by the immigration of educated people from other countries to the U.S. Therefore, sustaining the future growth of the postsecondary educated population in the U.S. will depend on immigration policies, and more importantly, extending educational access to the sizable portion of the population 25 and older without postsecondary education (approximately 70 percent in 2000).

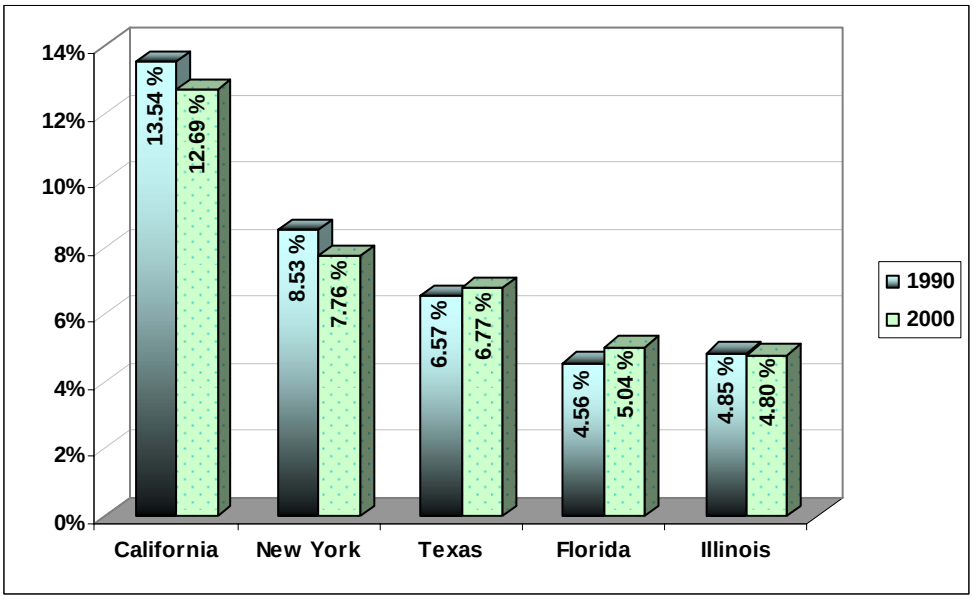
National Comparisons

The following state comparative analysis uses U.S. Census data compiled by the National Center for Higher Education Management Systems, tables of educational attainment of the population by degree level for the age group 25 to 64. The age group 25 to 64 was selected because it is the age range that most closely approximates the working-age population following the traditional years associated with higher education (ages 18 to 24). Comparing the educational attainment of this age range provides a rough standard for assessing the levels of human capital of workforces across states. In interpreting the change in the higher educated population between 1990 and 2000, one must remember that two dynamics are in process: the processes of new entrants and attrition into and out of the 25 to 64 year old cohort during the ten-year span between censuses. Therefore, positive gains demonstrate that more people entered the age cohort than exited the cohort. To summarize in advance, California ranks comparatively well in the Nation with respect to the higher educated population ages 25 to 64 in 1990 and 2000.

Also included as appendices are tables showing the states' rankings in percent of total population 25 to 64 years of age with bachelor's degrees or higher for 1990 and 2000 (Appendix A-2A), as well as tables sorted by absolute and percent growth in the percent of total population 25 to 64 with bachelor's degrees or higher (Appendices A-2B and A-2C).

In general, the percent of total population ages 25 to 64 with higher education (defined as having a bachelor's degree or higher) in California has increased over the last decade, from 25.2 percent to 28 percent. However, the State's ranking compared to other states slipped from 11th place to 16th place (Appendix 5-2A). This means that while California improved on the percent of total population with higher education, the overall *percent growth* in percent of total population with higher education was slower than most other states.

Figure A-6
Top 5 States by Share of National Higher Educated Population, 1990 to 2000
Percent of national total of higher educated population 25 to 64 years of age.

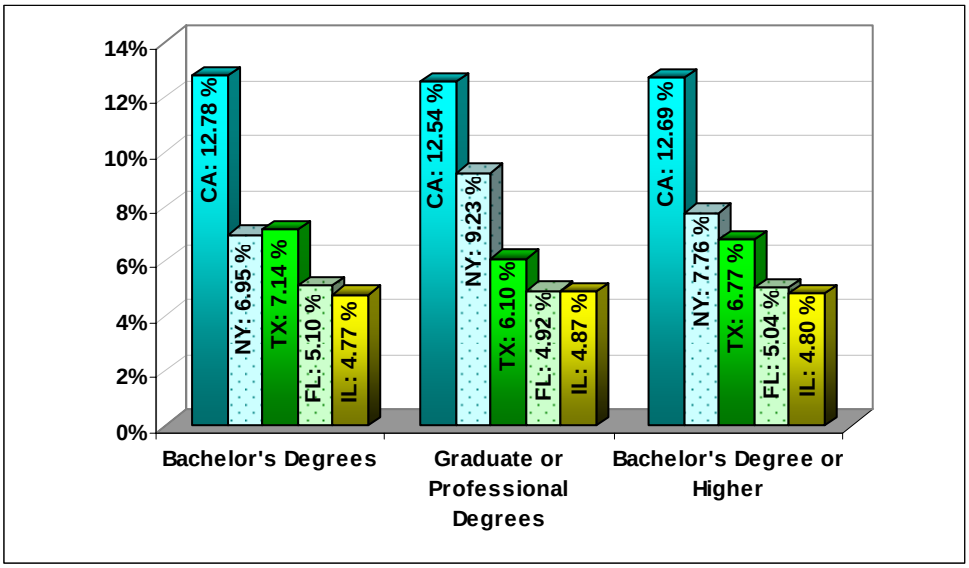


CSUS Applied Research Center, July 2005
Data Sources: National Center for Higher Education Management Systems; U.S. Census, Summary File 3

FigureA-6 shows the top five states in percent of the national total of higher educated population. California retained the greatest share of the Nation's total higher educated population, with 13.54 percent in 1990 and 12.69 percent in 2000. Three of the five states posted declines in their shares between 1990 and 2000: California (0.85 percent decline), New York (0.77 percent decline), and Illinois (0.05 percent decline); while both Texas and Florida increased their shares of the Nation's higher educated population (0.20 percent and 0.48 percent respectively).

Of the fifty states and the District of Columbia, Florida posted the greatest absolute gains in percent share of the Nation's higher educated population between 1990 and 2000, from 4.56 percent to 5.04 percent, and California posted the greatest absolute loss, from 13.54 percent to 12.69 percent. Half of the fifty states posted gains in their shares of the Nation's total higher educated population (25 states) and half posted declines in their shares (25 states and DC) (Appendix A-3).

Figure A-7
Top 5 States in Percent of Nation's Higher Educated Population, By Degree



CSUS Applied Research Center, July 2005
Data Sources: National Center for Higher Education Management Systems; U.S. Census, Summary File 3
Percent of national total of higher educated population 25 to 64 years of age by degree attainment in 2000.

FigureA-7 presents the top five states in percent share of the Nation's higher educated population by degree attainment in 2000. Again, California clearly claims the greatest portion of the Nation's graduates with all categories of higher education degrees.

California maintained a slightly higher percentage of the nation's bachelor's degrees than post-baccalaureate degrees (0.24 percent more bachelor's degrees). Similarly, Texas and Florida also claimed more graduates with bachelor's degrees than those with graduate or professional degrees. In contrast, both New York and Illinois retained more post-baccalaureate graduates than graduates with bachelor's degrees.

Figure A-8 shows the number and percent share of the Nation's higher educated population by degree attainment and growth rates for the top 5 states in 1990 and 2000.

Figure A-8

Top 5 States in 1990 and 2000: Growth in Degree Attainment

Top 5 States: 1990 & 2000	Number of Degrees		Change in Degrees		% National Total		Change in % National Total	
	1990	2000	Absolute	Percent	1990	2000	Absolute	Percent
California								
Bachelor's Degrees	2,583,629	3,218,735	635,106	24.58%	13.75%	12.78%	-0.97%	-7.03%
Graduate or Professional Degrees	1,337,165	1,741,475	404,310	30.24%	13.16%	12.54%	-0.63%	-4.77%
Bachelor's Degree or Higher	3,920,794	4,960,210	1,039,416	26.51%	13.54%	12.69%	-0.85%	-6.27%
New York								
Bachelor's Degrees	1,421,417	1,750,435	329,018	23.15%	7.56%	6.95%	-0.61%	-8.10%
Graduate or Professional Degrees	1,048,062	1,281,492	233,430	22.27%	10.32%	9.23%	-1.09%	-10.60%
Bachelor's Degree or Higher	2,469,479	3,031,927	562,448	22.78%	8.53%	7.76%	-0.77%	-9.04%
Texas								
Bachelor's Degrees	1,310,624	1,799,411	488,787	37.29%	6.97%	7.14%	0.17%	2.46%
Graduate or Professional Degrees	592,840	847,498	254,658	42.96%	5.84%	6.10%	0.26%	4.53%
Bachelor's Degree or Higher	1,903,464	2,646,909	743,445	39.06%	6.57%	6.77%	0.20%	3.03%
Florida								
Bachelor's Degrees	880,700	1,284,208	403,508	45.82%	4.69%	5.10%	0.41%	8.82%
Graduate or Professional Degrees	438,797	683,918	245,121	55.86%	4.32%	4.92%	0.60%	13.96%
Bachelor's Degree or Higher	1,319,497	1,968,126	648,629	49.16%	4.56%	5.04%	0.48%	10.51%
Illinois								
Bachelor's Degrees	912,354	1,200,447	288,093	31.58%	4.85%	4.77%	-0.09%	-1.81%
Graduate or Professional Degrees	493,120	676,008	182,888	37.09%	4.85%	4.87%	0.01%	0.24%
Bachelor's Degree or Higher	1,405,474	1,876,455	470,981	33.51%	4.85%	4.80%	-0.05%	-1.08%

CSUS Applied Research Center, July 2005
Data Sources: National Center for Higher Education Management Systems; U.S. Census, Summary File 3

Three of the top five states show declines in their percent shares of the Nation's total higher educated population between 1990 and 2000: California, New York, and Illinois. (However, Illinois did increase its share of graduate and professional degrees.) Florida and Texas both increased their shares of the Nation's higher educated population with a bachelor's degree and higher, with Florida posting the greatest absolute growth both in the top five and in the Nation (0.48 percent) (Appendix A-3). In contrast, California realized the greatest absolute loss in national share higher educated population (-0.85 percent) (Appendix A-3).

Figure A-8 also shows the number of degrees by educational attainment for the top five states in 1990 and 2000. Without a doubt, California leads in sheer numbers of higher educated population, which is true for both the top five states and in the Nation (Appendix A-3). However, California does not lead in growth rates, ranking 42nd in the Nation with 26.5 percent growth in higher educated population with a bachelor's degree or higher (Appendix A-1B). Of the top five states, Florida ranks first in growth (8th in the Nation), growing 49.2 percent between 1990 and 2000.

California ranks comparatively well in the Nation with respect to the postsecondary educated population ages 25 to 64 in 1990 and 2000. In terms of absolute numbers, the higher educated population (those with bachelor's degree or higher) grew by 1.04 million people between 1990 and 2000, the largest absolute increase of this segment of population in the Nation. California ranked first in both 1990 and 2000 in percent of the national total of higher educated population (ages 25 to 64), as well as in percents of national totals of higher educated population with bachelor's degrees and graduate or professional degrees when considered separately. By far, California has the largest higher educated population than any other state in the Nation. The only disadvantages faced by California in the decade between 1990 and 2000 were slower than average growth and a declining share of the Nation's total higher educated population.

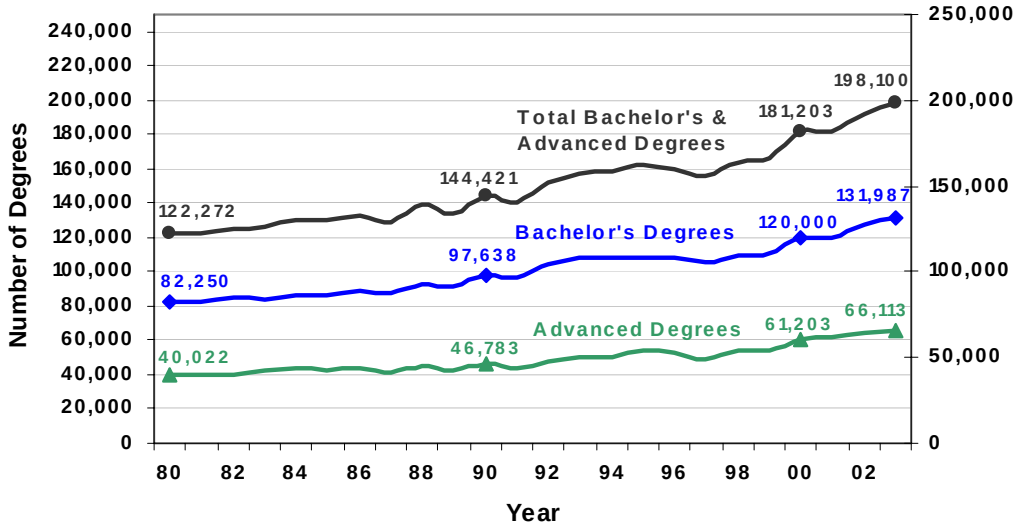
Overview of Higher Education in California

Degrees Granted

The analysis is this section is provided as a view of part of the higher education supply system for California, and is conducted in the context of the economic analysis which focuses on occupational education requirement identified in the BLS/EDD labor market forecasts. The analysis uses data collected by the California Postsecondary Education Commission, the State agency responsible for coordinating California's systems of public higher education. The dataset reports on the total number of degrees conferred yearly in California by the University of California, California State University, California Community College, WASC-Accredited private institutions, other institutions, and institutions exempt from State approval. The latter are excluded in our analysis because the relationship to employer educational specifications is not clear.

BA and Higher Degrees. Figure A-9 graphs the yearly number of bachelor's degrees, advanced degrees, and total bachelor's degrees or higher conferred in California from 1980 to 2003. Included in the advanced degrees category are master's degrees, doctorate degrees, and professional degrees. Values are given for the years 1980, 1990, 2000, and 2003.

Figure A-9. Total Number of BA and Higher Degrees Conferred in California, 1980 to 2003



CSUS Applied Research Center, July 2005
Data Source: California Postsecondary Education Commission

Since 1980, California has seen an overall increasing trend in the number of degrees conferred. When divided into distinct periods (1980 to 1986; 1987 to 1996; 1997 to 2003) and a simple linear regression performed, it is clear that the slope of the regression-line gets steeper for each period.[1] Between 1980 and 2003, the rate of change in the number of degrees conferred in California has nearly doubled approximately every six to nine years.

Figure A-10

Absolute and Percent Growth in Number of Degrees Conferred in California

Year	Bachelor's Degrees		Advanced Degrees		Bachelor's or Higher	
	Absolute	Percent	Absolute	Percent	Absolute	Percent
1980-1990	15,388	18.71%	6,761	16.89%	22,149	18.11%
1990-2000	22,362	22.90%	14,420	30.82%	36,782	25.47%
1980-2000	37,750	45.90%	21,181	52.92%	58,931	48.20%

CSUS Applied Research Center, July 2005
Data Source: California Postsecondary Education Commission

Figure A-10 presents the absolute and percent change in the number of degrees granted yearly in California from 1980 to 1990, 1990 to 2000, and 1980 to 2000. Between 1980

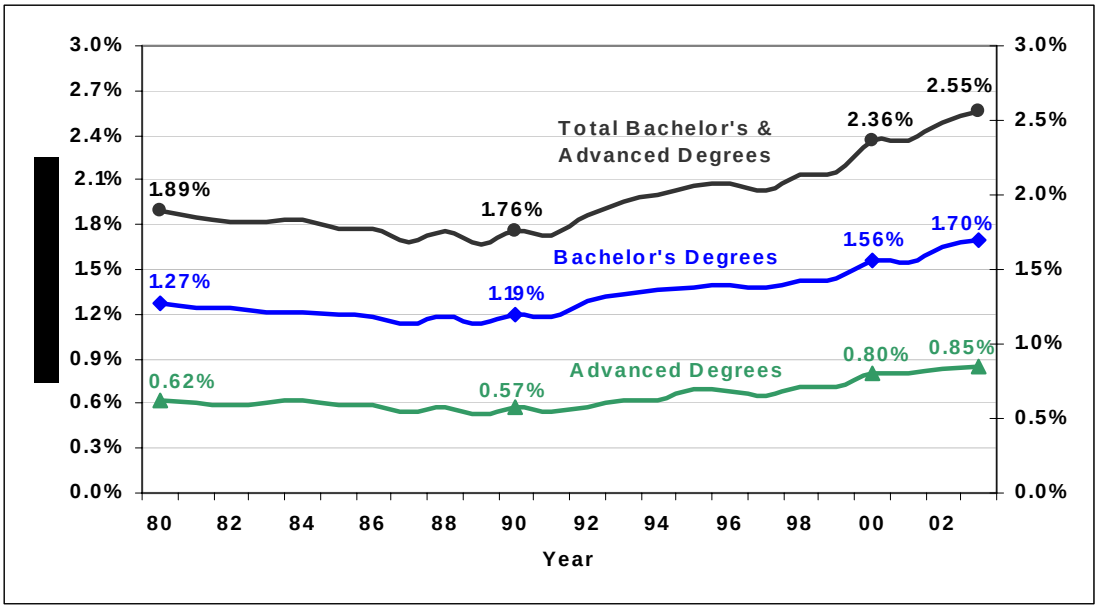
[1] 1980-1986 (R^2=0.95): 1,812 additional degrees over the previous year's total each year; 1987-1996 (R^2=0.91): 3,780 additional degrees over the previous year's total each year; 1997-2003 (R^2=0.97): 7,129 additional degrees over the previous year's total each year.

and 1990, the yearly number of bachelor's degrees or higher conferred grew by 18 percent, totaling 22,149 more degrees granted in 1990 than in 1980. Growth in the 1990s was more rapid, growing 25 percent and adding 36,782 more degrees granted in 2000 than in 1990. Between 1980 and 2000, the number of bachelor's degrees or higher granted grew by 48 percent with 58,931 more degrees granted in 2000 than in 1980.

