Higher Education: Enrollment Trends and Staffing Needs

This issue of Research Dialogues *explores the ways in which trends in college enrollments and student characteristics may affect future staffing needs in higher education. It also suggests that the forces affecting the forecasting of staffing needs go well beyond basic demographics and include important educational, economic, social, and political factors, and—most importantly—technological developments.*

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Introduction

The purpose of this report is to describe past trends and future projections of college enrollment and to discuss their implications for estimating the demand for college and university faculty and staff.

With the U.S. economy continuing to do surprisingly well, enjoying an unusual combination of low unemployment and low inflation rates, and with these conditions expected to continue for the forseeable future, the question arises: How do these favorable economic circumstances affect higher education and students' intentions to enroll in college? And, in turn, how does student demand translate into demand for college faculty and staff?

These questions are important not only for institutions of higher education but also for governments and business organizations, which need information about human resources for effective strategic planning. The information can also be valuable both to individual students and to faculty in preparing for the future.

Recent Enrollment Trends

We first look at trends in student enrollment. According to data from the Department of Education's National Center for Education Statistics (NCES), college enrollment peaked in 1992. The NCES data show that college enrollment topped at about 14.5 million students and then edged lower, hovering around 14.3 million students for the next five years.

Chart 1 illustrates the historical trend in college enrollment from 1947 to the present as reported by NCES. The chart shows the post-World War II surge in enrollment in the 1950s, followed by even more spectacular growth through the 1960s and into the early 1970s. After slowing in the late 1970s and mid-1980s, strong growth resumed in the late 1980s and into the early 1990s.

But since 1992, the NCES has been reporting that total college enrollment has edged more or less sideways.

Actually, there are two major sources of national data on college enrollment, the National Center for Education Statistics and the Bureau of the Census's *Current Population Reports.*

Census Bureau Data Looking at college enrollment trends reported by the Bureau of the Census, we see that these data do not show the fall-off of enrollment that NCES data exhibit. The Census data are fairly consistent with the NCES data until about 1992, but thereafter diverge. The differences are shown in Chart 2.

If implications for future staffing needs are to be drawn from enrollment trends, we must make sure we have a pretty good description of the actual direction of the trends, particularly in recent years. My discussions with officials at the Department of Education and the Census Bureau helped develop clearer ideas about some of the challenges in measuring enrollment, ideas that go be-

Chart 1

**Chronology of Trends and Events Affecting College Enrollment
in Public and Private Institutions, 1947-1997**

Enrollment (Millions)
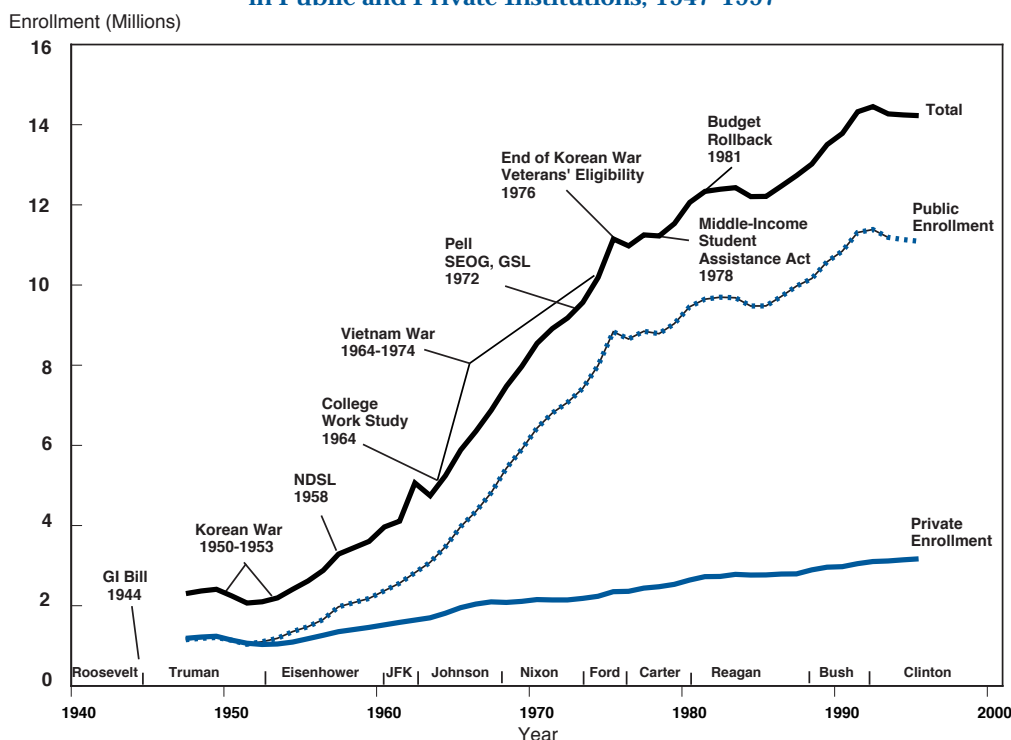
Sources: U.S. Department of Education, National Center for Education Statistics (NCES), *Digest of Education Statistics: 1996*, NCES 96-133 (Washington, D.C.: 1996), 176, Table 169; unpublished NCES updates and projections for 1997; John W. Wright, ed., *Universal Almanac,* 1996 ed. (Kansas City, Missouri: Universal Press Syndicate, 1995); Congressional reports.

Chart 2

**Enrollment Trends: Comparison of Data from the National Center for
Education Statistics and the Bureau of the Census, 1970-1995**
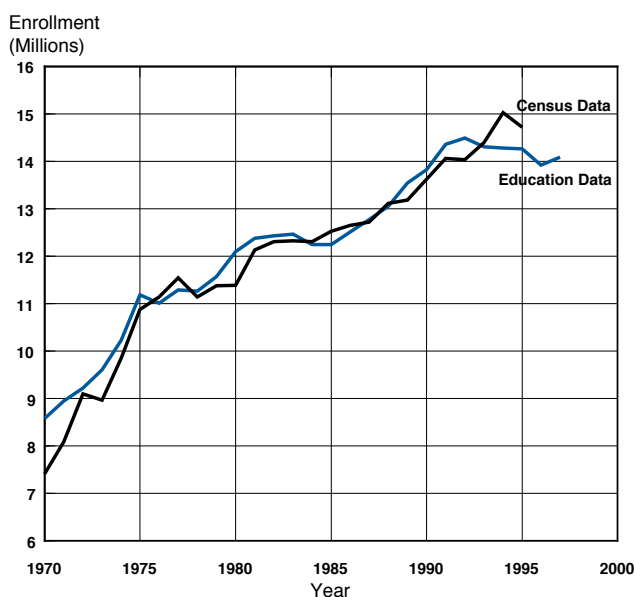
Enrollment (Millions)

Sources: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 176, Table 169; unpublished updates; U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census, "School Enrollment—Social and Economic Characteristics of Students: October 1995," *Current Population Reports, Population Characteristics.*

yond the specific measures of statistical confidence that can be applied to each data series. Data management in this area is not as straightforward a task as it might seem, as looking at some of the details can reveal. But why the difference? What is going on? Has the enrollment trend recently flattened—or hasn't it?