Figure A-10 also shows that among the two degree types ("bachelor's degrees" and "advanced degrees" separately), the most rapid growth occurred in the granting of advanced degrees. Between 1980 and 2000, the number of advanced degrees conferred grew by 52.9 percent.

The next figures illustrate the number of degrees conferred yearly in California relative to the population, ages 21 to 35. In looking at the age group 21 to 35, we aim to isolate the segment of the population most likely to have graduated with a bachelor's degree or advanced degree, and to assess graduations as a percentage of this population. The assumption employed for setting the lower and upper bounds of the age range 21 to 35 for this analysis use the following approach: it is commonly understood that the "traditional" age of college students is 18 to 24. Using this as a basis, we set the lower bound at age 21 since it is sufficiently low enough to capture the traditional graduates (those entering college following high school at approximately age 17 or 18 and graduating in four years), and set the upper bound at age 35 because it is sufficiently high enough to capture those who have completed postgraduate studies and have obtained advanced degrees.

Figure A-11
California BA and Higher Graduations as a Percent of Population, Ages 21 to 35



CSUS Applied Research Center, July 2005
Data Sources: California Department of Finance, California Postsecondary Education Commission

Figure A-11 shows that graduations as a percent of the population ages 21 to 35 have been on the rise. During the 1980s, graduations as a percent of population slightly declined throughout the decade striking a low point in 1989. However, since 1990, graduations as a percent of population have increased overall. Between 1980 and 2000, the percentage of population 21 to 35 with bachelor's degrees or higher has increased 24.9 percent.

California Community College (CCC) Degrees. Between 1980 and 2000, total associate degrees and vocational certificates awarded grew almost four times as fast (187.1 %) as total bachelors and advanced degrees awarded (48.2 %). Figure A-12 shows that Vocational certificates and degrees grew at the greatest rate, 237.3 percent, which was between four to five times faster than growth in bachelor's and advanced degrees. The number of associate degrees granted grew by 167.4 percent; three to three and half times faster than growth in bachelor's and advanced degrees.

Growth in degrees granted was stronger in the 1990s than it was in the 1980s. Growth in vocational certificates and degrees conferred doubled, growing by 100.4 percent. Associate degrees granted grew by 84.4 percent and total associate degrees and certificates grew by 89.4 percent. Throughout the periods studied, associate degrees and vocational certificates and degrees grew at greater rates than bachelors and advanced degrees.

Figure A-12

Number of Degrees Conferred in California, 1980 to 2000
Absolute and Percent Growth

Year	Associate Degrees		Other Certificates & Degrees		Total AAs & Certificates	
	Absolute	Percent	Absolute	Percent	Absolute	Percent
1980-1990	12,757	45.02%	7,607	68.30%	20,364	51.59%
1990-2000	34,666	84.36%	18,825	100.43%	53,491	89.40%
1980-2000	47,423	167.37%	26,432	237.34%	73,855	187.11%

Year	Bachelor's Degrees		Advanced Degrees		Total Bachelor's & Advanced	
	Absolute	Percent	Absolute	Percent	Absolute	Percent
1980-1990	15,388	18.71%	6,761	16.89%	22,149	18.11%
1990-2000	22,362	22.90%	14,420	30.82%	36,782	25.47%
1980-2000	37,750	45.90%	21,181	52.92%	58,931	48.20%

Sacramento State Applied Research Center, November 2005
Data Source: California Postsecondary Education Commission, Student Data Tables
Note: The above data refers to the academic year ending with the year shown; i.e. "1980" refers to the academic year 1979-1980.

Figure A-13 breaks down the same data presented in Figure A-12, but by program for which the degree is granted. The figure shows the number of degrees granted at the two-digit level of the CCC's Taxonomy of Programs (TOP). This is the most general level of program categorization reported by CCC.

Figure A-13

Total Number of Awards Granted by California Community Colleges by Program, 2000 and 2005
Sorted by Percent of Total Awards in 2005

Program Type	Awards Granted		Growth: 2000 to 2005		Percent Total Awards		Cumulative Percent	
	2000	2005	Absolute	Percent	2000	2005	2000	2005
Interdisciplinary Studies	40,748	48,202	7,454	18.29%	39.1%	40.3%	39.1%	40.3%
Health (Includes Nurses)	10,867	13,998	3,131	28.81%	10.4%	11.7%	49.5%	52.0%
Public and Protective Services	10,175	10,945	770	7.57%	9.8%	9.1%	59.3%	61.1%
Business and Management	10,330	10,599	269	2.60%	9.9%	8.9%	69.2%	70.0%
Family and Consumer Sciences	6,632	9,794	3,162	47.68%	6.4%	8.2%	75.6%	78.2%
Engineering and Industrial Technologies	8,594	7,310	-1,284	-14.94%	8.2%	6.1%	83.8%	84.3%
Social Sciences	2,850	4,100	1,250	43.86%	2.7%	3.4%	86.6%	87.7%
Information Technology	3,396	2,497	-899	-26.47%	3.3%	2.1%	89.8%	89.8%
Fine and Applied Arts	1,911	1,980	69	3.61%	1.8%	1.7%	91.7%	91.4%
Commercial Services	1,265	1,915	650	51.38%	1.2%	1.6%	92.9%	93.0%
Agriculture and Natural Resources	1,449	1,266	-183	-12.63%	1.4%	1.1%	94.3%	94.1%
Media and Communications	644	1,174	530	82.30%	0.6%	1.0%	94.9%	95.1%
Humanities	559	1,025	466	83.36%	0.5%	0.9%	95.4%	95.9%
Law	668	912	244	36.53%	0.6%	0.8%	96.1%	96.7%
Psychology	468	680	212	45.30%	0.4%	0.6%	96.5%	97.3%
Biological Sciences	428	653	225	52.57%	0.4%	0.5%	96.9%	97.8%
Education	738	556	-182	-24.66%	0.7%	0.5%	97.6%	98.3%
Environmental Sciences and Technologies	595	450	-145	-24.37%	0.6%	0.4%	98.2%	98.6%
Mathematics	365	426	61	16.71%	0.4%	0.4%	98.5%	99.0%
Foreign Language	319	391	72	22.57%	0.3%	0.3%	98.8%	99.3%
Physical Sciences	445	326	-119	-26.74%	0.4%	0.3%	99.3%	99.6%
Architecture and Related Technologies	146	269	123	84.25%	0.1%	0.2%	99.4%	99.8%
Library Science	144	190	46	31.94%	0.1%	0.2%	99.6%	100.0%
Unknown	467	19	-448	-95.93%	0.4%	0.0%	100.0%	100.0%
Total	104,203	119,677	15,474	14.85%	100.0%	100.0%		

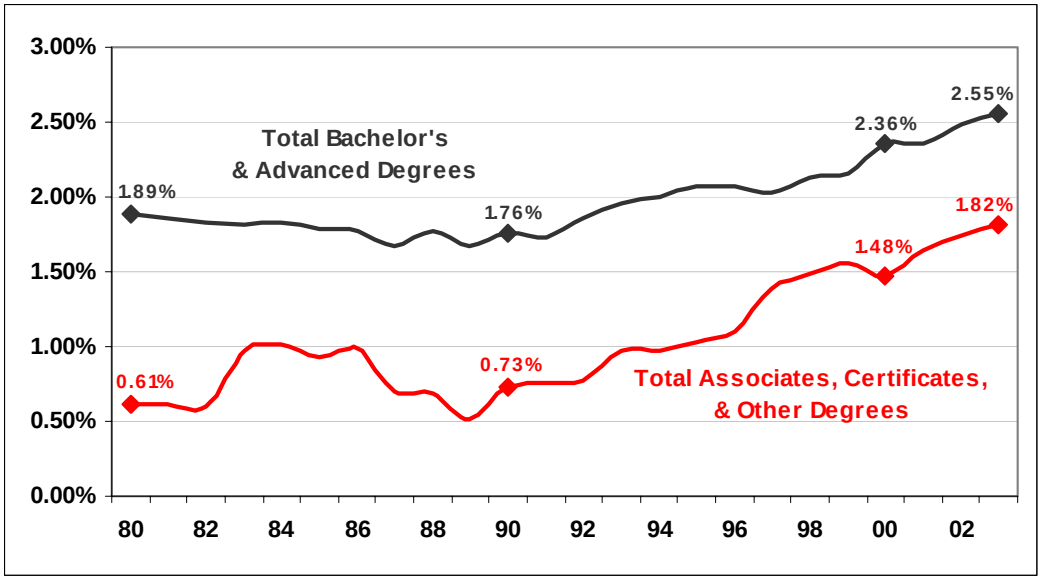
Approximately 40 percent of degrees granted at CCC in 2000 and 2005 were for Interdisciplinary Studies. These degrees include programs that are not concentrated in any one major discipline and range from general studies in Liberal Arts and Sciences (Transfer Studies and Liberal Studies) to Biological and Physical Sciences and Humanities. There was an additional 7,454 Interdisciplinary Studies degrees granted between 2000 and 2005.

Degrees in Health were the second most granted type of degree at CCC in both 2000 and 2005. Health degrees at CCC include programs that examine "the restoration or preservation of mental and physical health," and includes Nursing (RN, LVN, Certified Nurse Assistant), Psychiatric Technicians, Dental Hygienists, Paramedics and many

more. There were 3,131 more Health degrees granted in 2005 over 2000 (growth of 28.8 %).

Together, Interdisciplinary Studies and Health degrees represent approximately 50 percent of all degrees granted by CCC in both 2000 and 2005.

Figure A-14
California Postsecondary Graduations as a Percent of Population, Ages 21 to 35



Total associate degrees, certificates, and other degrees granted as a percent of population have increased at a greater rate than total bachelors and advanced degrees, as shown in Figure A-14. Since 1990, associate degrees, certificates, and other degrees granted as a percent of population have increased by .09 percent per year. If this trend continues, the percent of population ages 21 to 35 that hold an associate degree, certificate, or other degree will surpass the percent of population with bachelor's and advanced degrees by 2018.

Migration

Migration serves an important function in population growth. As one of the most ethnically and culturally diverse states in the Nation, California attracts its share of both domestic and international migrants. At the same time, California also loses residents to other states and countries. The following section analyzes domestic in-migration, out-migration, and net-migration in California between 1995 and 2000 using data from the 2000 U.S. Census, 5% Public Use Microdata Sample (PUMS) files, compiled by the National Center for Higher Education Management Systems by age group and educational attainment. The question asked by the Census in 2000 for which the data was

extracted inquired into where a resident lived five years earlier (i.e. 1995). The dataset gives comprehensive information on domestic migration, but incomplete information on international migration. For this reason the analysis focuses on domestic migration in to and out of California.

Figure A-15 gives the net domestic migration by level of education and age groups for California, 1995 to 2000. The age groups with higher education most likely to immigrate to California are the youngest groups. For example, between 1995 and 2000, California attracted 91,907 new residents ages 22 to 29 with a bachelor's degree or higher. Looking at ages 22 to 64, the age group that most closely approximates the working age population, California still benefited from positive immigration of residents with bachelor's degrees or higher, adding 78,512 residents. California attracted new residents with advanced degrees across the age groups analyzed, excluding the oldest age group, ages 65 and older, where California lost residents across the educational categories examined. The positive addition of residents with advanced degrees across age groups signifies that California is a popular destination for immigrants with advanced educations.

Figure A-15

California Net Domestic Migration
By Level of Education and Age Groups, 1995 to 2000

Age Group	Bachelor's Degrees	Advanced Degrees	Bachelor's or Higher	All Education Levels *
22 to 29	74,001	17,906	91,907	-42,331
22 to 64	46,444	32,068	78,512	-435,646
22 +	44,916	31,538	76,454	-469,710
30 to 64	-27,557	14,162	-13,395	-393,315
30 +	-29,085	13,632	-15,453	-427,379
65 +	-1,528	-530	-2,058	-34,064

CSUS Applied Research Center, July 2005
Data Sources: National Center for Higher Education Management Systems; 2000 U.S. Census
NOTE: * "All Education Levels" include those with less than a high school diploma, a high school diploma, and all levels of higher education.

Figure A-16 presents the top 20 states of origin and destination of California's domestic migrant population with a bachelor's degree or higher, ages 22 and older.

Figure A-16

Top 20 States of Origin and Destination of California's Higher Educated Migrants, 1995 to 2000
Residents with Bachelor's Degrees or Higher, Ages 22 and Older

States of Origin				States of Destination			
Rank	State	Number	Percent	Rank	State	Number	Percent
1	New York	53,199	9.80%	1	Washington	36,597	7.85%
2	Texas	38,161	7.03%	2	Texas	34,554	7.41%
3	Illinois	34,657	6.39%	3	New York	32,985	7.07%
4	Massachusetts	27,975	5.15%	4	Arizona	29,157	6.25%
5	Washington	25,093	4.62%	5	Oregon	25,495	5.47%
6	Arizona	23,242	4.28%	6	Colorado	24,856	5.33%
7	Florida	22,390	4.13%	7	Florida	23,023	4.94%
8	Pennsylvania	20,932	3.86%	8	Nevada	22,417	4.81%
9	Virginia	20,681	3.81%	9	Illinois	17,882	3.84%
10	Colorado	20,653	3.81%	10	Virginia	17,632	3.78%
11	Oregon	16,965	3.13%	11	Massachusetts	16,623	3.57%
12	Michigan	16,895	3.11%	12	Georgia	12,678	2.72%
13	New Jersey	16,337	3.01%	13	Maryland	11,669	2.50%
14	Ohio	16,293	3.00%	14	Pennsylvania	11,447	2.45%
15	Maryland	14,261	2.63%	15	New Jersey	10,402	2.23%
16	Hawaii	11,307	2.08%	16	North Carolina	9,878	2.12%
17	Georgia	11,263	2.08%	17	Ohio	9,402	2.02%
18	Utah	10,498	1.93%	18	Michigan	9,341	2.00%
19	North Carolina	10,111	1.86%	19	Hawaii	8,493	1.82%
20	Nevada	10,055	1.85%	20	Minnesota	8,081	1.73%
	Totals	420,968	77.56%		Totals	372,612	79.91%

CSUS Applied Research Center, July 2005
Data Sources: National Center for Higher Education Management Systems; 2000 U.S. Census

With the exception of Utah (States of Origin table) and Minnesota (States of Destination table), the same states appear in the top 20 rankings of both tables. The top 10 states in both tables comprise over 50 percent of California's migrant population with bachelor's degrees or higher (52.9 percent in the top 10 states of origin and 56.8 percent in the top 10 states of destination). In general, most of California's immigrant population with a bachelor's degree or higher originates in the Western, Northeastern, or Southern Regions of the United States (in that order of importance) while most of California's emigrant population is destined for states in the Western or Southern Regions.

Figure A-17 shows the top 20 states of origin posting a net in-migration of new residents with a bachelor's degree or higher (ages 22 and older) to California, and all states in which California posts a net out-migration of residents leaving the State.

Figure A-17

States of Origin and Destination: Net Domestic In-Migration and Out-Migration of California's Higher Educated Residents, 1995 to 2000
Residents with a Bachelor's Degree of Higher, Ages 22 and Older

Net In-Migration				Net Out-Migration			
Rank	State	Number	Percent	Rank	State	Number	Percent
1	New York	20,214	16.24%	1	Nevada	12,362	25.77%
2	Illinois	16,775	13.48%	2	Washington	11,504	23.98%
3	Massachusetts	11,352	9.12%	3	Oregon	8,530	17.78%
4	Pennsylvania	9,485	7.62%	4	Arizona	5,915	12.33%
5	Michigan	7,554	6.07%	5	Colorado	4,203	8.76%
6	Ohio	6,891	5.54%	6	Idaho	1,626	3.39%
7	New Jersey	5,935	4.77%	7	Georgia	1,415	2.95%
8	Indiana	4,690	3.77%	8	Arkansas	1,086	2.26%
9	Texas	3,607	2.90%	9	Florida	633	1.32%
10	District of Columbia	3,379	2.72%	10	Alaska	304	0.63%
11	Connecticut	3,232	2.60%	11	New Mexico	132	0.28%
12	Virginia	3,049	2.45%	12	Kentucky	123	0.26%
13	Wisconsin	2,852	2.29%	13	South Dakota	105	0.22%
14	Hawaii	2,814	2.26%	14	Montana	41	0.09%
15	Maryland	2,592	2.08%				
16	Utah	2,569	2.06%		Totals	47,979	100.00%
17	Iowa	2,388	1.92%				
18	Minnesota	1,739	1.40%				
19	Missouri	1,677	1.35%				
20	Rhode Island	1,512	1.22%				
	Totals	114,306	91.86%				

CSUS Applied Research Center, July 2005
Data Sources: National Center for Higher Education Management Systems; 2000 U.S. Census

More specifically, the Net In-Migration table shows the top 20 states that send to California more highly-educated immigrants than California sends to them in return, which represent positive net migration numbers to California. On the other hand, the Net Out-Migration table shows all states to which California lost residents between 1995 and 2000, and represents negative net migration numbers for California.

Looking at the Net In-Migration table, California appeared to be a popular destination for domestic immigrants from the Northeastern (44.3 percent of the top 20) and Midwestern (35.8 percent of the top 20) Regions of the United States between 1995 and 2000, both regions with high concentrations of old and highly reputable institutions of higher education. This suggests that California benefited from the immigration of new residents with bachelor's degrees or higher that may have had educations of high quality. The Net Out-Migration table shows that the majority of emigrants who left California between

1995 and 2000 chose to remain in the Western Region of the United States (93 percent). In all, California posted a net in-migration of 76,454 residents with a bachelor's degree or higher between 1995 and 2000.

While migration can be a source of new residents with higher education, the migration of people with higher education only slightly supplements California's own higher educated population. According to the 2000 Census, California had 4,960,210 residents with a bachelor's degree or higher. Subtracting the net in-migration of 76,454 immigrants with a bachelor's degree or higher, one arrives at an estimate of California's native-residential higher educated population of 4,883,756 residents with bachelor's degrees or higher. In 2000, immigration of new residents with higher education only accounted for 1.5 percent of California's higher educated population.

Additional Data. The following tables provide additional detail for the figures in this chapter.

Figure A-18

POPULATION 25 TO 64 YEARS OF AGE WITH A BACHELOR'S DEGREE OR HIGHER, SORTED BY ABSOLUTE GROWTH 1990 TO 2000

				Growth 1990 - 2000	
Rank	*State*	*1990*	*2000*	*Absolute*	*Percent*
1	California	3,920,794	4,960,210	1,039,416	26.5%
2	Texas	1,903,464	2,646,909	743,445	39.1%
3	Florida	1,319,497	1,968,126	648,629	49.2%
4	New York	2,469,479	3,031,927	562,448	22.8%
5	Illinois	1,405,474	1,876,455	470,981	33.5%
6	Georgia	715,372	1,148,814	433,442	60.6%
7	North Carolina	658,552	1,044,025	385,473	58.5%
8	Pennsylvania	1,262,189	1,618,658	356,469	28.2%
9	Virginia	888,699	1,232,454	343,755	38.7%
10	New Jersey	1,178,203	1,510,429	332,226	28.2%
11	Ohio	1,050,515	1,375,311	324,796	30.9%
12	Michigan	919,153	1,242,388	323,235	35.2%
13	Colorado	518,874	819,906	301,032	58.0%
14	Washington	639,751	932,352	292,601	45.7%
15	Massachusetts	984,225	1,266,113	281,888	28.6%
16	Arizona	397,353	638,515	241,162	60.7%
17	Minnesota	554,517	783,613	229,096	41.3%
18	Maryland	754,444	979,588	225,144	29.8%
19	Tennessee	450,271	649,844	199,573	44.3%
20	Wisconsin	492,125	690,065	197,940	40.2%
21	Indiana	486,079	672,835	186,756	38.4%
22	Missouri	527,434	695,491	168,057	31.9%
23	Oregon	333,404	488,862	155,458	46.6%
24	South Carolina	314,970	454,656	139,686	44.3%
25	Alabama	357,797	479,734	121,937	34.1%
26	Kentucky	283,168	402,094	118,926	42.0%
27	Nevada	108,010	206,361	98,351	91.1%
28	Utah	179,284	276,360	97,076	54.1%
29	Kansas	293,033	385,924	92,891	31.7%
30	Connecticut	542,052	633,867	91,815	16.9%
31	Iowa	263,219	351,922	88,703	33.7%
32	Louisiana	366,883	453,353	86,470	23.6%
33	Arkansas	173,497	247,079	73,582	42.4%
34	Oklahoma	310,572	383,381	72,809	23.4%
35	Nebraska	169,263	230,857	61,594	36.4%
36	New Mexico	165,598	226,334	60,736	36.7%
37	Mississippi	199,592	256,581	56,989	28.6%
38	Idaho	92,847	149,622	56,775	61.1%
39	New Hampshire	156,753	207,431	50,678	32.3%
40	Maine	131,085	170,334	39,249	29.9%
41	Hawaii	148,551	184,130	35,579	24.0%
42	Montana	89,045	124,462	35,417	39.8%
43	West Virginia	124,306	157,883	33,577	27.0%
44	Rhode Island	125,473	156,862	31,389	25.0%
45	Delaware	81,198	111,260	30,062	37.0%
46	Vermont	76,930	103,476	26,546	34.5%
47	South Dakota	65,034	89,855	24,821	38.2%
48	Alaska	71,645	87,739	16,094	22.5%
49	North Dakota	64,913	80,545	15,632	24.1%
50	Wyoming	47,134	60,451	13,317	28.3%
51	District of Columbia	121,624	133,155	11,531	9.5%
	Nation	28,953,344	39,078,598	10,125,254	35.0%

CSUS Applied Research Center, July 2005
Data Source: National Center for Higher Education Management Systems; U.S. Census, Summary File 3

Figure A-19
POPULATION 25 TO 64 WITH A BACHELOR'S DEGREE OR HIGHER, SORTED BY PERCENT GROWTH 1990 TO 2000

				Growth 1990 - 2000	
Rank	*State*	*1990*	*2000*	*Absolute*	*Percent*
1	Nevada	108,010	206,361	98,351	91.1%
2	Idaho	92,847	149,622	56,775	61.1%
3	Arizona	397,353	638,515	241,162	60.7%
4	Georgia	715,372	1,148,814	433,442	60.6%
5	North Carolina	658,552	1,044,025	385,473	58.5%
6	Colorado	518,874	819,906	301,032	58.0%
7	Utah	179,284	276,360	97,076	54.1%
8	Florida	1,319,497	1,968,126	648,629	49.2%
9	Oregon	333,404	488,862	155,458	46.6%
10	Washington	639,751	932,352	292,601	45.7%
11	South Carolina	314,970	454,656	139,686	44.3%
12	Tennessee	450,271	649,844	199,573	44.3%
13	Arkansas	173,497	247,079	73,582	42.4%
14	Kentucky	283,168	402,094	118,926	42.0%
15	Minnesota	554,517	783,613	229,096	41.3%
16	Wisconsin	492,125	690,065	197,940	40.2%
17	Montana	89,045	124,462	35,417	39.8%
18	Texas	1,903,464	2,646,909	743,445	39.1%
19	Virginia	888,699	1,232,454	343,755	38.7%
20	Indiana	486,079	672,835	186,756	38.4%
21	South Dakota	65,034	89,855	24,821	38.2%
22	Delaware	81,198	111,260	30,062	37.0%
23	New Mexico	165,598	226,334	60,736	36.7%
24	Nebraska	169,263	230,857	61,594	36.4%
25	Michigan	919,153	1,242,388	323,235	35.2%
26	Vermont	76,930	103,476	26,546	34.5%
27	Alabama	357,797	479,734	121,937	34.1%
28	Iowa	263,219	351,922	88,703	33.7%
29	Illinois	1,405,474	1,876,455	470,981	33.5%
30	New Hampshire	156,753	207,431	50,678	32.3%
31	Missouri	527,434	695,491	168,057	31.9%
32	Kansas	293,033	385,924	92,891	31.7%
33	Ohio	1,050,515	1,375,311	324,796	30.9%
34	Maine	131,085	170,334	39,249	29.9%
35	Maryland	754,444	979,588	225,144	29.8%
36	Massachusetts	984,225	1,266,113	281,888	28.6%
37	Mississippi	199,592	256,581	56,989	28.6%
38	Wyoming	47,134	60,451	13,317	28.3%
39	Pennsylvania	1,262,189	1,618,658	356,469	28.2%
40	New Jersey	1,178,203	1,510,429	332,226	28.2%
41	West Virginia	124,306	157,883	33,577	27.0%
42	California	3,920,794	4,960,210	1,039,416	26.5%
43	Rhode Island	125,473	156,862	31,389	25.0%
44	North Dakota	64,913	80,545	15,632	24.1%
45	Hawaii	148,551	184,130	35,579	24.0%
46	Louisiana	366,883	453,353	86,470	23.6%
47	Oklahoma	310,572	383,381	72,809	23.4%
48	New York	2,469,479	3,031,927	562,448	22.8%
49	Alaska	71,645	87,739	16,094	22.5%
50	Connecticut	542,052	633,867	91,815	16.9%
51	District of Columbia	121,624	133,155	11,531	9.5%
	Nation	28,953,344	39,078,598	10,125,254	35.0%

CSUS Applied Research Center, July 2005
Data Source: National Center for Higher Education Management Systems; U.S. Census, Summary File 3

Figure A-20 A

PERCENT AND RANKINGS OF TOTAL POPULATION 25 TO 64 YEARS OF AGE WITH A BACHELOR'S DEGREE OR HIGHER, 1990 TO 2000

	State Rank		% Population		Growth 1990 to 2000	
State	1990	2000	1990	2000	Absolute	Percent
Alabama	43	44	17.7%	20.8%	3.1%	17.5%
Alaska	18	24	23.8%	25.5%	1.7%	7.1%
Arizona	24	29	21.8%	24.7%	2.9%	13.3%
Arkansas	49	49	15.1%	18.2%	3.1%	20.5%
California	11	16	25.2%	28.0%	2.8%	11.1%
Colorado	3	3	29.2%	34.7%	5.5%	18.8%
Connecticut	2	2	30.9%	34.7%	3.8%	12.3%
Delaware	19	20	23.3%	26.9%	3.6%	15.5%
Florida	32	35	20.2%	23.9%	3.7%	18.3%
Georgia	26	22	21.2%	26.1%	4.9%	23.1%
Hawaii	10	14	25.4%	28.7%	3.3%	13.0%
Idaho	38	38	19.3%	23.3%	4.0%	20.7%
Illinois	15	12	24.0%	29.0%	5.0%	20.8%
Indiana	45	43	17.4%	21.4%	4.0%	23.0%
Iowa	36	34	19.5%	24.1%	4.6%	23.6%
Kansas	17	15	23.9%	28.7%	4.8%	20.1%
Kentucky	48	47	15.2%	18.8%	3.6%	23.7%
Louisiana	44	45	17.7%	20.1%	2.4%	13.6%
Maine	29	27	20.7%	24.8%	4.1%	19.8%
Maryland	4	4	29.0%	33.8%	4.8%	16.6%
Massachusetts	1	1	31.3%	37.1%	5.8%	18.5%
Michigan	37	36	19.4%	23.9%	4.5%	23.2%
Minnesota	13	9	24.9%	30.5%	5.6%	22.5%
Mississippi	46	48	16.4%	18.2%	1.8%	11.0%
Missouri	30	32	20.5%	24.2%	3.7%	18.0%
Montana	21	21	22.2%	26.7%	4.5%	20.3%
Nebraska	23	19	21.9%	27.0%	5.1%	23.3%
Nevada	47	46	16.3%	18.9%	2.6%	16.0%
New Hampshire	7	8	26.6%	30.7%	4.1%	15.4%
New Jersey	5	5	28.5%	33.2%	4.7%	16.5%
New Mexico	25	30	21.8%	24.5%	2.7%	12.4%
New York	9	10	26.1%	30.0%	3.9%	14.9%
North Carolina	39	33	19.1%	24.2%	5.1%	26.7%
North Dakota	27	23	21.2%	25.7%	4.5%	21.2%
Ohio	40	39	19.0%	23.3%	4.3%	22.6%
Oklahoma	34	40	19.8%	21.9%	2.1%	10.6%
Oregon	20	18	22.8%	27.0%	4.2%	18.4%
Pennsylvania	28	25	20.9%	25.5%	4.6%	22.0%
Rhode Island	14	13	24.7%	28.9%	4.2%	17.0%
South Carolina	42	41	17.8%	21.5%	3.7%	20.8%
South Dakota	35	31	19.8%	24.5%	4.7%	23.7%
Tennessee	41	42	17.9%	21.4%	3.5%	19.6%
Texas	22	28	22.1%	24.7%	2.6%	11.8%
Utah	16	17	24.0%	27.4%	3.4%	14.2%
Vermont	8	7	26.4%	31.7%	5.3%	20.1%
Virginia	6	6	26.8%	31.8%	5.0%	18.7%
Washington	12	11	25.1%	29.5%	4.4%	17.5%
West Virginia	50	50	13.8%	16.5%	2.7%	19.6%
Wisconsin	33	26	20.1%	24.9%	4.8%	23.9%
Wyoming	31	37	20.4%	23.4%	3.0%	14.7%
Nation			22.7%	26.5%	3.8%	16.7%

CSUS Applied Research Center, July 2005
Data Source: National Center for Higher Education Management Systems; U.S. Census, Summary File 3
NOTE: Table does not include the District of Columbia; however, the District of Columbia is included in the totals for the Nation.

Figure A-20 B

PERCENT OF TOTAL POPULATION 25 TO 64 YEARS OF AGE WITH A BACHELOR'S DEGREE OR HIGHER, SORTED BY ABSOLUTE GROWTH 1990 TO 2000

				Growth 1990 - 2000	
Rank	*State*	*1990*	*2000*	*Absolute*	*Percent*
1	Massachusetts	31.3%	37.1%	5.8%	18.5%
2	Minnesota	24.9%	30.5%	5.6%	22.5%
3	Colorado	29.2%	34.7%	5.5%	18.8%
4	Vermont	26.4%	31.7%	5.3%	20.1%
5	Nebraska	21.9%	27.0%	5.1%	23.3%
6	North Carolina	19.1%	24.2%	5.1%	26.7%
7	Illinois	24.0%	29.0%	5.0%	20.8%
8	Virginia	26.8%	31.8%	5.0%	18.7%
9	Georgia	21.2%	26.1%	4.9%	23.1%
10	Wisconsin	20.1%	24.9%	4.8%	23.9%
11	Kansas	23.9%	28.7%	4.8%	20.1%
12	Maryland	29.0%	33.8%	4.8%	16.6%
13	New Jersey	28.5%	33.2%	4.7%	16.5%
14	South Dakota	19.8%	24.5%	4.7%	23.7%
15	Iowa	19.5%	24.1%	4.6%	23.6%
16	Pennsylvania	20.9%	25.5%	4.6%	22.0%
17	Michigan	19.4%	23.9%	4.5%	23.2%
18	North Dakota	21.2%	25.7%	4.5%	21.2%
19	Montana	22.2%	26.7%	4.5%	20.3%
20	Washington	25.1%	29.5%	4.4%	17.5%
21	Ohio	19.0%	23.3%	4.3%	22.6%
22	Oregon	22.8%	27.0%	4.2%	18.4%
23	Rhode Island	24.7%	28.9%	4.2%	17.0%
24	Maine	20.7%	24.8%	4.1%	19.8%
25	New Hampshire	26.6%	30.7%	4.1%	15.4%
26	Indiana	17.4%	21.4%	4.0%	23.0%
27	Idaho	19.3%	23.3%	4.0%	20.7%
28	New York	26.1%	30.0%	3.9%	14.9%
29	Connecticut	30.9%	34.7%	3.8%	12.3%
30	Florida	20.2%	23.9%	3.7%	18.3%
31	Missouri	20.5%	24.2%	3.7%	18.0%
32	South Carolina	17.8%	21.5%	3.7%	20.8%
33	Kentucky	15.2%	18.8%	3.6%	23.7%
34	Delaware	23.3%	26.9%	3.6%	15.5%
35	Tennessee	17.9%	21.4%	3.5%	19.6%
36	Utah	24.0%	27.4%	3.4%	14.2%
37	Hawaii	25.4%	28.7%	3.3%	13.0%
38	Alabama	17.7%	20.8%	3.1%	17.5%
39	Arkansas	15.1%	18.2%	3.1%	20.5%
40	Wyoming	20.4%	23.4%	3.0%	14.7%
41	Arizona	21.8%	24.7%	2.9%	13.3%
42	California	25.2%	28.0%	2.8%	11.1%
43	West Virginia	13.8%	16.5%	2.7%	19.6%
44	New Mexico	21.8%	24.5%	2.7%	12.4%
45	Texas	22.1%	24.7%	2.6%	11.8%
46	Nevada	16.3%	18.9%	2.6%	16.0%
47	Louisiana	17.7%	20.1%	2.4%	13.6%
48	Oklahoma	19.8%	21.9%	2.1%	10.6%
49	Mississippi	16.4%	18.2%	1.8%	11.0%
50	Alaska	23.8%	25.5%	1.7%	7.1%
	Nation	22.7%	26.5%	3.8%	16.7%

CSUS Applied Research Center, July 2005

Data Source: National Center for Higher Education Management Systems; U.S. Census Summary File 3

NOTE: Table does not include the District of Columbia; however, the District of Columbia is included in the totals for the Nation.