As a start in examining the differences reported by the two sources of enrollment data, we note that the NCES obtains its total counts from reports by institutions of the numbers of students they enroll. The Bureau of the Census, on the other hand, derives its estimates of total enrollment from sample surveys of about 55,000 households—in this case, those reporting that individual household members are enrolled in college.

Both the NCES and the Census Bureau series report fall enrollments, but fall enrollment may be only a partial measure of the total enrollment. In fact, it is estimated that fall counts may capture only about 90 percent of the enrollments at traditional institutions and only about 40 percent

of those at proprietary institutions, which characteristically have continuous registration over the course of the academic year.[1] However, proprietary institutions account for less than 2 percent of the total number of students in higher education.[2]

Student enrollments may be underestimated, particularly in light of the growing use of new, flexible modes of education service delivery—including distance learning, where students are not necessarily counted in standard fall-enrollment statistics.

At their simplest, estimates of needs for new staff are based on increased future enrollment estimates divided by average class size. If, however, enrollment numbers are softer than is commonly thought, the connection between enrollment trends and staffing needs may be less easy to establish. But there are other factors as well, and it is important to consider how they may affect future enrollment trends and consequent staffing needs.

High School Graduation Rates Analysts who forecast trends in college enrollments usually start by looking at high school graduation rates. Chart 3 shows that the numbers of high school graduates track very closely the numbers of 17-year-olds in the population.

The relatively unchanging ratio, over time, of high school graduates to all 17-year-olds is quite dismaying, however. Illustrating the point even more clearly, Chart 4 shows that high school graduates as a percent of the 17-year-old population have been almost constant for close to two decades—at just over 70 percent. And, in the mid-1990s, the ratios were somewhat below those reached in the mid-1960s.

While the overall high school graduation rate has remained steady at just over 70 percent, there are differences in the trends when the population is disaggregated by component race and gender categories. This is shown in Chart 5.

Chart 5 shows that ever-so-slight increases in high school graduation rates of white females are being offset by ever-so-slight decreases in the rates of white males. And the more markedly increasing high school graduation rates of blacks from the mid-1960s to the mid-1990s

Chart 3
High School Graduates Compared with the
17-Year-Old Population, 1960-2010 (Projected)
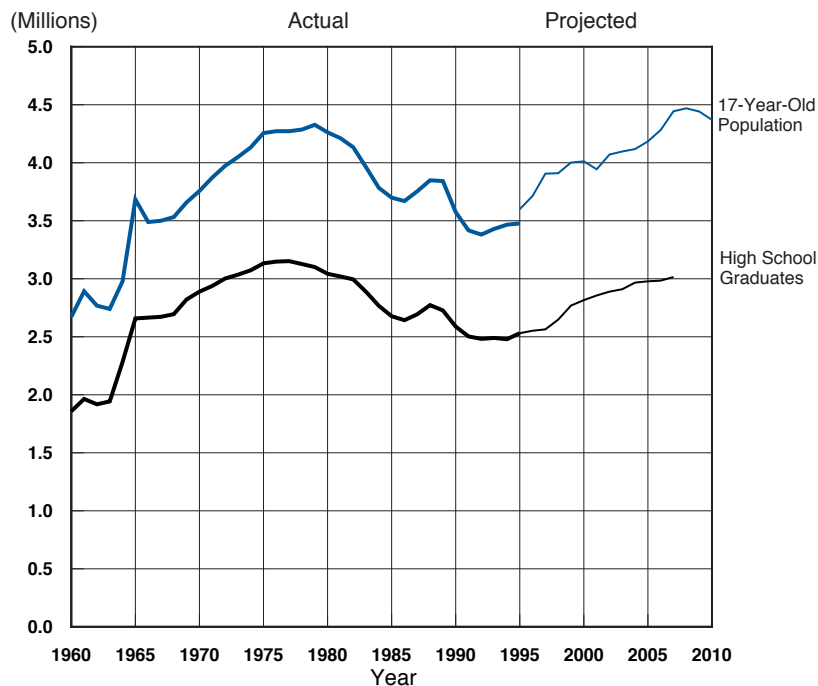
Sources: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 108, Table 98; NCES projections; U.S. Department of Commerce, Bureau of the Census, "Population Projections of the United States by Age, Sex, Race, and Hispanic Origin: 1995 to 2010," *Current Population Reports* (P25-130).

Chart 4
High School Graduates as a Percent of the
17-Year-Old Population, 1960-1996
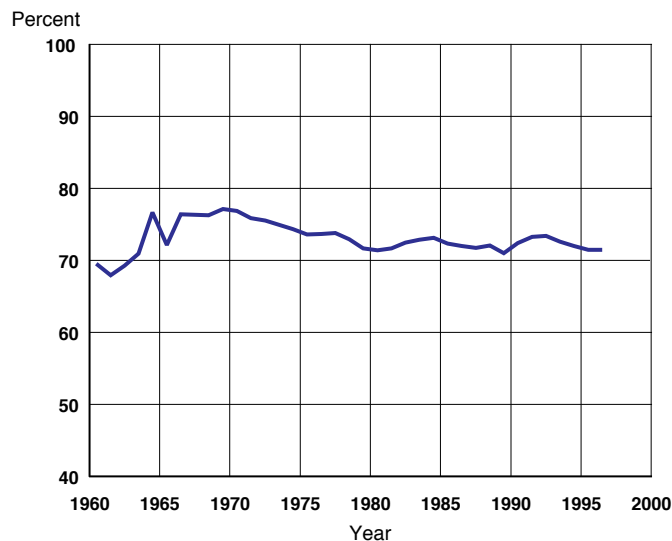
Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 108, Table 98.

Chart 5

High School Graduation Rates, by Race and Gender, 1970-1994

Percent of 17-Year-Olds Who Have Graduated from High School

White Female
White Male
Black Female

Black Male

Hispanic Female

Hispanic Male

Year
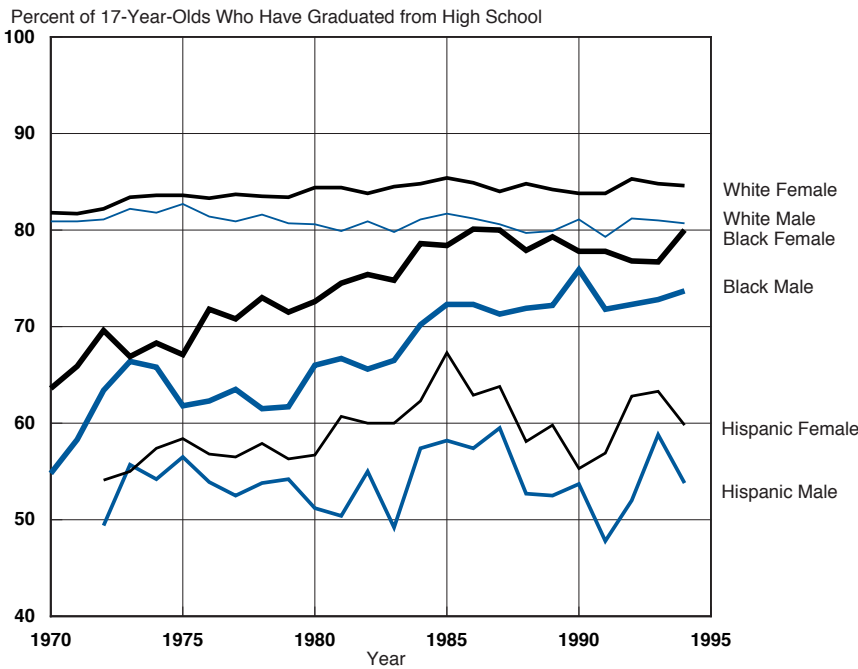
Sources: Rosalind R. Bruno and Andrea Curry, "School Enrollment—Social and Economic Characteristics of Students: October 1994," *Current Population Reports, Population Characteristics*, U.S. Department of Commerce, Bureau of the Census (P20-487, September 1996), A-2, Table A-5.