Figure A-20 C

PERCENT OF TOTAL POPULATION 25 TO 64 YEARS OF AGE WITH A BACHELOR'S DEGREE OR HIGHER, SORTED BY PERCENT GROWTH 1990 TO 2000

				Growth 1990 - 2000	
Rank	*State*	*1990*	*2000*	*Absolute*	*Percent*
1	North Carolina	19.1%	24.2%	5.1%	26.7%
2	Wisconsin	20.1%	24.9%	4.8%	23.9%
3	South Dakota	19.8%	24.5%	4.7%	23.7%
4	Kentucky	15.2%	18.8%	3.6%	23.7%
5	Iowa	19.5%	24.1%	4.6%	23.6%
6	Nebraska	21.9%	27.0%	5.1%	23.3%
7	Michigan	19.4%	23.9%	4.5%	23.2%
8	Georgia	21.2%	26.1%	4.9%	23.1%
9	Indiana	17.4%	21.4%	4.0%	23.0%
10	Ohio	19.0%	23.3%	4.3%	22.6%
11	Minnesota	24.9%	30.5%	5.6%	22.5%
12	Pennsylvania	20.9%	25.5%	4.6%	22.0%
13	North Dakota	21.2%	25.7%	4.5%	21.2%
14	Illinois	24.0%	29.0%	5.0%	20.8%
15	South Carolina	17.8%	21.5%	3.7%	20.8%
16	Idaho	19.3%	23.3%	4.0%	20.7%
17	Arkansas	15.1%	18.2%	3.1%	20.5%
18	Montana	22.2%	26.7%	4.5%	20.3%
19	Kansas	23.9%	28.7%	4.8%	20.1%
20	Vermont	26.4%	31.7%	5.3%	20.1%
21	Maine	20.7%	24.8%	4.1%	19.8%
22	West Virginia	13.8%	16.5%	2.7%	19.6%
23	Tennessee	17.9%	21.4%	3.5%	19.6%
24	Colorado	29.2%	34.7%	5.5%	18.8%
25	Virginia	26.8%	31.8%	5.0%	18.7%
26	Massachusetts	31.3%	37.1%	5.8%	18.5%
27	Oregon	22.8%	27.0%	4.2%	18.4%
28	Florida	20.2%	23.9%	3.7%	18.3%
29	Missouri	20.5%	24.2%	3.7%	18.0%
30	Washington	25.1%	29.5%	4.4%	17.5%
31	Alabama	17.7%	20.8%	3.1%	17.5%
32	Rhode Island	24.7%	28.9%	4.2%	17.0%
33	Maryland	29.0%	33.8%	4.8%	16.6%
34	New Jersey	28.5%	33.2%	4.7%	16.5%
35	Nevada	16.3%	18.9%	2.6%	16.0%
36	Delaware	23.3%	26.9%	3.6%	15.5%
37	New Hampshire	26.6%	30.7%	4.1%	15.4%
38	New York	26.1%	30.0%	3.9%	14.9%
39	Wyoming	20.4%	23.4%	3.0%	14.7%
40	Utah	24.0%	27.4%	3.4%	14.2%
41	Louisiana	17.7%	20.1%	2.4%	13.6%
42	Arizona	21.8%	24.7%	2.9%	13.3%
43	Hawaii	25.4%	28.7%	3.3%	13.0%
44	New Mexico	21.8%	24.5%	2.7%	12.4%
45	Connecticut	30.9%	34.7%	3.8%	12.3%
46	Texas	22.1%	24.7%	2.6%	11.8%
47	California	25.2%	28.0%	2.8%	11.1%
48	Mississippi	16.4%	18.2%	1.8%	11.0%
49	Oklahoma	19.8%	21.9%	2.1%	10.6%
50	Alaska	23.8%	25.5%	1.7%	7.1%
	Nation	22.7%	26.5%	3.8%	16.7%

CSUS Applied Research Center, July 2005

Data Source: National Center for Higher Education Management Systems; U.S. Census Summary File 3

NOTE: Table does not include the District of Columbia; however, the District of Columbia is included in the totals for the Nation.

Figure A-21

PERCENT OF NATIONAL TOTAL POSTSECONDARY EDUCATED POPULATION AGES 25 TO 64, SORTED BY ABSOLUTE GROWTH 1990 TO 2000

	State Rank		Number of Degrees		% National Share		Change in % National Share	
State	1990	2000	1990	2000	1990	2000	Absolute	Percent
California	1	1	3,920,794	4,960,210	13.54%	12.69%	-0.8489%	-6.27%
New York	2	2	2,469,479	3,031,927	8.53%	7.76%	-0.7706%	-9.04%
Connecticut	17	23	542,052	633,867	1.87%	1.62%	-0.2501%	-13.36%
Pennsylvania	6	6	1,262,189	1,618,658	4.36%	4.14%	-0.2173%	-4.99%
New Jersey	7	7	1,178,203	1,510,429	4.07%	3.87%	-0.2042%	-5.02%
Massachusetts	9	9	984,225	1,266,113	3.40%	3.24%	-0.1594%	-4.69%
Ohio	8	8	1,050,515	1,375,311	3.63%	3.52%	-0.1090%	-3.00%
Louisiana	24	27	366,883	453,353	1.27%	1.16%	-0.1070%	-8.45%
Maryland	12	14	754,444	979,588	2.61%	2.51%	-0.0990%	-3.80%
Oklahoma	28	30	310,572	383,381	1.07%	0.98%	-0.0916%	-8.54%
District of Columbia	42	44	121,624	133,155	0.42%	0.34%	-0.0793%	-18.89%
Illinois	4	5	1,405,474	1,876,455	4.85%	4.80%	-0.0525%	-1.08%
Missouri	18	18	527,434	695,491	1.82%	1.78%	-0.0419%	-2.30%
Hawaii	38	39	148,551	184,130	0.51%	0.47%	-0.0419%	-8.16%
Mississippi	32	33	199,592	256,581	0.69%	0.66%	-0.0328%	-4.76%
Rhode Island	40	42	125,473	156,862	0.43%	0.40%	-0.0320%	-7.38%
West Virginia	41	41	124,306	157,883	0.43%	0.40%	-0.0253%	-5.90%
Kansas	29	29	293,033	385,924	1.01%	0.99%	-0.0245%	-2.42%
Alaska	48	49	71,645	87,739	0.25%	0.22%	-0.0229%	-9.27%
North Dakota	50	50	64,913	80,545	0.22%	0.21%	-0.0181%	-8.07%
Maine	39	40	131,085	170,334	0.45%	0.44%	-0.0169%	-3.73%
New Hampshire	37	37	156,753	207,431	0.54%	0.53%	-0.0106%	-1.96%
Iowa	31	31	263,219	351,922	0.91%	0.90%	-0.0086%	-0.94%
Alabama	25	25	357,797	479,734	1.24%	1.23%	-0.0082%	-0.66%
Wyoming	51	51	47,134	60,451	0.16%	0.15%	-0.0081%	-4.98%
Vermont	47	47	76,930	103,476	0.27%	0.26%	-0.0009%	-0.34%
Delaware	46	46	81,198	111,260	0.28%	0.28%	0.0043%	1.52%
Michigan	10	10	919,153	1,242,388	3.17%	3.18%	0.0046%	0.14%
South Dakota	49	48	65,034	89,855	0.22%	0.23%	0.0053%	2.37%
Nebraska	35	35	169,263	230,857	0.58%	0.59%	0.0061%	1.05%
New Mexico	36	36	165,598	226,334	0.57%	0.58%	0.0072%	1.26%
Montana	45	45	89,045	124,462	0.31%	0.32%	0.0109%	3.56%
Arkansas	34	34	173,497	247,079	0.60%	0.63%	0.0330%	5.51%
Indiana	21	20	486,079	672,835	1.68%	1.72%	0.0429%	2.56%
Kentucky	30	28	283,168	402,094	0.98%	1.03%	0.0509%	5.21%
Idaho	44	43	92,847	149,622	0.32%	0.38%	0.0622%	19.40%
Wisconsin	20	19	492,125	690,065	1.70%	1.77%	0.0661%	3.89%
South Carolina	27	26	314,970	454,656	1.09%	1.16%	0.0756%	6.95%
Virginia	11	11	888,699	1,232,454	3.07%	3.15%	0.0844%	2.75%
Utah	33	32	179,284	276,360	0.62%	0.71%	0.0880%	14.21%
Minnesota	16	17	554,517	783,613	1.92%	2.01%	0.0900%	4.70%
Oregon	26	24	333,404	488,862	1.15%	1.25%	0.0994%	8.64%
Tennessee	22	21	450,271	649,844	1.56%	1.66%	0.1078%	6.93%
Nevada	43	38	108,010	206,361	0.37%	0.53%	0.1550%	41.55%
Washington	15	15	639,751	932,352	2.21%	2.39%	0.1762%	7.98%
Texas	3	3	1,903,464	2,646,909	6.57%	6.77%	0.1990%	3.03%
Arizona	23	22	397,353	638,515	1.37%	1.63%	0.2615%	19.06%
Colorado	19	16	518,874	819,906	1.79%	2.10%	0.3060%	17.07%
North Carolina	14	13	658,552	1,044,025	2.27%	2.67%	0.3971%	17.46%
Georgia	13	12	715,372	1,148,814	2.47%	2.94%	0.4690%	18.98%
Florida	5	4	1,319,497	1,968,126	4.56%	5.04%	0.4790%	10.51%
Nation			28,953,344	39,078,598	100.00%	100.00%		

CSUS Applied Research Center, July 2005
Data Sources: National Center for Higher Education Management Systems; U.S. Census

Research Methods

Our examination of the economic implications of California's educational trends on future workforce composition arises in partial response to a number of studies on how demographic changes in educational trends effect workforce composition and related economic activities. For example, studies published by the Bureau of Labor Statistics address national trends in workforce development, which include examinations into the occupation-educational attainments of the population; a widely-known seminal work, *The New Texas Challenge: Population Change and the Future of Texas* (Murdock, Steve H., et al.: 2003), recognizes the effects of demographic changes on economic activities; the Public Policy Institute of California recently published several reports examining variations of similar issues with specific reference to California; and a recent report conducted by the UC Berkeley Survey Research Center, *Return on Investment: Educational Choices and Demographic Change in California's Future* (Brady et al.: 2005), also adds to the increasing body of research of potential economic consequences associated with California's future demographic and educational trends. Under these premises, the Campaign for College Opportunity engaged the CSUS Applied Research Center in studying the projected economic impacts of educational trends specific to higher education on the future industrial-occupational economic composition of California.

Much of what follows in this summary of research methods, data sources, and terminology is explained in various levels of detail throughout this report.

The Applied Research Center utilized a variety of research methods in examining the projected economic impacts of occupations requiring higher education. These methods include an economic impact analysis using the IMPLAN Professional 2.0 econometric impact modeling program to estimate the economic impacts of employing a higher educated workforce; examining secondary data sources on international, national, and statewide indicators of workforce educational attainment and other related indicators; assessing the capacities of the segments of higher education in California; and conducting a limited literature review of academic and nonacademic journals and publications available through associations of related significance to our study. The following describes our research methods and data sources in further detail.

The IMPLAN Economic Impact Models

To examine the projected economic impacts of occupations requiring higher education, the Applied Research Center utilized an economic impact modeling program – IMPLAN Professional 2.0 – developed by the Minnesota IMPLAN Group in association with US government departments and agencies for the purpose of measuring the economic impacts of government decisions. The IMPLAN model is superior to other economic impact methods in that it has a complete specification of the economy including non-business sectors such as households, all levels of government, and trade flows.

In this analysis, the IMPLAN model's specifications were calibrated for the California economy using the latest data available through the Minnesota IMPLAN Group, which is based on the Employment Security 202 (ES-202) data series that also provides the benchmark for the EDD industry employment projections and the NAICS industry data used in the base-case impact models generated for this study. The IMPLAN model specifications used in our analysis contain two kinds of base-level data: (1) The production function for each industry in California including the interactions between suppliers and consumers of products and services, and (2) The current IMPLAN input-output econometric matrix coefficients for 2002 on the employment and output levels of industry sectors in California.

Since the IMPLAN models created and employed in this analysis use the most recent input-output matrix coefficients for California (2002), an important caveat underlies our projections of the economic impacts in 2022: All impacts are estimated using an econometric matrix describing industry interrelationships and associated levels of output in 2002. That is, the underlying production functions for each industry are still based on the 2002 ES-202 data and other national databases which identify industry relationships in terms of inputs and outputs. As a result, the two base-case economic impact models created for this analysis represent 2022 in terms of overall productive activity, output, and industry structure, but the specific details of the interrelationship of industry production and structure represent 2002 relationships.

The base-case economic impact models created in IMPLAN to estimate the impacts of the higher educated workforce in 2022 include two further modifications. First, levels of employment and industry outputs used in our analysis were set to reflect the industry or occupational projections of the California economy in 2022 using two data sources: the BLS/EDD industry-occupational employment projections (entered in IMPLAN in terms of employment) and the UCLA Anderson Forecasts of economic output (entered in IMPLAN in terms of industry output). The two models are referred to as the base-case models, or the BLS/EDD and UCLA models throughout this report, and represent the BLS/EDD and UCLA projections in their aggregate structures and levels of activity. These two base-case models were then used to measure the potential impacts of the top higher educated occupations and the three higher education attainment scenarios developed by the UC Berkeley Survey Research Center. The top higher educated occupations impact analysis and higher education attainment scenarios are described in further detail later in this chapter.

Second, the IMPLAN model sectors are different and more detailed than the sectors reported by the BLS/EDD and UCLA data sources. To correct for this dissimilarity, we aggregated conversions between NAICS and IMPLAN using the *2001 IMPLAN Sectoring Scheme for NAICS.*

In general, IMPLAN provides data for three levels of impacts on several economic measures. All are defined below as they relate to this study.

The three levels of impacts are the direct, indirect, and induced economic impacts. These impacts are reported for each economic measure analyzed by IMPLAN. We are ultimately concerned with total economic impacts in this analysis, which is the sum of all three levels of impacts.

Levels of Economic Impacts:

> Direct Impacts: Measures the level of economic activity created by the industry sectors whose change is being measured. In this study, the direct impacts include the economic value (i.e. salaries and wages) created directly by occupations requiring higher education and are exemplified as impacts to industry sectors which employ higher educated occupations.
>
> Indirect Impacts: Also identified as supplier impacts, indirect impacts define the economic activity of businesses which supply goods and services to the direct sector. For our analysis, indirect impacts include the economic impacts generated by firms, industries, and occupations that supply adjunct support and are necessary to occupations requiring higher education.
>
> Induced Impacts: Also defined as consumption impacts, induced benefits include all other economic impacts generated through consumption effects created when the higher educated workforce and indirect supporting workforce spend their wages on retail, housing, medical, and other consumer activities.

The economic measures examined in this study include the total output, value added, employment, and state and local tax revenues generated by the employment of the higher educated workforce. Each economic measure is summarized in IMPLAN by the direct, indirect, and induced impacts described above.

Economic Measures:

> Total Industry Output: A gross measure of total revenues, which includes all sources of income, sales, and other aggregate measures that firms or industries use to indicate their total level of business activity. In this analysis, total industry output represents the total economic value of employing the higher educated workforce.
>
> Value Added: A net measure of the value created over and above the cost of inputs. This measure is close to a measure of profitability or productivity, and the aggregate for all industries is the Gross State Product (GSP).
>
> State & Local Tax Revenues: Measures the generation of taxes based on analysis over all industries. This measure is one of generation, not allocation, and should not be viewed as an actual accounting analysis of local government revenues from employing the higher educated occupations. The method for allocating tax

revenues between State and local governments cannot be accurately predicted in California's environment of rapidly changing tax structure.

Employment: Shows the number of full-time equivalent jobs created as a result of the change being measured and is the only measure not stated in terms of dollars. For our study, employment measures the total number of jobs created by employing the higher educated workforce.

Selection of Higher Educated Occupations and Conversion of Occupational Employment to Industry Employment

In addition to the BLS/EDD and UCLA base-case impact models which describe projections of the aggregate economy, the Applied Research Center also estimated the economic impacts of the top higher educated occupations, or the "higher educated workforce" in 2022. To accomplish this we calculated employment by industry for the top higher educated occupations in 2022, assessed the economic impacts of the higher educated workforce using both base-case models (BLS/EDD and UCLA), and compared the results to the base-case models of the aggregate economy to isolate the economic impacts of the higher educated workforce. Our aim in selecting the top higher educated occupations in our workforce analysis was to include only the occupations that constitute the bulk of the higher educated workforce in California and at the same time exclude those occupations where the marginal increase in the percent of California's higher educated workforce was minimal.

To identify the higher educated occupations, we used the Employment Development Department's *California Occupational Projections 2002-2012* table. The *Occupations Projections* table is the most concise source available that provides education and training requirements by occupation as well as employment projections by occupation. The table was used to both quantify estimates of employment by required levels of higher education in California and to select the top 40 occupations requiring a bachelor's degree or higher and top 5 occupations requiring an associate's degree in 2022. We chose to select the top "40+5" higher educated occupations to narrow the scope of the workforce analysis. Figure B-1 shows the occupations selected for inclusion in the 40+5 higher educated workforce impact analysis.

Figure B-1
Top Higher Educated Occupations, 2022

Occupational Title	Employment	% CA Higher Educated Workforce	Required Education
Total Education, Training, & Library Occupations	**830,200**	**14.87%**	
Elementary School Teachers, Except Special Education	237,600	4.26%	BA/BS Degree
Secondary School Teachers, Except Special & Voc. Education	169,300	3.03%	BA/BS Degree
All Other Teachers, Primary, Secondary, & Adult	150,400	2.69%	BA/BS Degree
All Other Postsecondary Teachers	89,400	1.60%	Master's Degree
Preschool Teachers, Except Special Education	71,000	1.27%	BA/BS Degree
Middle School Teachers, Except Special & Voc. Education	64,900	1.16%	BA/BS Degree
Graduate Teaching Assistants	47,600	0.85%	BA/BS Degree
Total Management Occupations	**801,000**	**14.35%**	
General & Operations Managers	309,900	5.55%	BA/BS + Experience
Financial Managers	82,300	1.47%	BA/BS + Experience
Sales Managers	69,000	1.24%	BA/BS + Experience
Computer & Information Systems Managers	61,400	1.10%	BA/BS + Experience
Chief Executives	61,200	1.10%	BA/BS + Experience
Property, Real Estate, & Community Association Managers	54,900	0.98%	BA/BS Degree
Marketing Managers	46,500	0.83%	BA/BS + Experience
Administrative Services Managers	45,300	0.81%	BA/BS + Experience
Engineering Managers	39,200	0.70%	BA/BS + Experience
Education Administrators, Elementary & Secondary School	31,300	0.56%	BA/BS + Experience
Total Business & Financial Operations Occupations	**620,500**	**11.11%**	
All Other Business Operations Specialists	269,100	4.82%	BA/BS Degree
Accountants & Auditors	151,200	2.71%	BA/BS Degree
Management Analysts	89,900	1.61%	BA/BS + Experience
Purchasing Agents, Except Wholesale, Retail, & Farm Products	40,000	0.72%	BA/BS Degree
Cost Estimators	36,400	0.65%	BA/BS Degree
Loan Officers	33,900	0.61%	BA/BS Degree
Total Computer and Mathematical Occupations	**573,600**	**10.27%**	
Computer Software Engineers, Applications	138,700	2.48%	BA/BS Degree
Computer Software Engineers, Systems Software	96,900	1.74%	BA/BS Degree
Computer Support Specialists	89,200	1.60%	Associate Degree
Computer Systems Analysts	88,400	1.58%	BA/BS Degree
Computer Programmers	59,200	1.06%	BA/BS Degree
Network & Computer Systems Administrators	58,300	1.04%	BA/BS Degree
Network Systems & Data Communications Analysts	42,900	0.77%	BA/BS Degree
Total Healthcare Practitioners and Technical Occupations	**388,300**	**6.95%**	
Registered Nurses	315,200	5.65%	Associate Degree
All Other Health Professionals & Technicians	38,800	0.69%	Associate Degree
Pharmacists	34,300	0.61%	Professional Degree
Total Architecture and Engineering Occupations	**152,500**	**2.73%**	
Civil Engineers	41,400	0.74%	BA/BS Degree
Electronics Engineers, Except Computer	40,600	0.73%	BA/BS Degree
Electrical & Electronic Engineering Technicians	36,300	0.65%	Associate Degree
All Other Engineers	34,200	0.61%	BA/BS Degree

* Table continues on the next page.

Figure B-1 (Continued)
Top Higher Educated Occupations, 2022

Occupational Title	Employment	% CA Higher Educated Workforce	Required Education
Total Legal Occupations	**121,200**	**2.17%**	
Lawyers	84,600	1.52%	Professional Degree
Paralegals & Legal Assistants	36,600	0.66%	Associate Degree
Sales & Related Occupations	**74,200**	**1.33%**	
Insurance Sales Agents	38,300	0.69%	BA/BS Degree
Securities, Commodities, & Financial Services Sales Agents	35,900	0.64%	BA/BS Degree
Community and Social Services Occupations	**73,300**	**1.31%**	
All Other Counselors, Social, & Religious Workers	39,000	0.70%	BA/BS Degree
Child, Family, & School Social Workers	34,300	0.61%	BA/BS Degree
Total Personal Care and Service Occupations	**56,900**	**1.02%**	
Recreation Workers	56,900	1.02%	BA/BS Degree
Life, Physical, and Social Science Occupations	**31,900**	**0.57%**	
Market Research Analysts	31,900	0.57%	Master's Degree
Total	**3,723,600**	**66.69%**	

CSUS Applied Research Center, August 2005
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012*
NOTE: Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

Figure B-1 shows that the top 40+5 occupations will comprise 66.7 percent of California's total higher educated workforce in 2022. Examining this further, over half (57.6 %) of projected demand for higher educated occupations in California will be for the following general occupational categories:

- Education, Training, and Library Occupations (14.87 %)
- Management Occupations (14.35 %)
- Business and Financial Operations Occupations (11.11 %)
- Computer and Mathematical Occupations (10.27 %)
- Healthcare Practitioners and Technical Occupations (6.95 %)

After identifying the top higher educated occupations in 2022, we used the *California Industry-Occupational Matrix 2002-2012* to convert employment by occupation to employment by industry, a necessary conversion for input into IMPLAN.

However, the *Occupational Projections* table used in selecting the higher educated occupations and the *Industry-Occupational Matrix* are not entirely compatible sources. The employment estimates and projections of the two sources do not reconcile. Reasons for the incompatibility are that some occupations are suppressed for confidentiality or because the data collected by EDD did not meet the release standards of the projections units responsible for producing the data sources. For the most part, the *Occupational*

Projections table reports higher employment estimates and projections than the *Industry-Occupational Matrix.*

Another inconsistency affecting the analysis of the higher educated workforce concerns the occupation "Graduate Teaching Assistants," which does not appear in the *Industry-Occupational Matrix* because the data was suppressed for both confidential reasons and for EDD minimal data requirements. Consequently, the higher educated workforce impact analysis is actually based on the top 39 occupations requiring bachelor's degrees of higher and top 5 occupations requiring associates degrees, and is sometimes referred to as the "39+5" higher educated workforce in this report. Nonetheless, the economic impacts of the higher educated workforce described in this report are based on the 39+5 higher educated occupations. Figure B-2 compares the employment projections of both the *Occupational Projections* table and the *Industry-Occupational Matrix* for the top higher educated occupations in 2022.

Figure B-2
Comparison of Employment Projections for the Top Higher Educated Occupations, 2022

Occupational Title	Projected Employment in 2022	
	EDD Occ. Projections	EDD Ind-Occ Matrix
Total Education, Training, & Library Occupations	**830,200**	**776,300**
Elementary School Teachers, Except Special Education	237,600	235,100
Secondary School Teachers, Except Special & Voc. Education	169,300	168,200
All Other Teachers, Primary, Secondary, & Adult	150,400	149,300
All Other Postsecondary Teachers	89,400	89,000
Preschool Teachers, Except Special Education	71,000	70,600
Middle School Teachers, Except Special & Voc. Education	64,900	64,100
Graduate Teaching Assistants	47,600	No Data
Total Management Occupations	**801,000**	**762,500**
General & Operations Managers	309,900	302,200
Financial Managers	82,300	79,600
Sales Managers	69,000	65,500
Computer & Information Systems Managers	61,400	57,300
Chief Executives	61,200	53,000
Property, Real Estate, & Community Association Managers	54,900	54,200
Marketing Managers	46,500	43,000
Administrative Services Managers	45,300	42,800
Engineering Managers	39,200	33,500
Education Administrators, Elementary & Secondary School	31,300	31,400
Total Business & Financial Operations Occupations	**620,500**	**543,700**
All Other Business Operations Specialists	269,100	210,900
Accountants & Auditors	151,200	147,600
Management Analysts	89,900	82,800
Purchasing Agents, Except Wholesale, Retail, & Farm Products	40,000	36,200
Cost Estimators	36,400	32,800
Loan Officers	33,900	33,400

* Table continues on the next page.

Figure B-2 (Continued)
Comparison of Employment Projections for the Top Higher Educated Occupations, 2022

Occupational Title	Projected Employment in 2022	
	EDD Occ. Projections	EDD Ind-Occ Matrix
Total Computer and Mathematical Occupations	**573,600**	**544,600**
Computer Software Engineers, Applications	138,700	134,200
Computer Software Engineers, Systems Software	96,900	91,400
Computer Support Specialists	89,200	86,900
Computer Systems Analysts	88,400	84,000
Computer Programmers	59,200	54,800
Network & Computer Systems Administrators	58,300	54,600
Network Systems & Data Communications Analysts	42,900	38,700
Total Healthcare Practitioners and Technical Occupations	**388,300**	**371,800**
Registered Nurses	315,200	313,700
All Other Health Professionals & Technicians	38,800	26,800
Pharmacists	34,300	31,300
Total Architecture and Engineering Occupations	**152,500**	**132,900**
Civil Engineers	41,400	40,300
Electronics Engineers, Except Computer	40,600	31,400
Electrical & Electronic Engineering Technicians	36,300	34,300
All Other Engineers	34,200	26,900
Total Legal Occupations	**121,200**	**117,100**
Lawyers	84,600	82,300
Paralegals & Legal Assistants	36,600	34,800
Sales & Related Occupations	**74,200**	**74,000**
Insurance Sales Agents	38,300	38,100
Securities, Commodities, & Financial Services Sales Agents	35,900	35,900
Community and Social Services Occupations	**73,300**	**73,900**
All Other Counselors, Social, & Religious Workers	39,000	39,500
Child, Family, & School Social Workers	34,300	34,400
Total Personal Care and Service Occupations	**56,900**	**56,500**
Recreation Workers	56,900	56,500
Life, Physical, and Social Science Occupations	**31,900**	**30,200**
Market Research Analysts	31,900	30,200
Total	**3,723,600**	**3,483,500**

CSUS Applied Research Center, August 2005
Data Source: California Employment Development Department, *California Occupational Projections 2002-2012* and *California Industry-Occupational Matrix 2002-2012*
NOTE: Estimates for 2022 were calculated using a linear projection of the 2002 – 2012 change.

Thus, the *Industry-Occupational Matrix* represents a more conservative estimate of projected demand for the top higher educated occupations.

Using the *Industry-Occupational Matrix*, we calculated the employment structure by industry for California and for the top higher educated occupations in 2022. Accordingly, the *Industry-Occupational Matrix* was the data source for the industry employment used

in the BLS/EDD base-case impact model and in estimating industry employment for the 39+5 higher educated occupations. The 39+5 higher educated occupations industry-employment conversion was then applied to both the BLS/EDD and UCLA base-case models to isolate the economic impacts of the higher educated workforce in relation to the two aggregate estimates of California's projected economic structures.

Estimating Impacts of the Higher Education Attainment Scenarios

After calibrating IMPLAN for the two base-case economic impact models (BLS/EDD and UCLA), we estimated the economic impacts of three higher education attainment scenarios developed by the UC Berkeley Survey Research Center and published in their report "*Return on Investment: Educational Choices and Demographic Change in California's Future*" (Brady et al.: 2005). The higher education scenarios were developed as part of their long-range projections of California's population, which included a number of disaggregations of demographic components, one of which was educational attainment. Four educational attainment scenarios were created based on assumptions about the higher education system itself and on the educational successes of a number of population components. The four educational attainment scenarios developed by the Survey Research Center are defined as follows:

> Current Conditions Scenario: Considered the base-case scenario, it anticipates that current trends in high school completions and college-going rates continue into the future.
>
> Fixed Capacity Scenario: This scenario is based on a fixed capacity of the educational system where the State's capacity to provide higher education does not increase over time, but remains static at present levels.
>
> Increased College-Going Scenario: This scenario is based on steadily increasing high school completions and college-entry or college-going rates.
>
> Increased College Completion Scenario: This scenario includes both increased college-going and college completion rates.

The Survey Research Center scenarios analyze the effects of population educational attainment on a number of fiscal and social outcomes. Our research uses the same scenarios to estimate the projected economic impact of changes to the availability of the higher educated workforce on economic output. Since the outputs of the Survey Research Center's scenarios are for population education attainment, and our economic analysis is based on the educational composition of the workforce, we had to make an assumption about the long-term relationship between population and workforce levels of educational attainment. Our approach was to assume a constant ratio between the population with bachelor's degrees or higher to the workforce with bachelor's degrees or higher. By changing the workforce attainment in each scenario by the same percentage as the change

in population attainment for each scenario, the ratio of population to workforce attainment remained constant.

We then estimated the impacts of three of the educational attainment scenarios – the Fixed Capacity, Increased College-Going, and Increased College Completion scenarios – and compared the results to both BLS/EDD and UCLA base-case models of California's projected economic structure, which we equated to the "Current Conditions" scenario. The outcomes were compared to measure the relative economic impacts of the three educational attainment scenarios.

Secondary Data Sources and their Applications

The use of secondary data sources was fundamental to this study. Many data sets and matrices were used to analyze the economic impacts of the higher educated workforce and educational attainment scenarios; to analyze California's relative standing in higher educated population compared to other states and nations; in assessing the number of degrees granted in California; and in evaluating the capacities of the segments of higher education in California to name only a few of the areas in which this report relied heavily on secondary data. In effect, this study uses secondary data sources in the entirety of its analysis.

In this section, we briefly touch on an important discussion that arose during the research process that has subsequently shaped our analysis – why use data defined and constructed by BLS assumptions (i.e. the BLS/EDD data used in our report) versus Census data. Lastly, we also briefly list and describe the main data sources used in this report, as well as their application, limitation, and implications.

BLS Data vs. Census Data

The BLS and Census data give substantially different views of the occupation-education relationship, primarily because they are collected using different survey populations and for different applications.

The data on occupation-education available through the Census comes from the Public Use Microdata Sample (PUMS), which is based on a small sample of all census respondents who are selected to complete the long census survey instead of the much shorter general survey. The long form survey asks additional questions about the respondent's employer, type of business, the type of work, and activities performed. The Census then codes industry and occupation from the SIC/NAICS and SOC classifications, a process which is subject to a number of opportunities for error. The resulting relationship between industry and occupation can then be correlated by the researcher with educational attainment.

Essentially, the Census gathers data from the respondents themselves. Analysts contacted regarding issues between Census and BLS derived data state there are problems in the accuracy of Census, or population derived data, due to the respondent's lack of

knowledge about occupational and industry categories (SOC and NAICS). This is especially prominent in the process of converting respondent derived data to occupational and industry categories. One problem is "occupation inflation" or "title inflation" where respondents use job titles such as "technicians" for occupations which would otherwise be categorized under SOC as "repairers," or mechanics who describe themselves as "engineers." The coding process then assigns incorrect occupations or industries which are embodied in subsequent analysis. It is likely these types of errors are more frequent for respondents with lower levels of educational attainment, although this assumption has not been tested.