Chart 6

Comparison of Trends in the Traditional College-Age Population and Total College Enrollment, 1960-2015 (Projected)

(Millions)   Actual   Census Projection Made in the 1980s - - - - -

Population Age 18-24

Total College Enrollment

Year

Sources: U.S. Department of Commerce, Bureau of the Census, "U.S. Population Estimates, by Age, Sex, Race, and Hispanic Origin," *Current Population Reports,* Series P25 and PPL-21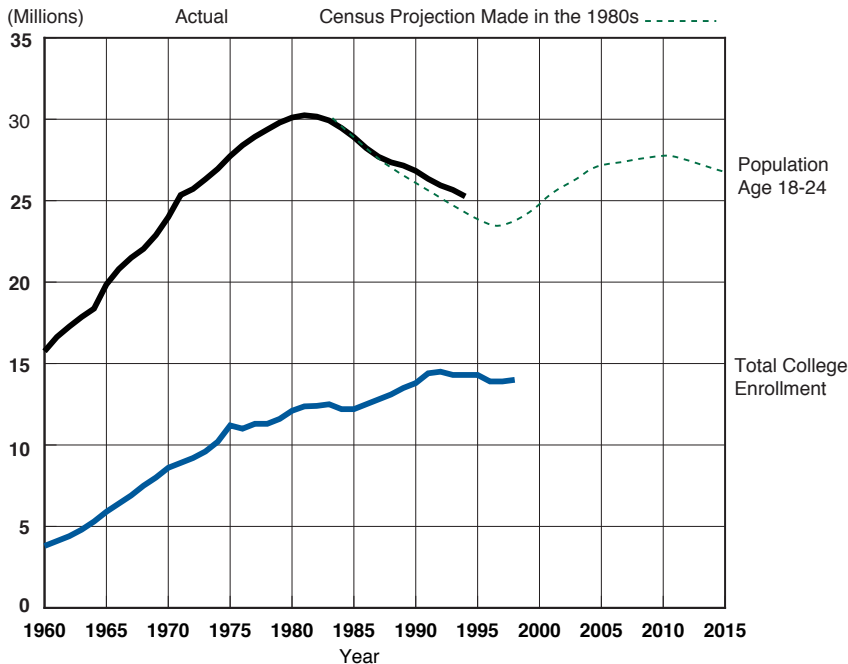; U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 176, Table 169; and unpublished updates.

were accompanied by much lower and more jagged rates of Hispanics.

Even without increases in the high school graduation rates, the actual numbers of graduates are projected to increase beginning in the mid-1990s—and to continue to increase for at least another decade—simply because of the demographically based increases in the expected numbers of 17-year-olds in the population.[3]

College-Age Population The traditional college-age population of 18- to 24-year-olds peaked way back in 1981 at 30.2 million and began a decline that has lasted for sixteen successive years. By 1997, the college-age population had declined by 18 percent, or 5.5 million, and bottomed out at 24.7 million. Beginning in 1998, the college-age population is projected to begin a steady climb back, reaching its earlier peak level by about 2010.[4]

Yet deriving enrollment projections based primarily on demographic trends is perilous. The marked decline in the number of traditional college-age people in the 1980s was accompanied by an equally marked increase in total college enrollment, as illustrated in Chart 6.

Growth of College Enrollment by Age Group Chart 7 shows the total enrollment growth by age group over the period 1970-1994. These data clearly show that students in older age groups have been of striking importance in sustaining enrollment growth. The trend line for the 18- to 19-year-old group is fairly flat but then the trend lines climb more steeply with each successively older age group.

Chart 8 carries the analysis further and compares the *percentage distribution,* by age group, of the *increase* in enrollment over three successive periods: 1970-1980, 1980-1990, and 1990-1995. Note that the chart does not show percentage increases, but rather the percent *distribution* of the increase in enrollment by age group. The percentage distribution by age group adds to 100 percent for each of the three periods.

From 1970 to 1980, college enrollment increased spectacularly, by more than 40 percent, growing by 3.6 million,

from 8.5 million to 12.1 million students. The percentage distribution by age of this 3.6 million increase is shown on the top panel of Chart 8. It shows that about 30 percent of the increase in enrollment over that decade was accounted for by students age 35 and over.

From 1980 to 1990, college enrollment increased by about 14 percent, growing just over 1.7 million from 12.1 million to 13.8 million, at only about one-third the rate of increase reached in the previous decade. About half of the 1.7 million increase in enrollment from 1980 to 1990 was accounted for by students age 35 and over.

From 1990 to 1995, the rate of increase in college enrollment slowed again even more dramatically to an annual rate only about half of that experienced in the previous decade. The increases in college enrollments from 1990 to 1995 were the smallest of any five-year period in the last fifty years, both in absolute numbers and in percentage terms, based on head-count data from the NCES (though, remember, the Census data do not show the same slowdown).

In the most recent period shown in Chart 8—the five years from 1990 to 1995—the age distribution of the increase in enrollment is quite different from that in the 1970s or 1980s. While students age 35 and over still accounted for about 30 percent of the increase in enrollment, much more than 50 percent of the increase is accounted for by the traditional college-age population of 18- to 24-year-olds. The traditional college-age population group in Chart 8 includes the columns for three age groups (18-19, 20-21, and 22-24) shown separately.

Thus, while the older age groups accounted for the largest share of enrollment growth from 1970 to 1980 and from 1980 to 1990, since 1990 traditional college-age students have accounted for more than half of the increase in enrollment.

Note that the 18-to-24 college-age group contributed to enrollment growth in the early 1990s because of increased college-going rates, even though the absolute numbers of 18- to 24-year-olds continued to decline.

Chart 7
Trends in College Enrollment, by Student Age Group, 1970-1994
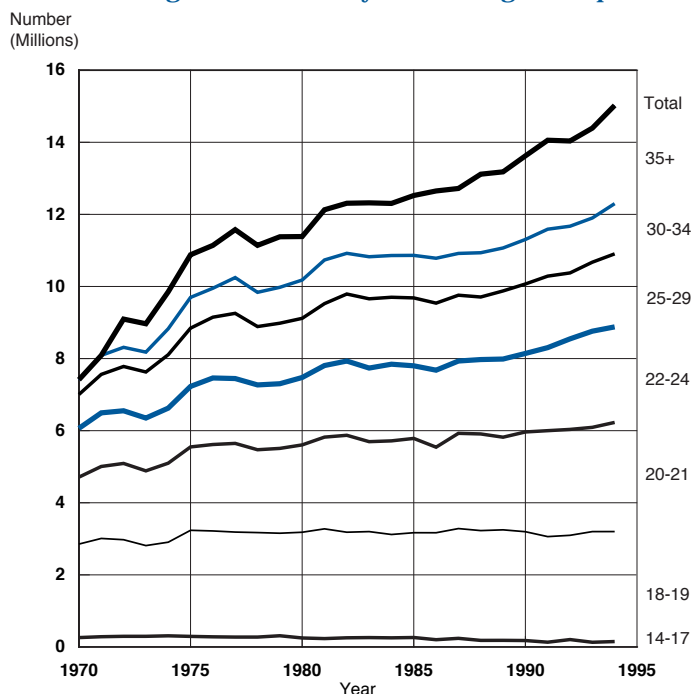
Source: Bruno and Curry, "School Enrollment—Social and Economic Characteristics of Students: October 1994," *Current Population Reports, Population Characteristics* (P20-487, September 1996), A-37.