However, BLS data is gathered in a completely different manner and is ultimately based on employer survey responses rather than population or employee surveys. BLS data results from a process that utilizes multiple employer surveys and employer generated data sources. Employment by industry data is derived from the Current Employment Statistics (CES) program, a very large monthly survey of employers. Data gathered through CES is based on industry, not occupation. Furthermore, CES data is benchmarked annually to conform to the ES-202 (also called Quarterly Census of Employment and Wages or QCEW) data, which is based on the tax documentation of employers with employees covered by unemployment insurance. This step normalizes the CES data for sample irregularities and provides more detailed industry sector information.

Employment by occupation data is collected from the Occupational Employment Statistics (OES) program; an annual survey of non-farm employers conducted by EDD under the guidance of BLS. The OES is the source of employment and earnings data used in occupational projections by BLS. The survey for California covers roughly 111,000 business establishments and 800 occupations. This data, also called the "Staffing Patterns" data, provides data on the industry distribution of occupations in terms of the Standard Occupational Classification (SOC) which defines occupations according to the type of work performed and the required skills, education, training, or credentials required.

The following summarizes the basic characteristics of Census and BLS derived data:

<u>Census Derived Data:</u>

- Based on population responses, not employer responses.
- Covers those employed by any definition (self-employed, family businesses, consultants, informal or unreported employment, etc.).
- The survey elicits descriptions of occupation and industry of employment from survey respondents, which are subsequently interpreted and coded through the Census data gathering process.

BLS Derived Data:

- Based on large samples of employer-derived data, not employee or population data.
- Employment by industry definitions are based on a rigorous methodology linked to employer taxation documentation.
- Employment by occupation definitions are based on a national standard (SOC), which includes the educational requirements considered standard for the occupation.
- The educational requirements required by occupations are most frequently applied by employers to new employees and are not necessarily retroactively applied to existing employees. As a result, BLS occupation-education data is more representative of the future workforce than of the present workforce.

Both Census and BLS data sources present complications for further analyses. Long-term analysis of Census data is difficult because of changes in definitions and in the way data is gathered and assembled. Industry, occupation, and educational attainment definitions changed substantially for the 1990 census from the 1970 and 1980 census categories. While the industry and occupation data can be standardized among censuses using matrices provided by the Census, educational attainment cannot, making it necessary to formulate assumptions about whether completing four years of college is the same as attaining a BA degree, etc. As a result, projections based on these series are vulnerable to errors due to definitional changes between censuses.

Another difficulty for researchers concerning BLS data is that their methodology is not very transparent, especially the derivation of educational requirements. Unlike the Census data, a researcher cannot go back to the "raw" data to confirm an outcome. It is also likely that while BLS employment definitions include occupations other than wage and salary employees, the industry occupation data is primarily based on wage and salary data, which excludes several rapidly growing sectors of the economy. (Examples include self-employed contract workers in business and professional occupations and industry sectors, and undocumented "day workers" common in agriculture, landscaping, construction, and maintenance related industry sectors.)

There are significant differences between Census and BLS data sources on occupations, industries, and educational attainment, which forced us to select among the data sources early in the study. The primary difference between the two sources results from differences in the population parameters from which the data is collected, that is, the Census collects data from employees (i.e. population) and BLS collects data from employers (i.e. industry). The main advantage to using BLS derived data, or employer-

derived data, is it is closer to current hiring and occupational evaluation processes, making it more consistent with the objectives of this study.

Furthermore, BLS has projected occupational and industry employment out to 2012, and has defined educational requirements for occupations (which is not necessarily the same as educational attainment). These are appropriately called "prevailing" or "significant" educational requirements, and do not display the range of actual or existing educational levels among employees in an occupation. BLS data, however, does serve as an indicator of employer's expectations of the education required of the future labor force. Again, BLS data is closer to the objectives of this study than Census data.

Additionally, BLS projections are based on a number of studies and assumptions that address labor force availability and occupation/industry demands. Some of the assumptions evaluated in BLS projections include the following:

Labor Force Availability:

- Population Projections
- Labor Force Participation Rates
- International Migration
- Workforce Separations

Occupation and Industry Demand:

- Overall US GDP Expansion
- Trends in Industry Composition
- Productivity
- Unemployment Rates

(Sources: **Berman, Jay. *Industry Output and Employment Projections to 2012*, Monthly Labor Review, Feb 2004; **Horrigan, Michael W. *Employment Projections to 2012: Concepts and Context*, Monthly Labor Review, Feb. 2004; **Toossi, Mitra. *A Century of Change: The US Labor Force, 1950-2050*, Monthly Labor Review, May 2002)

Thus, we came to the conclusion that the level of rigor and methodological expertise embedded in the BLS/EDD data series and projections were more appropriate for the purposes of this study than the Census data, for the BLS/EDD data series are more focused on the intended issues of examination for this study. While the Census data can potentially provide much greater descriptive detail, it is not without its errors and inconsistencies. More important, the Census data has not proven to be useful for projecting occupation and industry structures, which means that using Census data would require replicating the BLS studies, and even then there is no assurance that more accurate or useful projections would result.

Our Projections of the BLS/EDD Data

Another data-related issue arises from the difficulties of accurately projecting either the industrial or occupational structure of California far into the future. It is noted that many industries and occupations now very important to California did not exist 25 to 50 years ago, and attempts to project these changes with accuracy have rarely been successful. It has been shown that previous BLS occupational projections were especially inaccurate at the individual occupation level.

The methods used in this study rely heavily on the BLS occupational data, and even extends trends embedded in the BLS/EDD projections far beyond their projection horizons. There is certainly no assurance that methods employed in this study will be very accurate in projecting the long run occupational composition.

However, our methods of projecting the industry/occupation structure using BLS/EDD data are much less sensitive to the detailed industry/occupation structure of California in the distant future. Our method included creating an aggregate of education intensive occupations and industries – what we call the higher educated or education-intensive occupations, workforce, or sectors – and based our econometric impact analysis on this aggregated structure. We identified the education-intensive occupations and examined their aggregate impact on the California economy for a number of time intervals (2002, 2012, and 2022). The extension of this aggregate was used to measure the economic impact compared to the base-case scenarios of California's projected economic structure. Essentially we created an aggregate occupation, the "education-intensive sector," and in doing so, we projected only the size of the aggregate and not the individual occupations.

Lastly, the sources of the BLS/EDD projections used in this study were the *California Occupational Projections 2002-2012* and the *California Industry-Occupational Matrix 2002-2012*, both described in further detail in the summary of data sources. The projection period for both data sources is 2002-2012. We extended the BLS/EDD projections to 2022 using a linear projection of the change between 2002 and 2012.

Summary of Major Data Sources:

This study uses many sources of secondary data to validate its conclusions. What follows briefly lists and describes the main data sources used in this report, as well as their application, limitation, and implications for our analysis.

Data Sources Used in the Economic Impact Analyses:

- *California Occupational Projections 2002-2012* – Developed by the California Employment Development Department, this table provides employment estimates and projections to 2012 for approximately 700 occupations[2] and is based on survey data gathered for the BLS Occupational Employment Statistics (OES) program. One advantage of the *Occupational Projections* table is that it includes

[2] Occupations with less than 1,000 employed in 2002 are excluded from EDD's estimates and projections.

the education and training levels required for occupations in California. For this reason, the *Occupational Projections* table was used to select the top higher educated occupations to include in our economic impact analysis and for analyses addressing projections of workforce educational requirements.

- *California Industry-Occupational Matrix 2002-2012* – A matrix also developed by the Employment Development Department that gives employment estimates and projections to 2012 by occupation and industry. Since many occupations are employed by more than a few industries, the matrix breaks the interrelationship down, listing estimates and projections by occupation for all industries employing those occupations. One shortcoming is the original versions of the matrix used for this report contained an error: the staffing patterns for NAICS super-sectors 54 (Professional, Scientific, and Technical Services) and 55 (Management of Companies and Enterprises), and the tail end of 53 (Real Estate and Rental and Leasing) were entered into the matrix twice. After confirming with EDD that this was indeed an error, we deleted all duplicate staffing patterns for these industry super-sectors. In so doing, 1,280 entries were deleted, leaving a total of 14,131 entries included in our analysis. The *Industry-Occupational Matrix* was the source used in our analysis to convert the occupation data into industry data for the economic impact analysis.

- *IMPLAN Professional 2.0* – IMPLAN is an economic impact modeling program developed by the Minnesota IMPLAN Group that has the capability to estimate local economic impacts of a variety of economic events. IMPLAN analyzes the local economic potential of events as direct, indirect, and induced economic benefits. These economic benefits are further examined in our analysis as employment, output, value added, and state/local tax impact measures. The models employed in this analysis use the most recent IMPLAN input-output matrix for California available (2002), which sets up an important caveat to our economic impact projections for 2022: the impacts were estimated using a matrix describing industry relationships in 2002. (For a more detailed discussion on the use of IMPLAN in this study, please refer to the section on "The IMPLAN Economic Impact Models" in this chapter.)

- *UC Berkeley Survey Research Center, Higher Education Attainment Scenarios* – In addition to estimating the economic impacts of two versions of California's projected economic structure (BLS/EDD and UCLA base-case models) and the higher educated workforce, we estimated the economic impacts of three higher education attainment scenarios developed by the UC Berkeley Survey Research Center and published in their report "*Return on Investment: Educational Choices and Demographic Change in California's Future*" (Brady, Henry et al.: 2005). The higher education scenarios were developed as part of their long-range projections of California's population, which included a number of disaggregations of demographic components, one of which was educational attainment. The three educational attainment scenarios borrowed from the Survey Research Center and used in our economic impact analysis are the Fixed

Capacity, Increased College-Going, and Increased College Completion Scenarios. (Refer to the section in this chapter on "Estimating Impacts of the Higher Education Attainment Scenarios" for a more detailed discussion of this data source.)

- *UCLA Anderson Forecasts 2004-2030* – The UCLA Anderson Forecast produces economic forecasts of California and the Nation's economies. The forecasts produced by the UCLA Anderson Forecast are acknowledged for being nonbiased and are often cited in research. For this study, the 2002 and 2022 forecasts of the California economy published in the "September 2004 Report" were examined and used in our economic impact analyses.

Data Sources Used in the Comparisons of Educational Attainment:
Some of the data sources used in the chapter on educational attainment comparisons were the same sources used in economic impact chapters of this report. As such, only the data sources distinct to the chapter on educational attainment comparisons are discussed here.

- *California Department of Finance, Population Estimates and Projections* – The population estimates and projections produced by the California Department of Finance's Demographic Research Unit provide annual estimates of the State's population and projections of the population out 50 years in advance. The estimates and projections produced by the Unit are used as inputs into the State budgetary process. For this study, we used the *Race/Ethnic Population with Age and Sex Detail* estimates for 1980 through 2003.

- *California Postsecondary Education Commission, Student Data Tables & "Data at a Glance" Tables* – CPEC is the State governing body responsible for coordinating higher education in California. We used several data tables generated by CPEC in both the educational attainment and community colleges chapters. The "Student Data" tables provide data on enrollment and degrees granted by institution, as well as other indicators. We examined data from these tables for 1980 through 2003. The "Data at a Glance" tables are "snapshots" of commonly sought data on a number of postsecondary indictors such as number of institutions, enrollment by postsecondary segment, and several other indicators.

- *Center for International Development at Harvard, International Data on Educational Attainment* – A research center housed at Harvard University, CID is Harvard's leading multidisciplinary research center on sustainable international development. We examined CID's publicly available data on international educational attainment for this study. The dataset uses the perpetual inventory method in estimating postsecondary educational attainment using census and survey data from the United Nations Educational, Scientific and Cultural Organization (UNESCO) and other sources as benchmark stocks, and new school enrollments as flows added with suitable time-lags on 138 countries worldwide (Barro and Lee 3).

- *National Center for Higher Education Management Systems* – In some cases we utilized Census 2000 data available from NCHEMS for our analyses on national educational attainment comparisons and the effects of migration on educational attainment in California. NCHEMS is a private nonprofit organization committed to assisting college and university administrators in research and management related issues. We used NCHEMS data based on Census summary file 3 (SF-3) data for the analysis on national educational attainment comparisons, and 5% Public Use Microdata Sample (PUMS) data for the analysis on domestic migration. Both SF-3 and PUMS data are sample data that includes details on educational attainment and migration respectively. Census data is population-derived data, which is a departure from the methodology employed by most of the data sources used in this study.

Data Sources Used in Analysis of California Community Colleges:
Some of the data sources used in the analysis on the role of California Community Colleges in the California economy were the same sources used in the economic impact and educational attainment chapters of this report. As such, only the data sources distinct to the analysis of community colleges are discussed here.

- *Current Population Survey, March 2005 Supplement* – The CPS is a monthly survey on labor force characteristics of the population and is conducted by the Census and Bureau of Labor Statistics. Like the Census data used in this study, CPS data is population-derived data. The March Supplement, also known as the Annual Social and Economic (ASEC) Supplement, asks respondents additional information on employment and income not covered in the monthly CPS. We used this data source to analyze the present-day occupations and industries that holders of associate degrees work in.

- *California Community Colleges Chancellor's Office, Student Demographic & Student Program Awards Tables* – We obtained and analyzed data from the California Community Colleges Chancellor's Office on community colleges in California. We looked at enrollment by academic status, number of associate degrees granted, and types of awards granted. Unlike the CPEC data, which is data collected by the state regulatory body responsible for overseeing higher education in California, this data source represents the CCC's internal data on their own programs and awards.

- *California Postsecondary Education Commission, "Transfer Pathways" Data Tables* – CPEC is the State governing body responsible for coordinating higher education in California. We used several data tables generated by CPEC in both the educational attainment and community colleges chapters. For the analysis on transfer enrollment, we used the "Transfer Pathways" data, which provides data on transfer enrollment by institution.

Literature Review: An Annotated Discussion of Relevant Topics

Modern economic, technological, social, and global changes are increasing the need for a workforce with higher levels of educational preparation. Over the last half of the twentieth century, and more specifically the 1990s, the rise of information, communications, and advanced technologies has fundamentally changed how and where we produce. The steady introduction of new technologies continues to change production systems, which are increasingly more mechanized and inclined toward processes that rely on information and its dissemination.

At the same time, occupational trends across the nation parallel this shift in how we produce; the composition of the workforce shows a decrease in our reliance on conventional industrial and production work and an increase in knowledge-based information and service work. The difference in required educational preparation of the workforce between the two approaches to production is considerable: industrial and production work has traditionally been blue-collar work requiring less education and more on-the-job training, and knowledge-based information and service work is increasingly requiring higher education. Consequently, the shift in the occupational composition of the workforce toward support for a knowledge-based economy is changing the level of workforce education and skills needed to fill the occupations in growing demand.

In a knowledge-based economy, economic value is created from the application of knowledge and intellectual content that requires a workforce capable of working with intangible systems and the "ability to understand information, react to it, manage it and use it…" (Klotz [No Year Given]: 3-4). The development of knowledge-based information services has had an affect across industry sectors, where more entry-level occupations and occupations in industries that traditionally employ workers with lower levels of education now require higher levels of education and technological knowledge than occupations in the recent past. Employers need workers with computer skills, knowledge of information systems, and the abilities to adapt to technological and resulting social changes. Thus, what essentially drives the growth in demand for a workforce with higher education originates from both the occupational upgrading of educational requirements in response to changing technologies and social conditions over time, and from the more general shift in production toward reliance on knowledge-based information and service work. It is already evident that a knowledge-based economy demands an educated workforce, and the availability of an educated workforce is important to the future of the US and California economies.

National Industry-Employment Outlook

The leading research authority on national employment statistics and analysis in the U.S. is the Bureau of Labor Statistics. Since WWII, BLS has examined workforce prospects and has steadily increased its scope and application of labor force analyses. BLS

projections are of particular interest to this study since the economic impact analysis is based largely on BLS/EDD employment projections for 2002 to 2012. BLS projections are based on the economic assumption of full-employment in the long-run where labor markets clear (no excess or shortage in supply or demand for employment). BLS projections nonetheless provide reasonable measures for policy makers and researchers to orient themselves in making decisions about the future needs of the workforce, and to individuals in decisions about how to situate oneself in the workforce. To give some context to the state-level impact analysis (i.e. the BLS/EDD base-case impact model of the aggregate economy) that ensues in this report, the following briefly summarizes the Bureau of Labor Statistics' national industry employment outlook to 2012. In general, the economic indicators affecting employment look good even though they follow a period where economic growth was considered healthier (1992 to 2002).