The circumstances that are driving changes in enrollment patterns are complex. They are demographic, educational, economic, social, cultural, political—and technological. They include a rapidly growing and increasingly diversified economy; intensifying demands for a highly trained and educated workforce; rapid growth in the service sectors of the economy, particularly in areas of communications and business and financial services; globalization; and exponential growth in technology and its applications.

All of these factors signify new and higher levels of the need for continuing education, for training and retraining, and for recurring renewal of skills for still-larger segments of the working population.

Other Enrollment Components In addition to changes in the age composition of students over the period from 1990 to 1995, a number of other components of enrollment growth should be examined. These are detailed in Table 1, which is based on NCES data. We can look at these data as elements that may aid in enrollment fore-casting and in preparing for future staffing needs. But first, we should re-emphasize that student enrollment has grown very slowly or hardly at all in recent years—increasing overall by only about half a million from 13.8 million to 14.3 million over the period from 1990 to 1995, according to NCES data. A look at the composition of recent enrollment growth, even though the growth is modest, can nonetheless contribute to an improved understanding of the current base for projecting future staff needs.

Full-Time/Part-Time We see in Table 1 that about 70 percent of the growth in enrollment over the 1990-1995 period was accounted for by full-time students and 30 percent by part-time students. This would be consistent with the large share of the increase in enrollment over the five-year period accounted for by traditional-age students, that is, students age 18 to 24, who are more likely to enroll in college full-time than are older students.

We also see from Table 1 that in the 1990-1995 period, among men, the numbers of full-time students showed virtual-

Chart 8

Percent Distribution of the Growth of College Enrollment, by Student Age Group, 1970-1995

(Percent)

1970-1980

(Percent)

1980-1990

(Percent)

1990-1995

Age Group
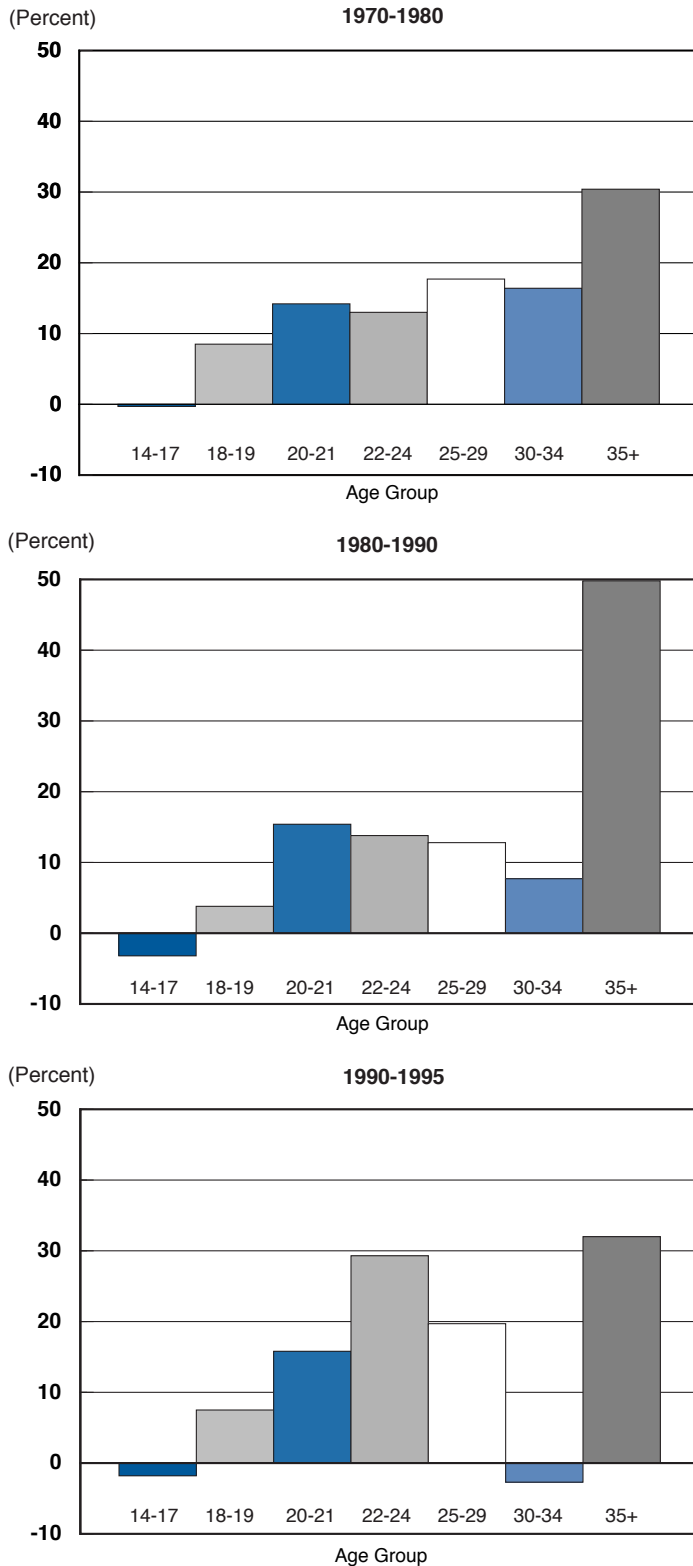
Sources: Bruno and Curry, "School Enrollment—Social and Economic Characteristics of Students: October 1994," *Current Population Reports, Population Characteristics* (P20-487, September 1996), A-37, and 1995 update.

ly no growth at all, while the growth in part-time students was 2.4 percent. Among women, the number of full-time students grew by 7.7 percent, while the number of part-time students grew by only 2.2 percent.

Gender Distribution Overall, women accounted for 87 percent of the increase in enrollment from 1990 to 1995, while men accounted for only 13 percent. The enrollment of men increased by only 0.9 percent over this five-year period while the enrollment of women increased 5.1 percent.

Race Distribution Examining the share of the increase in enrollment by race, all of the net increase in enrollment in higher education from 1990 to 1995 was accounted for by minority students. (This is the net change, of course, and does not imply that all new enrollments in the 1990-1995 period were minority students.) The numbers of white students enrolled in higher education actually decreased by 411,000, while the numbers of minority students increased by 790,000 over the five years.

Academic Level Examining the 1990-1995 increase in enrollment by academic level, we find that approximately 62 percent of the increase was accounted for by undergraduates, 6 percent by first professionals, and 33 percent by graduate students. The specific percentage increases in academic-level enrollments over the five-year span were 2.3 percent, undergraduate; 9.2 percent, first professional; and 9.2 percent, graduate students.

Enrollment Projections

We have just examined enrollment trends of the recent past; but our real concern will be projections into the future. The standard way to project enrollments has been to project the population by age group and multiply the age-group series by current or projected college-going rates. The college-going rates are calculated by dividing actual enrollment, disaggregated into age groups, by population, also disaggregated into corresponding age groups.

The Census data are not published using age groups that are specially formulated to facilitate education policy analy-

Table 1
Components of College Student Enrollment Increase, 1990-1995
(In Thousands)

	1990	1995	Increase	Percent Increase	Percent Distribution of Increase
Total enrollment, by status					
Head count	13,819	14,262	443	3.2	100.0
Full-time	7,821	8,129	308	3.9	69.5
Part-time	5,998	6,133	135	2.3	30.5
Full-time equivalent	9,983	10,335	352	3.5	—
Total enrollment, by gender	13,819	14,262	443	3.2	100.0
Men	6,284	6,343	59	0.9	13.3
Women	7,535	7,919	384	5.1	86.7
Men	6,284	6,343	59	0.9	13.3
Full-time	3,808	3,807	(1)	(0.0)	(0.2)
Part-time	2,476	2,535	59	2.4	13.3
Women	7,535	7,919	384	5.1	86.7
Full-time	4,013	4,321	308	7.7	69.5
Part-time	3,521	3,598	77	2.2	17.4
Total enrollment, by level	13,819	14,262	443	3.2	100.0
Undergraduate	11,959	12,232	273	2.3	61.6
First-time, first-year	2,257	2,169	(88)	(3.9)	(19.9)
Other undergraduate	9,702	10,063	361	3.7	81.5
First professional	273	298	25	9.2	5.6
Graduate	1,586	1,732	146	9.2	33.0
Total enrollment, by race	13,819	14,262	443	3.2	100.0
White, non-Hispanic	10,722	10,311	(411)	(3.8)	(92.8)
Total minority	2,705	3,495	790	29.2	178.3
Black, non-Hispanic	1,247	1,473	226	18.1	51.0
Hispanic	782	1,094	312	39.9	70.4
Asian, Pacific Islander	572	797	225	39.3	50.8
American Indian, Alaskan	103	131	28	27.2	6.3
Nonresident alien	392	454	62	15.8	14.0
Total enrollment, by sector	13,819	14,262	443	3.2	100.0
Public institutions	10,844	11,092	248	2.3	56.0
Private institutions	2,974	3,169	195	6.6	44.0

	1990	1995	Increase	Percent Increase	Percent Distribution of Increase
Public institutions	10,844	11,092	248	2.3	56.0
Full-time	5,751	5,925	174	3.0	39.3
Part-time	5,093	5,167	74	1.5	16.7
Private institutions	2,974	3,169	195	6.6	44.0
Full-time	2,070	2,203	133	6.4	30.0
Part-time	904	966	62	6.9	14.0
Total enrollment, by type	13,819	14,262	443	3.2	100.0
Four-year institutions	8,579	8,769	190	2.2	42.9
Two-year institutions	5,240	5,493	253	4.8	57.1
Public institutions	10,844	11,092	248	2.3	56.0
Four-year	5,848	5,815	(33)	(0.6)	(7.4)
Two-year	4,996	5,278	282	5.6	63.7
Private institutions	2,974	3,169	195	6.6	44.0
Four-year	2,730	2,955	225	8.2	50.8
Two-year	244	215	(29)	(11.9)	(6.5)
All ages	13,819	14,262	443	3.2	100.0
Under 18	167	148	-19	-11.4	-4.3
18-19	2,800	2,895	95	3.4	21.4
20-21	2,619	2,705	86	3.3	19.4
22-24	2,166	2,411	245	11.3	55.3
25-29	2,063	2,120	57	2.8	12.9
30-34	1,360	1,236	-124	-9.1	-28.0
35 and over	2,644	2,747	103	3.9	23.3
Men	6,284	6,343	59	0.9	100.0
Under 18	82	61	-21	-25.6	-35.6
18-19	1,351	1,338	-12	-0.9	-20.3
20-21	1,304	1,282	-22	-1.7	-37.3
22-24	1,107	1,153	46	4.2	78.0
25-29	976	962	-14	-1.4	-23.7
30-34	564	561	-3	-0.5	-5.1
35 and over	901	986	85	9.4	144.1
Women	7,535	7,919	384	5.1	100.0
Under 18	85	87	2	2.4	0.5
18-19	1,450	1,557	107	7.4	27.9
20-21	1,315	1,424	109	8.3	28.4
22-24	1,059	1,258	199	18.8	51.8
25-29	1,087	1,159	72	6.6	18.8
30-34	796	675	-121	-15.2	-31.5
35 and over	1,743	1,759	16	0.9	4.2

Sources: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), and NCES, *Digest of Education Statistics: 1997* (NCES 98-015), 184, Table 174.

sis, so it is better to construct our own age groups for this purpose from the population estimates and projections by race made for each single year of age. The age groups that are most useful for education policy purposes are age groups that correspond with differences in institutional delivery of, and behavioral differences in the demand for, educational services.

The age groups that are particularly relevant for educational policy analysis are:

0-4 Preschool
5-17 Elementary and secondary
18-24 Traditional college age

The 18-24 group can be further disaggregated into:

18-19 Entry level
20-21 Continuing enrollment, persistence
22-24 Upper division, completion
25-34 Graduate study
35-64 Adult education, re-entry
65+ Senior participation

Trends in college-going rates by age during the 1990s are shown in Chart 9.

As enrollments continue to increase over a broader age range, enrollment forecasts based on expected college entry of high school graduates will probably play a somewhat lesser, although still significant, part in enrollment forecasts.

On balance, the outlook for increased enrollment and changing mixes of students (age, full-time/part-time, gender, minority status, and academic status) would, in the past, have led immediately to conclusions about the increased numbers and changing mix of faculty needed. But before we go ahead on the usual path to these conclusions, let us look at some additional factors that will affect staffing needs.

### Faculty and Staff Employment Trends

We now turn to college and university faculty and staff. In 1993, about 2.6 million people, including full-timers and part-timers, were employed by colleges and universities, as detailed in Table 2. Of this total, about 915,000 were faculty engaged in either instruction or research. Thus, in the traditional public and private higher education institutions only about one-third of those employed are faculty.[5]

Occupational Mix The occupational mix of employment in higher education has changed dramatically over the years, as also shown in Table 2.