According to BLS macroeconomic projections, the U.S. economy is anticipated to grow from $9.4 trillion to $12.6 trillion between 2002 and 2012 (1996 chain-weighted dollars), which represents an annual growth rate in real gross domestic product of 3.0 percent (Horrigan 2004: 3). This is slightly lower than the annual growth in GDP between 1992 and 2002, which was 3.2 percent annually (Berman 2004: 59). Broken-down into the components of GDP, investment (fixed and nonresidential) is anticipated to grow the quickest over the projection period at 6.6 percent annually. Next are exports at 5.7 percent annually, and consumption – accounting for nearly 70 percent of total economic output throughout the period – expected to grow 2.8 percent (the author does not report on government spending) (Berman 2004: 59).

BLS reports the labor force is expected to increase from 144.9 million to 162.3 million from 2002 to 2012, growing 1.1 percent annually (Horrigan 2004: 3). On the other hand total employment – or the estimated number of jobs needed to support the anticipated economic activity – is expected to grow at an annual rate of 1.4 percent, increasing 21.3 million from 144.0 to 165.3 million jobs. (Berman 2004: 58). The productivity of labor is expected to increase 2.1 percent annually (Berman 2004: 59; Horrigan 2004: 3, 5), which is a little slower than the most recent peak in the growth of labor productivity that occurred between 1995 and 2001 (2.3 percent annually), but still considered strong growth within an historic context (Horrigan 2004: 5).

Most of the growth in national employment will be accounted for by increases in non-farm wage and salary employment, which is expected to grow from 91 percent of total employment in 2002 to 92.4 percent of total employment in 2012, and at a rate of 1.5 percent annually (Berman 2004: 55-9). This is also slightly slower growth than what was experienced between 1992 and 2002, which posted an annual growth rate of 1.8 percent in non-farm wage and salary employment. Most of the growth in national employment will be assumed by the service-providing sector.

The industries that comprise the service-providing sector represent the largest concentration of the fastest growing industries in terms of employment, anticipated to grow at an annual rate of 1.8 percent and increase its share of total employment from 75.3 to 78.2 percent. Yet most of these industries have also seen declining rates of growth in

employment since the 1992 to 2002 period. Even so, the following service-providing industries are among the fastest growing industries, growing faster than total employment during the 2002 to 2012 projections period (1.4% annually): Education and Health Services (2.8%); Professional and Business Services (2.7%); Transportation and Warehousing (2.0%); Information (1.7%); Leisure and Hospitality (1.7%); and Other Services (1.5%) (Berman 2004: 59).

The second branch of non-farm wage and salary employment, the goods-producing sector (excluding Agriculture) is projected to grow at a much less robust rate, 0.3 percent annually between 2002 and 2012, and will decline in its share of total employment from 15.7 to 14.1 percent. But unlike the service-providing sector, the goods-producing sector is slated for stronger growth between 2002 and 2012 than it had during the 1992 to 2002 period (0.2%). However, this growth does not necessarily translate into more jobs; in fact the only industry projected to post positive employment gains within the goods-producing sector is Construction, which is expected to grow 1.4 percent, yet the growth is less than what the industry encountered between 1992 and 2002 (3.9%). Both Mining and Manufacturing are expected to have negative growth (-1.3% and -0.1% respectively), though less negative than the previous period (-1.7% and -0.9%), showing that continued employment losses in these industries are slowing. Of the three industries comprising the goods-producing sector, Manufacturing is projected to retain the largest share of total employment at 9.2 percent in 2012, followed by Construction (4.7%) and Mining (0.3 %) (Berman 2004: 59).

The following employment sectors accounted for 7.7 percent of total employment in 2012, but are not included in non-farm wage and salary employment: Agriculture (1.2% of total employment); non-agriculture self-employed and unpaid family workers (5.5%); secondary wage and salary jobs in agricultural production and household industries (0.1%); and secondary jobs as self-employed or unpaid family workers (0.9%) (Berman 2004: 59). However, since this study is concerned with non-farm wage and salary employment, it is not relevant to discuss these extraneous sources of employment here.

To briefly summarize, the service-providing sector is projected to be the largest and fastest growing sector in terms of national employment and is the sector where three out of four U.S. jobs are anticipated (Berman 2004:60). However, growth in the service-providing sector between 2002 and 2012 is projected to be less vigorous than the growth experienced between 1992 and 2002. Comprised of fewer industries, the goods-producing sector is expected to grow slightly between 2002 and 2012; growth that will be largely due to employment increases anticipated in the Construction industry.

National Trends in Demand for a Higher Educated Workforce

In a recent series of articles published by BLS summarizing the national job outlook by education, BLS projects an additional 56 million job openings for first-time occupational entrants between 2002 and 2012 (Lacey and Crosby 2004-5:17-8). Of the 56 million jobs, 14 million are anticipated for first-time college-educated entrants, totaling 25 percent of national employment growth between 2002 and 2012. The majority of job openings for

college-educated workers will arise from the need to fill new, recently created jobs, and the remainder of job openings will be needed to replace retiring college-educated workers. 6.8 million – or 49 percent of job openings for college-educated workers are for "pure-college" occupations where a minimum of 60 percent of current workers ages 25 to 44 have at least a bachelor's degree. However, some occupations tracked by BLS are considered "mixed-education" occupations that employ workers with a variety of levels of education, but where at least 20 percent of current workers have a bachelor's degree or higher. BLS projects that 23 million of the 56 million job openings for first-time workforce entrants will be for mixed-education occupations, and 33 percent of these occupations are expected to be filled by college-educated workers.

BLS also asserts that the most rapid growth in newly created jobs is expected in occupations employing mostly college-educated workers (20-4). BLS expects pure-college occupations to grow 22 percent between 2002 and 2012, which is 7 percent faster than the projected average growth for all occupations (15 percent between 2002 and 2012). The greatest growth in pure-college and mixed-education occupations is anticipated in the following general occupational fields: Business, Finance, and Sales; Computers and Engineering; Counseling, Social Services, and Psychology; Education; and Healthcare.

The distribution and composition of the higher educated workforce is expected to advance along with economic trends influencing the complexities of business and finance; the sales of scientific and technical products; and in the engineering of technologies such as computers, biotechnology, and the environment (24). In addition to the above occupational trends, the following socioeconomic trends are also expected to influence the distribution and composition of the higher educated workforce: an increase in projected demand for social support services and counseling; the need to replace retiring educators and education administrators, and to increase the education workforce overall in response to mandated policies affecting class size and population growth; and in healthcare where the need for college-educated practitioners and technicians is upheld by the overall aging of the population (24-5). The projections suggest the impending knowledge-based economy will rely on a higher educated workforce with a composition to support the above trends.

But what is the job outlook for workers who do not have at least a bachelor's degree? BLS estimates 42 million job openings for first-time occupational entrants who do not hold bachelor's degrees (Moncarz and Crosby 2004-5: 3), or the equivalent of three out of every four job openings. Approximately 27 million of these job openings will be for workers with a high school diploma or less, with the remaining 15 million openings projected to be filled by first-time workforce entrants with some college or associate degrees (3). However, even among the jobs projected to be available to workers with less than a bachelor's degree, BLS does emphasize that some of these jobs are expected to be filled by first-time college educated workers (6). To remain competitive in the labor market and secure possibilities for advancement, BLS encourages individuals with less than a higher education (i.e. a bachelor's degree) to add to their skills by increasing work or volunteer experience, taking high school or college courses that prepare for an

occupation, completing certificate programs, and by contacting local labor market information offices to find the most successful training programs in the area and what occupations are in greatest demand (6). The following occupational fields are those expected to have the greatest number of openings for first-time occupational entrants with less than a bachelor's degree: Office and Administrative Support (several million job openings); Healthcare (3 million openings); Construction (2 million openings); Police and Other Protective Service (1.4 million openings); Education and Childcare (1.2 million openings); and Computers (444 thousand openings) (7-11). However, many of the occupational openings require certificates or associate degrees, or extensive on-the-job training.

California's Industry-Employment Outlook

California's industry-employment outlook is largely the subject of this analysis and is covered in detail in Chapter 2 of this report. Even so, it is sensible to recap what others believe is in store for California's future industry-employment composition.

Fortunately limited analyses of California's occupational projections by EDD's Labor Market Information Division exist. According to the EDD-LMID *Occupational Outlook for 2002-2012*, EDD estimates that by 2012, employment in California will reach just over 17 million jobs, with approximately 2.7 million new jobs created in response to growth in industries (Coleman 9/29/05 email). An additional 3.5 million jobs are expected due to workforce separations or occupational changes. The top 50 largest growing occupations in terms of absolute growth will make up over 53 percent of all job growth, and include a variety of occupations such as "Computer Engineers, Teachers, Registered Nurses, and Lawyers to Construction Trades, Retail Services, and Office and Administrative Support." The top 50 fastest growing occupations in terms of percent growth are clustered in Healthcare, Construction, Education, and Computer occupational fields. While the required education and experience for these occupations vary, half of these occupations are expected to require at least an associate degree. The majority of the highest paying jobs – those paying over $20 per hour – require college degrees.

Still others have attempted to articulate California's future industry-employment outlook. In a recent study by the Public Policy Institute of California, *California 2025: Taking on the Future*, PPIC examines key issues important to the state's future economic success (PPIC 2005). The range of the PPIC forecasts study future demands on the state's infrastructure – particularly schools, transportation, water systems, and issues over their equitable distribution; changes in population demographics; efficacy of state governance and political processes; and an examination of the public's opinion on these issues. PPIC affirms that California is rapidly changing, and how we choose to allocate our resources will have a major impact on the state's future economic strength, workforce preparation, and overall quality of life. With respect to workforce preparation, PPIC compares economic and employment projections from various sources (UCLA Anderson Forecasts, EDD, CCSCE, DOT, PPIC, and Cogs) to arrive at assumptions about the future workforce demands of industry and whether California will be in the position to supply this workforce.

More pertinent to our study are the PPIC projections of the educational attainment of the workforce by industry-employment composition. Comparable to national trends, projections examined by PPIC reveal workforce demand to follow the continued shift in industry from goods-producing to service-providing sectors (PPIC 2005: 56-8). To examine the shift in the educational attainment of the workforce accompanying the shift in industry, PPIC uses 2002 Current Population Survey (CPS) data on the educational attainment of the workforce and applies it to the UCLA Anderson and EDD industry employment forecasts. PPIC considers two projections scenarios (2000 to 2020): a static scenario where the distribution of educational attainment within industries is held constant and a dynamic scenario where the distribution of educational attainment continues along established trends (69). The static scenario predicts in both cases (UCLA and EDD) a decline in demand for workers with a high school diploma or less and an increase in demand for workers with higher education – some college through professional degrees and PhDs (70). The dynamic scenario predicts the same, yet the magnitudes of the declines and increases are greatly intensified (70-1).

Moreover, PPIC rejects the common belief that service jobs are low skill and low paying jobs (71-3). Using CPS data (1992 and 2002), PPIC looks at the educational attainment of workers by industry and concludes that "the services industry, which is the fastest growing, makes use of relatively more-educated workers, and the trend is toward increased education in this industry" (73). At the same time, their analysis upholds assumptions about the educational attainment of workers in the goods-producing industries – "mining, construction, manufacturing, and trade use relatively less-educated workers…" (71). Finance, Insurance, and Real Estate industries use the highest concentration of workers with a bachelor's degree (28.1% of all workers within the industry held bachelor's degrees in 2002), followed by the Services industry (25.0%) and Public Administration (24.1%) (72). In general, the overall trend across most industries has been toward increased levels of education (72-3).

PPIC asserts that possibly the "most serious challenge to California's economic future," apart from the infrastructure needs of a growing population, "is the need for a more educated workforce" (75).

Other Factors Influencing Industry-Employment Composition

BLS identifies several factors expected to influence national industry output and employment composition during the projection period (2002 to 2012): "the discovery of new technologies and their integration into the production process; the influence of global competition; the different emphases placed by industries on research and development, marketing, and output customization; and the outsourcing of functions to firms in other domestic industries or abroad, among others" (Horrigan 2004: 8). Summarized further, the main factors likely to influence national industry-employment composition are research and development, technological change, globalization, and outsourcing.

The influence these factors have on industry and employment compositions are well covered topics. PPIC thoroughly covers potential socioeconomic developments that could affect the state's future economic growth, infrastructure, and workforce demands in its study *California 2025: Taking on the Future* (PPIC 2005: 59), and places these issues in the context of "threats to forecasts," listing them as sources that may potentially alter the accuracies of projections. They are nonetheless potential events with economic consequences for California. PPIC lists four general socioeconomic events with such influence, "international economic relations, technological change, political decisions, and infrastructure investment and utilization" (59-61). "Sharp technological changes," such as biotechnology and nanotechnology could potentially change the state's industrial and employment compositions in addition to changing trade and international relations. Changes in international relations, immigration policies, and the economic development of Mexico and the Pacific Rim could also influence the state's industrial and employment compositions. Political decisions regarding infrastructure investments could influence economic growth (economic growth also affects economic composition) and our more general capacity for growth. These are just some of the potential issues outlined by PPIC that could significantly influence California industry and workforce compositions, including our capacity for future growth (59-62).

A report published by the Economist Intelligence Unit, an international economic research firm, discusses trends in the globalization and outsourcing of a specific knowledge-based activity: research and development activities (Borzo 2004). Several factors contribute to the globalization and outsourcing of R&D activities including decreased barriers to international business; the need to place product development in large, newly emerging markets (primary examples are China and India); the Internet; increasing use of English as a common language; demand for skilled researchers; large operating costs that increase the likelihood of collaboration; and the general increase in the number of global locations capable of supporting research and development. While some of these factors cannot be influenced by local industry and employment compositions – such as situating R&D efforts in the markets for which the products developed are intended – some factors contributing to the drive to outsource R&D activities can be controlled – for example, ensuring a local workforce with levels of education and skills that make it capable of supplying R&D activities.

While every industrial economy is familiar with the outsourcing of goods-producing industries (the primary example is manufacturing), the outsourcing of higher level service-providing industries is a relatively new outcome of globalization. The outsourcing of R&D provides only one example of potential challenges to local knowledge-based industry employment. Other knowledge-based industry employment subject to outsourcing in the 21st century include those that produce communications and information technologies, financial and insurance services, customer service and data entry occupations.

California's Changing Demographics, Statewide Educational Attainment, and Meeting the State's Future Workforce Needs

In addition to research and development, technological change, globalization, and outsourcing; population characteristics also influence the composition of industry employment. Changes in characteristics such as the ethnic composition, age structure, and growth of California's population are predicted to have an impact on future workforce composition. Furthermore, it is expected that with the shift in industry composition from goods-producing to service-providing industries – that is, towards an economy increasingly dominated by knowledge-based services – there will also be greater employment demand for a higher educated workforce. Cultural differences in propensities for completing higher education; greater rates of population growth anticipated among demographic groups with historically low-levels of education; the aging and ensuing retirement of a large portion of today's experienced workforce; and challenges faced by the public education system are poised to negatively affect the future supply of California's higher educated workforce and industry-employment composition. Responding to these demographic challenges by increasing statewide educational attainment is essential to California's future economy.

Many of the studies examined for this literature review share a common concern for the anticipated population growth among ethnic groups with historically low-levels of education (Baldassare and Hanak 2005: 11; Brady et al. 2005: 11; PPIC 2005: 4-6). For example, in testifying before the California State Assembly Select Committee on Adult Education, Deborah Reed of PPIC summarizes the demographic makeup of California's least educated population – those with less than a ninth grade education and those with no high school diploma or GED (Reed 2003: 4). Even though California ranks similar or even better than national averages of working-age adults ages 19 to 64 with low levels of education by ethnic and racial groups, California's population is composed of greater shares of groups with low education. Taken as a whole, California maintains a higher percentage of working-age adult populations with low levels of education than the nation. More specifically, when compared to national averages, California's population is composed of greater shares of two demographic groups with historically low-levels of education – foreign born (Mexicans and Central Americans) and U.S. born Hispanics – and a smaller share of a relatively educated group – non-Hispanic whites (4).[3]

Furthermore, fertility rates are higher for women with lower levels of education, which makes these parents comparatively less educated than the working-age adult population as a whole (5). This has profound implications for the educational attainment of California's future population. Reed estimates that over one quarter of the State's children live in families where remedial or adult basic education would significantly

[3] 18 percent of California's working-age adult population (both men and women) are foreign born Hispanics compared to an average of 3 percent for the nation; 12 percent are U.S. born Hispanics compared to 4 percent in the nation; and 48 percent of working-age Californians are non-Hispanic whites compared to 73 percent in the nation (4). Another demographic group with relatively low-levels of education analyzed for the hearing was foreign born Southeast Asians, though their share of the population is not as great as Hispanics or non-Hispanic whites.

benefit the educational and economic outcomes of parents, and since "parental education is related to a child's cognitive development and school success…" increasing the educational attainment of heads-of-households with low-levels of education "can improve the well-being and educational attainment of the next generation" (6).