From 1976 to 1989, nonfaculty professionals (including development officers, student-aid officers, etc.) were hired at a much faster rate than were faculty members. The numbers of nonfaculty professionals at colleges and universities more than doubled (123 percent) over the 1976-1989 period, while the number of

Chart 9
College-Going Rates, by Age, 1990-2010 (Projected)
Percent of Age Group Enrolled in College
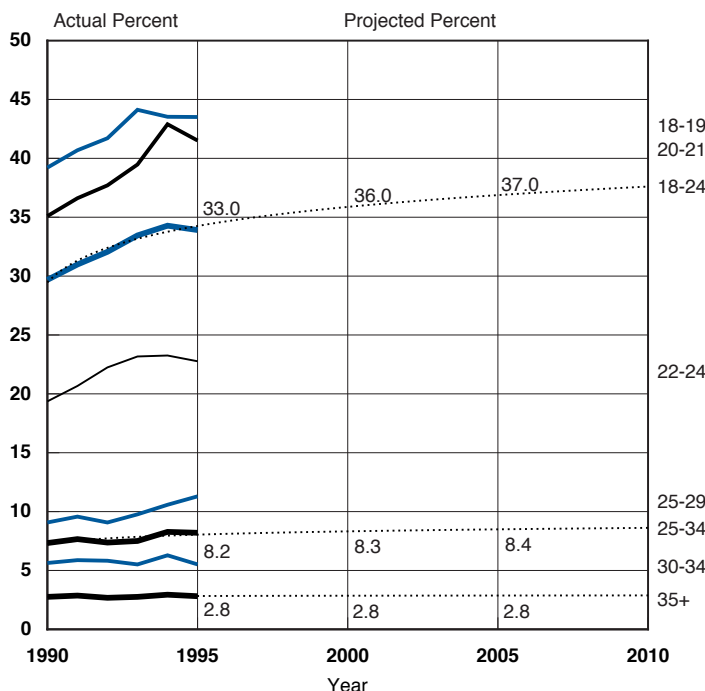
Sources: Calculated using data from Bruno and Curry, "School Enrollment—Social and Economic Characteristics of Students: October 1994," *Current Population Reports, Population Characteristics* (P20-487, September 1996), and 1995 update: and U.S. Department of Commerce, Bureau of the Census, Population Projections Branch, "U.S. Population Estimates by Age, Sex, Race, and Hispanic Origin: 1990-1996" (PPL-57R, March 1997).
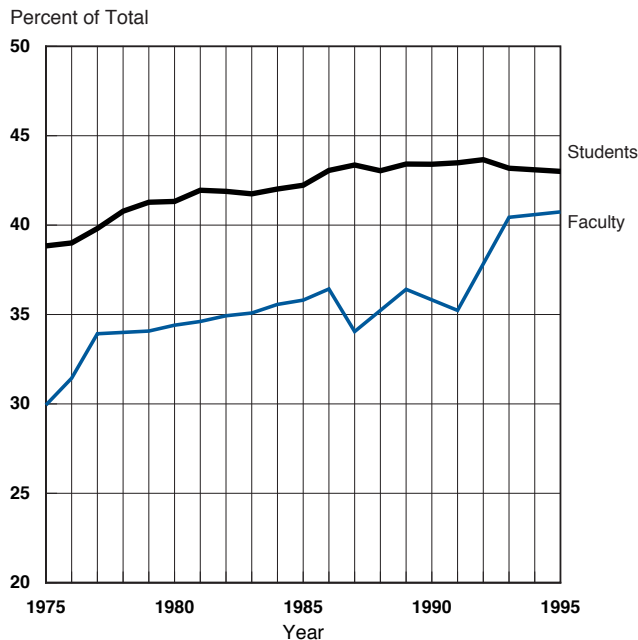
Table 2
Employment and Occupational Mix in Institutions of Higher Education, 1976-1993
(In Thousands)

	Fall 1976	Fall 1989	Fall 1991	Fall 1993	Percent Increase 1976-1989	Percent Increase 1989-1993	Percent Distribution of the Increase 1976-1989	Percent Distribution of the Increase 1989-1993
Total, all institutions	1,864	2,473	2,545	2,602	32.7	5.2	100.0	100.0
Professional staff	1,073	1,531	1,595	1,687	42.7	10.2	75.1	120.9
Executives/administrative/ managerial	101	145	145	144	43.6	-0.7	7.2	-0.8
Faculty (instruction and research)	633	824	826	915	30.2	11.0	31.3	70.5
Instruction and research assistants	160	163	198	203	1.9	24.5	0.5	31.0
Nonfaculty professionals	179	399	427	425	122.9	6.5	36.1	20.2
Nonprofessional staff	791	942	950	915	19.1	-2.9	24.9	-20.9
Technical and paraprofessionals				184				
Clerical and secretarial				438				
Skilled crafts				84				
Service and maintenance				229				
Total, all institutions	1,863	2,473	2,545	2,602	32.7	5.2	100.0	100.0
Professional staff	1,073	1,531	1,595	1,687	42.7	10.2	75.1	120.9
Teaching and research	793	987	1,024	1,118	24.5	13.3	31.8	101.6
Administrative, nonfaculty professionsals	280	544	572	569	94.3	4.6	43.3	19.4
Percent nonfaculty of professional staff	26.1	35.5	35.9	33.7				

Sources: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 227, Table 216, and unpublished updates.

Chart 10

Faculty and Students: Part-Time Percent of the Total, 1975-1995

Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 176, Table 169; 231, Table 220.

faculty increased by less than a third (30 percent), which was at a slower pace than the increase in the number of administrators (44 percent).[6]

Between 1989 and 1993, the patterns of employment growth contrasted sharply with the patterns over the period from 1976 to 1989. The numbers of administrators declined slightly from 1989 to 1993, while the number of faculty increased by almost 90,000, or by about 11 percent.[7]

During the earlier (1976-1989) period, the numbers of nonprofessional support staff in higher education (including the technical staff and paraprofessionals, clerical workers, skilled craftsmen, and service and maintenance personnel) increased by about a fifth, while during the later (1989-1993) period these support staff were cut by about 3 percent.[8]

Full-Time and Part-Time Faculty
According to the most recent data available from the NCES, over 40 percent of

Table 3

Trends in the Numbers of Faculty and Students, Full-Time, Part-Time, and Full-Time Equivalent, 1975-1995
(In Thousands)

	Faculty						Students					
Year	Total	Full-Time	Part-Time	Percent Part-Time	Calculated Full-Time Equivalent		Total	Full-Time	Part-Time	Reported Full-Time Equivalent	Student/Faculty Ratio Total	FTE
1975	628	440	188	29.9	503		11,185	6,841	4,344	8,480	17.8	16.9
1976	633	434	199	31.4	500		11,012	6,717	4,295	8,313	17.4	16.6
1977	678	448	230	33.9	525		11,286	6,793	4,493	8,415	16.6	16.0
1978	N/A	N/A	N/A	N/A	N/A		11,261	6,668	4,592	8,348	N/A	N/A
1979	675	445	230	34.1	522		11,570	6,794	4,776	8,487	17.1	16.3
1980	686	450	236	34.4	529		12,097	7,098	4,999	8,819	17.6	16.7
1981	705	461	244	34.6	542		12,372	7,181	5,190	9,015	17.5	16.6
1982	710	462	248	34.9	545		12,426	7,221	5,205	9,092	17.5	16.7
1983	724	471	254	35.1	556		12,465	7,261	5,204	9,166	17.2	16.5
1984	717	462	255	35.6	547		12,242	7,098	5,144	8,952	17.1	16.4
1985	715	459	256	35.8	544		12,247	7,075	5,172	8,943	17.1	16.4
1986	722	459	263	36.4	547		12,504	7,120	5,384	9,084	17.3	16.6
1987	793	523	270	34.0	613		12,767	7,231	5,536	9,230	16.1	15.1
1988	N/A	N/A	N/A	N/A	N/A		13,055	7,437	5,619	9,464	N/A	N/A
1989	824	524	300	36.4	624		13,539	7,661	5,878	9,780	16.4	15.7
1990	N/A	N/A	N/A	N/A	N/A		13,819	7,821	5,998	9,983	N/A	N/A
1991	826	536	291	35.2	633		14,359	8,115	6,244	10,361	17.4	16.4
1992	905	528	377	41.6	654		14,487	8,162	6,325	10,437	16.0	16.0
1993	915	546	370	40.4	669		14,305	8,127	6,177	10,351	15.6	15.5
1994	N/A	N/A	N/A	N/A	N/A		14,279	8,137	6,141	10,348	N/A	N/A
1995	931	550	380	40.8	.677		14,262	8,129	6,133	10,335	15.3	15.3
Percent Increase (1975-1989):												
	31.2	19.1	59.6		24.1		21.0	12.0	35.3	15.3	(7.7)	(7.1)
Percent Increase (1989-1995):												
	13.0	5.0	26.7		8.5		5.3	6.1	4.3	5.6	(6.7)	(2.5)

Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 176, Table 169; 201, Table 196; 227, Table 216; 231, Table 220; 236-37, Table 225.

Note: Full-time equivalent faculty are calculated as full-time faculty plus one-third of part-time faculty. The reported number of FTE faculty for 1976, 1991, and 1993 track exactly with the calculated figures. Full-time equivalent students are calculated as full-time students plus approximately one-third of part-time students, as calculated by NCES from student credit hours, with updates from the Integrated Postsecondary Data System (IPEDS) "Fall Staff" survey, 1995. The entries N/A = Not Available.

Chart 11

**Comparison of Growth: College Enrollment and
Faculty Employment, 1970-1995**
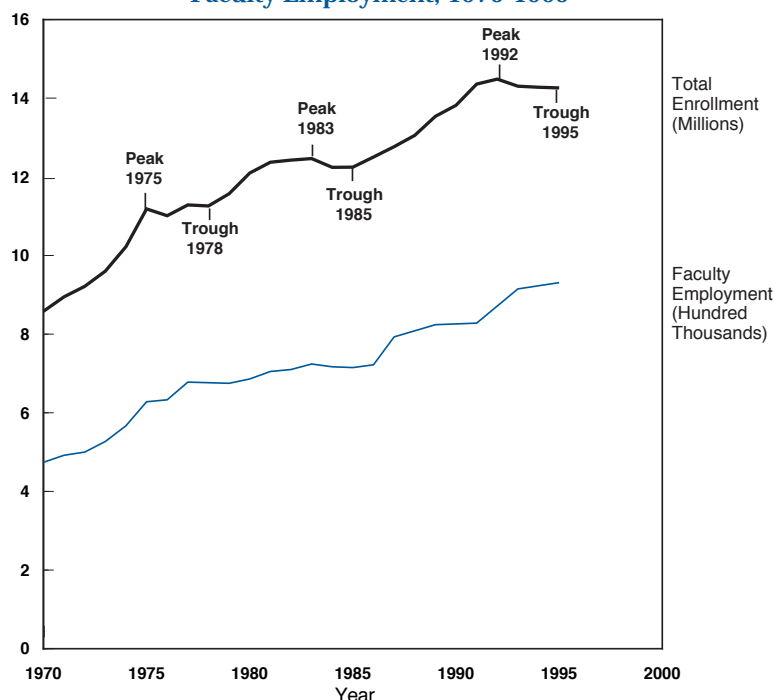
Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 176, Table 169; 231, Table 220, with updates from the Integrated Postsecondary Education Data System (IPEDS) "Fall Staff" survey, 1995.

Table 4

**Fast and Slow Growth Periods in College Enrollment
and Faculty Employment, 1970-1995**
(In Thousands)

| | | | Head Count | | Percent Change | |
			College Enrollment	Faculty Employment	College Enrollment	Faculty Employment
Beginning Year		1970	8,581	474		
Peak	Fast Growth	1975	11,185	628	30.3	32.5
Trough	Slow Growth	1978	11,260	676	0.7	7.6
Peak	Fast Growth	1983	12,465	724	10.7	7.1
Trough	Slow Growth	1985	12,247	715	-1.7	-1.2
Peak	Fast Growth	1992	14,487	900	18.3	25.9
Trough	Slow Growth	1995	14,262	931	-1.5	3.4

Source: Based on data from the U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 176, Table 169; 231, Table 220, with updates from the Integrated Postsecondary Data System (IPEDS) "Fall Staff" survey, 1995.

faculty are employed part-time. The part-time share of the total has increased sharply since 1991, as shown in Chart 10. As a consequence, the overall student/faculty ratio has edged downward.

From 1989 to 1995, the number of faculty employed part-time increased 27 percent, compared with an increase of only 5 percent in the number employed full-time.[9]

The roles and responsibilities of part-time faculty are generally not the same as those of full-time faculty and staff. Part-time faculty do not work as much with students outside the classroom, advising majors, sitting on dissertation committees, or counseling students on their careers. As institutions have been hiring fewer numbers of support staff and greater numbers of part-time faculty, more of the work with students outside the classroom is being done by a diminishing proportion of full-time faculty.

Overloading the full-time faculty could ultimately limit the proportion of part-time faculty hired and consequently affect the faculty job market.

The NCES data combine the number of full-time faculty plus one-third of the number of part-time faculty to derive the number of full-time-equivalent (FTE) faculty.

Comparing trends in faculty employment and in college student enrollment, both calculated on an FTE basis, we find that the increase in the number of faculty has outstripped the increase in the number of students since 1975, as well as since 1989. These comparative trends are documented in Table 3.

Relationship between Trends in College Enrollment and in Faculty Employment

What impact will trends in college enrollment have on future demand for college faculty and staff? In addressing the question, we first look at the relationships that appear to have held in the past between student enrollment and faculty.

Periods of Analysis One basic observation about this relationship between student enrollment and faculty employment is that the findings depend entirely on the periods selected for making the comparisons.

Data from the U.S. Department of Education derived from its "Fall Staff" surveys cover selected years from 1976 to 1995. The data series (in Table 3) can be broken into two distinct periods based on comparative rates of enrollment growth: first, a long period, from 1976 to 1989, characterized by very rapid enrollment growth; and second, from 1989 to 1995 (the most recent year for which the biennial faculty survey results are currently available), characterized by very modest growth in enrollment.

Using these periods to compare the rates of increase in student enrollment and in faculty employment yields an observation that there might be a considerable disconnect between the two trends. Looking at the long period 1976-1989—

years of very rapid growth in enrollment—an average of about 15,000 net additional faculty were hired each year. From 1989 to 1995, a period characterized by little growth in enrollment, almost 18,000 net additional faculty were hired each year. The conclusion is that over these two periods there is not a very close relationship between student enrollment growth and the net numbers of additional faculty hired.

A much better approach is to use all the information inherent in the trend data and break the series into periods demarcated precisely by the specific years when the slope in the enrollment trend changes from fast growth to slow growth, and back from slow to fast again. These more precise periods are shown in Chart 11 and Table 4. Both peaks and troughs of enrollment trends are indicated, an approach similar to the way that the National Bureau of Economic Research demarcates business cycles based on changes in the trends in gross domestic product.