Additionally, the age structure of the workforce also creates concern over whether California will be able to supply the workforce necessary for future industry-employment demands. California's population is somewhat younger compared to the rest of US (Brady et al 2005: 13; McClellan and Holden 2001: 7), but with the impending retirements of a large share of today's experienced workforce (i.e. the baby-boomers), concerns over the age structure of the population and of the workforce are increasing in importance and are expected to affect the composition of the labor force in general. Three major issues concerning the age structure of the workforce and the general labor force from which it recruits were identified in a paper published by EDD's Labor Market Information Division (McClellan and Holden 2001), and are summarized here:

- The imminent increase in number and retirement of older workers.

- The generation immediately following the baby-boom – the "baby-bust" – is smaller in size, which creates problems in workforce replacement of retirees that is especially detrimental to experienced positions in the public sector and in professional, management, and technical occupations.

- The composition of the workforce will change from older/homogenous to younger/diverse.

Several recommendations can be made for addressing age in the workplace, for providing temporary solutions to workforce shortages, and for acknowledging workforce diversity. These include policies accommodating older workers, such as flexible benefits to address the different needs of an intergenerational workforce; recognizing age and cultural differences as the workforce becomes younger and more diverse; planning job transitions for experienced positions, especially for professional, management, supervisory, and technical positions; and considering foreign worker or employment-based immigration programs to address labor shortages (McClellan and Holden 2001: 11).

Public sector employment, particularly public education, may be hit hardest by the aging of the workforce (McClellan and Holden 2001: 6-7). An older workforce and secured retirement benefits will promote vast retirement in the public sector in approaching years. This will be particularly relevant to public education where the workforce is older than average and has options for early retirement (McClellan and Holden 2001: 6-7). Combined with the consequences of state hiring freezes in recent years, public sector employment is at risk for suffering from critical labor shortages.

Lastly, California's age structure is also expected to increase the State's dependency ratio (the ratio of dependents on social services to those employed), which is anticipated to

reach 65:100 by 2025 (Baldassare and Hanak 2005: 22; PPIC 2005: 36-7)[4] An increase such as this is likely to increase the demand for tax-supported social services at a time when the workforce is predicted to dwindle, in other words, when the taxpayer base is shrinking. Moreover, the demographic shift in age structure may complicate the equitable distribution of state resources, diverting funds normally spent on younger generations, such as education, to programs supporting the burgeoning senior population – a population know to be politically active and socially influential (Baldassare and Hanak 2005: 25).

Of related significance to meeting the State's future workforce needs are the challenges faced by California's public education system. There are issues at present over operating capacity in meeting increasing enrollment demands, which highlights the essential interaction between growth and infrastructure. For instance, an economy that relies on a higher educated workforce also relies on the higher education infrastructure that supports it (PPIC 2005: 53). Capacity related infrastructure issues combined with labor shortages in public education could worsen limitations in access to public higher education, putting the State at imminent risk of violating the 1960 Master Plan for Education that could potentially initiate subsequent changes to the governance of California's public education system (PPIC 2005: 180).

Education is Key to Closing Gaps in Inequality and Creating a More Prosperous State

Over the last three decades, the rates of return to education have been increasing for those with college degrees (that is, higher wage premiums paid) and decreasing for those with high school diplomas or less. This has been the trend across racial categories, though wage premiums are highest for non-Hispanic whites. If the trend continues and rates of return to education continue to increase for those with college educations and decrease for those with a high school diploma or less, then education-determined wage inequalities will widen. Those with low-levels of education will become relatively poorer than they are at present. The real value of wages for low-educated, low-earning workers are actually falling (Reed 2003: 7).

Policies to increase educational attainment would decrease poverty, reduce ethnic income and education-determined wage inequalities (reduce the polarization of the rates of return to education and wage premiums by raising the bottom ranks up), and improve the well-being of children through less poverty and better health in general. (Reed 2003: 7-12). Reed of PPIC asserts that California has the highest rate of poverty in the US (11), and since poverty rates are much higher for those with low-levels of education, California needs adult education programs (remedial/basic) to address the low-levels of education among specific racial groups (especially for immigrants) (5). Furthermore, those with low-levels of education have higher fertility rates, and increasing the education of these adults would improve outcomes for both parents and children (6, 12).

---

[4] For a more detailed examination of several projections of dependency ratios, including child dependency ratios, see UC Berkeley's Survey Research Center's report, *Return on Investment: Educational Choices and Demographic Change in California's Future* (49-50).

UC Berkeley's Survey Research Center found that increasing educational attainment – especially attainment in higher education – would positively increase personal income in the State and would therefore increase state income (Brady et al 2005: 10; 13; 63). The Survey Research Center examined two scenarios in their report, *Return on Investment: Educational Choices and Demographic Change in California's Future*, which describes the effects of increasing higher educational attainment beyond current trends that are worth consideration: the Increased College and Increased College Completion scenarios (105-107). Under both scenarios, the increased tax base resulting from increases in personal income associated with higher educational attainment, coupled with reduced reliance on state supported social services and incarceration/correctional costs (6; 13; 101), would pay for increased state expenditures for higher education "several times over" (107). Additionally, increasing educational attainment would not only improve the private and economic returns to the individual (necessary for increasing individual well-being), but also improve the social returns to society (better educated citizenry and lower welfare and incarceration/correctional costs). Lastly, increasing educational attainment has a generational effect, where increasing the educational attainment of parents increases the likelihood of younger generations completing higher levels of education in the future (see tables on "Progeny's Education" (46)).

What Might Happen if We Fail to Increase Educational Attainment?

Given the examination of the literature on the subject-matter of educational attainment and trends in projected workforce composition, it is logical to conclude that California will become poorer if we fail to increase the educational attainment of the population, especially among low-income and specific ethnic groups. Failure to increase educational attainment in the State will do nothing to curtail the increasing education-determined and racial wage inequalities that exist at present and show continued polarization in magnitude.

Also, issues if over operating capacity, budget cuts, and tuition increases threaten to limited access to public higher education in California, and puts the State at imminent risk of violating the 1960 Master Plan for Education by making the State unable to admit all eligible students to the appropriate systems of public higher education. This will limit California's ability to provide the workforce necessary to our future, which in turn will result in decreases in the State's tax base and consequently, decreases in funds for social services (i.e. transfer programs) and state infrastructure (i.e. roads, water, and schools) (Baldassare and Hanak 2005: 17).

Furthermore, current trends in increasing fees for higher education will eventually lead to decreasing enrollments, especially at California Community Colleges that serve the most disadvantaged students with the lowest levels of education. Low-levels of educational attainment will lead to increased difficulties in finding employment and lower paying jobs when employed for the most disadvantage segments of the population.

Lastly, according to the Survey Research Center's Fixed and Current Rates scenarios of educational attainment, failure to increase educational attainment in the State will only continue California's declines in its relative advantage over the Nation in average personal income, per capita personal income, and the rates of educational attainment for high school and college students (Brady et al 2005: 3-7; 105-7). Therefore, the consequences for failure to increase educational attainment is the perpetuation and potential increase in poverty rates for the least educated and an overall decline in the quality of life in the State.

Works Consulted

Baldassare, Mark and Ellen Hanak. "CA 2025: It's Your Choice." Public Policy Institute of California. San Francisco: PPIC, 2005.

Barro, Robert J. and Jong-Wha Lee. "International Data on Educational Attainment: Updates and Implications." National Bureau of Economic Research. Working paper 7911. Cambridge: NBER, 2000.

Berman, Jay M. "Industry Output and Employment Projections to 2012." U. S. Department of Labor, Bureau of Labor Statistics. Employment Outlook, 2002-12. Monthly Labor Review. Feb (2004): 55-79.

Brady, Henry et al. "Return on Investment: Educational Choices and Demographic Change in California's Future." Survey Research Center. Berkeley: UC Berkeley, 2005.

California Community Colleges. "Effects of Community College Degree/Certificate Completion on Post-Attainment Wage Progression." Research and Planning Unit. Sacramento: CCC, 2006.

Cheeseman Day, Jennifer and Kurt J. Bauman. "Have We Reached the Top? Educational Attainment Projections of the U.S. Population." U.S. Census Bureau, Population Division. Working Paper no. 43. Washington D.C.: Census Bureau, 2000.

Coastline Community College. "Occupational Trends Analysis, Master Planning Research." Draft. Chapter 2, Part 2. Fountain Valley, CA: June 2004.

Coleman, Laura. Email Correspondences. California Employment Development Department, Labor Market Information Division, Sacramento. 21 Aug. 2005 to 29 Sept. 2005.

Conklin Bueschel, Andrea. "The Missing Link: The Role of Community Colleges in the Transitions between High School and College." Working Paper. The Bridge Project: Strengthening K-16 Transition Policies. Stanford University, 2003.

Franco, Robert W. "The Civic Role of Community Colleges: Preparing Students for the Work of Democracy." Community College Resources. Campus Compact. Rhode Island: Brown University. <http://www.compact.org/.>

Horrigan, Michael W. "Employment Projections to 2012: Concepts and Context." U. S Department of Labor, Bureau of Labor Statistics. Employment Outlook, 2002-12. Monthly Labor Review. Feb (2004): 3-22.

Kasper, Henry. "The Changing Role of Community College." U.S.

Department of Labor, Bureau of Labor Statistics. Occupational Outlook Quarterly. Winter (2002-03): 14-21.

Lacey, Jill N. and Olivia Crosby. "Job Outlook for College Graduates." U.S. Department of Labor, Bureau of Labor Statistics. Occupational Outlook Quarterly. Winter (2004-05): 15-27.

Lopez, Elias S. "High-Growth Industries and Highly-Educated Workers in California." California Research Bureau. Sacramento: CRB, 2002.

Matheson, Nancy et al. "Education Indicators: An International Perspective." U.S. Department of Education and National Center for Research Statistics. NCES 96-003. Washington D.C.: 1996.

Mathur, Anita et al. "From Jobs to Careers: How California Community College Credentials Pay Off for Welfare Participants." Center for Law and Social Policy and California Community Colleges Chancellor's Office. Washington DC: CLASP, 2004.

McClellan, Judi L. and Richard Holden. "The New Workforce: Age and Ethnic Changes." California Employment Development Department, Labor Market Information Division. Sacramento: EDD-LMID, 2001.

Moncarz, Roger and Olivia Crosby. "Job Outlook for People Who Don't Have a Bachelor's Degree." U.S. Department of Labor, Bureau of Labor Statistics. Occupational Outlook Quarterly. Winter (2004-05): 2-13.

Moore, Colleen, and Nancy Shulock. "Variations on a Theme: Higher Education Performance in California by Region and Race." CSUS Institute for Higher Education Leadership and Policy. Sacramento: CSUS, 2005.

Murdock, Steve H., et al. The New Texas Challenge: Population Change and the Future of Texas. Texas: Texas A&M University, 2003.

National Center for Public Policy and Higher Education. "Measuring up 2004: The National Report Card on Higher Education." San Jose: NCPPHE, 2004.

Peralta Community College District. "Environmental Profile 2005." Office of Research and Development. Oakland: PCCD, Jan. 2005.

Public Policy Institute of California. "California 2025: Taking on the Future." Ellen Hanak and Mark Baldassare eds. San Francisco: PPIC, 2005.

- - -. "Getting to 2025: Can California Meet the Challenegs?" Research Brief. Issue 100 (2005).

Reed, Deborah. "The Growing Importance of Education in California." Public Policy Institute of California. San Francisco: PPIC, 2003.

Salzman, Harold. "Restructuring and Skill Needs: Will Firms Train?" The Annals of the American Academy of Political and Social Science. Eds. Robert Zemsky and Peter Cappelli. 559 (1998): 125-40.

Sen, Anindita, et al. "Comparative Indicators of Education in the United States and Other G8 Countries: 2004." U.S. Department of Education and the National Center for Education Statistics. Washington D.C.: NCES, 2005.

Shulock, Nancy, Colleen Moore, and Mary Gill. "Shared Solutions: A Framework for Discussing California Higher Education Finance." CSUS Institute for Higher Education Leadership and Policy. Sacramento: CSUS, 2005.

Smith Morest, Vanessa, et al. "The Role of Community Colleges in State Adult Education Systems." Working Paper. CAAL Community College Series. Council for the Advancement of Adult Literacy. New York: CAAL, 2004.

Toossi, Mitra. "A Century of Change: The US Labor Force, 1950-2050." U. S. Department of Labor, Bureau of Labor Statistics. Monthly Labor Review. May (2002): 15-28.

U.S. Department of Labor, Bureau of Labor Statistics. "Chapter 1: Educational Attainment Data Improve Occupational Analyses." Occupational Projections and Training Data, 2004-05 Edition. Washington D.C.: BLS, 2004.

- - -. "Employment Growth among Sectors in the United States, Japan, and Europe Based Upon Educational Attainment." Issues in Labor Statistics. Bulletin, Summary 95-7. July (1998).

- - -. "Growth of Jobs with Above Average Earnings Projected at All Educational Levels." Issues in Labor Statistics. Bulletin, Summary 94-2. May (1994).

- - -. "Health and Social Services Provide Rich Soil for New Occupations." Issues in Labor Statistics. Bulletin, Summary 96-5. Feb (1996).

- - -. "Job Openings for New Entrants in Occupations that Usually Require Postsecondary Education or More than 1 Year of Training, Projected 2000-10." Occupational Outlook Quarterly. Summer (2002): 40.

- - -. "New and Emerging Occupations." Issues in Labor Statistics. Bulletin, Summary 01-06. Dec (2001).

- - -. "New Occupations Emerging Across Industry Lines." Issues in Labor Statistics. Bulletin, Summary 95-11. Nov (1998).

United States. Educational Attainment and Success in the New Economy: An Analysis of Challenges for Improving Hispanic Students' Achievement. Washington D.C.: Office of the President, Clinton Administration, 2000.

VanDerLinden, Kim. "A Portrait of America's Community College Students, Credit Student Analysis: 1999 and 2000." Faces of the Future. American Association of Community Colleges. Washington: AACC, 2002.

Zemsky, Robert. "Labor, Markets, and Educational Restructuring." The Annals of the American Academy of Political and Social Science. Eds. Robert Zemsky and Peter Cappelli. 559 (1998): 77-90.

Data Sources and Methodology

American Association of Community Colleges. National Community Colleges Statistics. Dates of Access: Nov. – Dec. 2005. <http://www.aacc.nche.edu/>.

Barro, Robert J. and Jong-Wha Lee. "International Data on Educational Attainment: Updates and Implications." Research datasets. Center for International Development. Cambridge: Harvard U, 2000.

Brady, Henry et al. "Return on Investment: Educational Choices and Demographic Change in California's Future." Higher Education Attainment Scenarios. Survey Research Center. Berkeley: UC Berkeley, 2005.

California Community Colleges Chancellor's Office. Student Demographics Tables. Dates of Access: Oct. – Dec. 2005. <http://www.cccco.edu/>.

- - - . Student Program Awards Tables. Dates of Access: Oct. – Dec. 2005. <http://www.cccco.edu/>.

California Employment Development Department, Labor Market Information Division. "California Occupational Projections 2002-2012." <http://www.labormarketinfo.edd.ca.gov/>.

- - - . "California Industry-Occupational Matrix 2002-2012." <http://www.labormarketinfo.edd.ca.gov/>.

California Department of Finance. "Race/Ethic Population with Age and Sex Detail." 1970-2050 Population Estimates and Projections. <http://www.dof.ca.gov/>.

California Postsecondary Education Commission. Student Data Tables. Access Dates: June – Dec. 2005. <http://www.cpec.ca.gov/>.

- - - . "Data at a Glance" Tables. Dates of Access: Nov. – Dec. 2005. <http://www.cpec.ca.gov/>.

- - - . "Transfer Pathways" Data Tables. Dates of Access: Nov. – Dec. 2005. <http://www.cpec.ca.gov/>.

Minnesota IMPLAN Group. 2002 Input-Output Industry Multipliers.

National Center for Higher Education Management Systems. "Educational Attainment of Population by Degree Level – Selected Age Groups." 1990 and 2000 SF3 Census data. < http://www.higheredinfo.org/ >.

- - - . Migration Data Tables. 2000 Census PUMS data. <http://www.higheredinfo.org/>.

Johnson, David B. "A Quick Look: Input-Output Tables." Finding and Using Economic Information: A Guide to Sources and Interpretation. Ed. Alan S. Blinder. Mountain View, CA: Bristlecone, 1993. 291-312.

UCLA Anderson School of Management. The UCLA Anderson Forecast for the Nation and California, March 2005 Report. Los Angeles: UC, 2005.

- - -. The UCLA Anderson Forecast for the Nation and California, September 2004 Report. Los Angeles: UC, 2005.

U.S. Census Bureau and Bureau of Labor Statistics. Current Population Survey, March 2005 Supplement.

Woods and Poole Economics, Inc. 2004 State Profile: California. Washington D.C.: Woods and Poole, 2004.