Using the more precisely demarcated cycles in the enrollment trends, we come to exactly the opposite conclusion: There appears to be a reasonably close relationship between trends in student enrollment and in faculty employment. Both increase rapidly in the same periods, and both grow more slowly or even decrease in intervening shorter periods. The results of the analysis using the shorter, more carefully designated time periods, and the positive relationship between trends in student enrollment and in faculty employment, are shown in Chart 12.

Still another way to look at the relationship between trends in student enrollment and in faculty employment is to observe that student enrollment is counter-cyclical while faculty employment is cyclical. Student enrollment increases during economic recessions as unemployed and underemployed people enroll to increase their chances for better jobs when the economy recovers. In contrast, the hiring of faculty in response to increased enrollment is delayed during a recession because of fiscal constraints and takes place later during the recovery phase of the economic cycle when the institutional financial situation begins to ease.

### Projection of Enrollment-Driven Demand for Additional Faculty

In the past, the demand for faculty was often projected using a simple model, based only on enrollment and the average numbers of students per faculty member, that is, the student/faculty ratio.

A framework for projecting demand for faculty, based on this simple model (see Simple Projection Model, illustrated at bottom left on this page), is shown in Table 5, using both population and college enrollment data obtained from the Census Bureau.

Census Bureau population counts are grouped by age and then divided by college enrollments also grouped into the same categories to calculate college-going rates for a base period 1990-1995. College-going rates are applied to Census Bureau population projections for the year 2005, first using the rates for 1995 to establish a baseline that shows how much enrollments would increase simply as a result of increases in the population. Then, conservatively projected college-going rates are applied to the population projections to communicate an idea of how much college enrollment would increase as a result of both population increases and increases in the participation rates.

As shown in Table 5, college enrollment can be expected to increase by at least one million students, from 14.7 million in 1995 to 15.7 million—or

Chart 12
**Comparative Trends in College Enrollment and
Faculty Employment, 1970-1995**
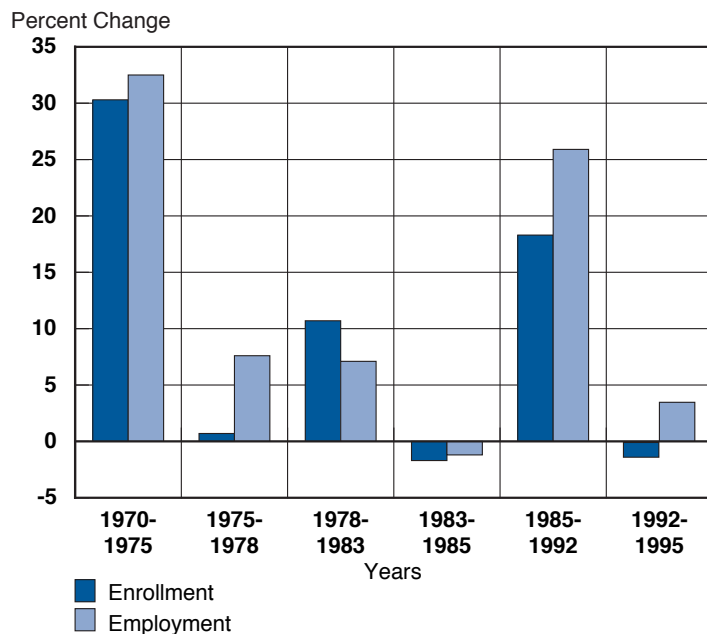
Percent Change

Source: Based on data from the U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 176, Table 169; 231, Table 220, with updates from the Integrated Postsecondary Education Data System (IPEDS) "Fall Staff" survey, 1995.

SIMPLE PROJECTION MODEL
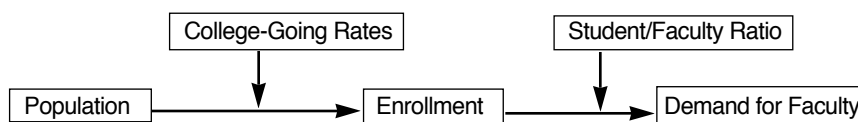
Table 5
Framework for Projecting College Enrollment and Faculty Employment, 1995 and 2005
(Numbers in Thousands)

Projection Based on the Same College-Going Rates in 1995 and 2005

Age Group	Actual Population	Projected Population	Calculated College-Going Rate	Projected College-Going Rate	Actual College Enrollment	Projected College Enrollment	Student / Faculty Ratio	Actual Faculty Employment	Projected Faculty Employment
Year	1995	2005	1995	2005	1995	2005	1995	1995	2005
Total	262,890	285,981	5.6	5.6	14,715	15,732	15 / 1	931	1,049
0-17	68,509	71,964	0	0	158	0			
18-24	25,181	28,268	33.9	33.9	8,539	9,583			
25-34	40,835	36,306	8.2	8.2	3,349	2,977			
35-64	94,820	113,276	2.8	2.8	2,669	3,172			
65+	33,544	36,166	0	0	[0]	0			
Percent Increase (1995-2005):		8.8%				6.9%			12.7%

Projection Based on Slightly Increased College-Going Rates in 2005

Age Group	Actual Population	Projected Population	Calculated College-Going Rate	Projected College-Going Rate	Actual College Enrollment	Projected College Enrollment	Student / Faculty Ratio	Actual Faculty Employment	Projected Faculty Employment
Year	1995	2005	1995	2005	1995	2005	1995	1995	2005
Total	262,890	285,981	5.6	5.8	14,715	16,681	15 / 1	931	1,112
0-17	68,509	71,964	0	0	158	0			
18-24	25,181	28,268	33.9	37.0	8,539	10,459			
25-34	40,835	36,306	8.2	8.4	3,349	3,050			
35-64	94,820	113,276	2.8	2.8	2,669	3,172			
65+	33,544	36,166	0	0	[0]	0			
Percent Increase (1995-2005):		8.8%				13.4%			19.4%

Source: Calculations based on extrapolations of Census Bureau data.

about 7 percent—in 2005, simply as a result of increases in the population. Taking into account probable increases in college-going rates, enrollment can be conservatively estimated to increase by another one million, to 16.7 million—or about 14 percent.

Student/faculty ratios have been declining slightly since the early 1970s, as shown in Chart 13, in spite of continuing financial pressures on higher education institutions to increase productivity by increasing class sizes. Using the 1995 student/faculty ratio of about 15 to 1, an increase of one to two million students would imply demand, crudely estimated, for 134,000 to 167,000 additional faculty. This would represent an increase in the range of 13 to 19 percent over the total of 931,000 full-time and part-time senior instructional faculty employed by colleges and universities in 1995.

This simple projection can be improved by strengthening the demographic analysis with consideration of the educational, economic, social, and political forces affecting college-going rates, along with the technological change likely to transform teaching and learning, thereby affecting conventional student/faculty ratios.

In the future, the simple linear model may be inadequate for projecting the demand for faculty because of this potential of information technology and communications innovation to transform the teaching and learning processes and alter the places where they occur. A more comprehensive model for projecting future demand for faculty would look something like the Comprehensive Projection Model illustrated below.

Faculty Tenure Tenure may also affect the future demand for faculty. Tenure has

COMPREHENSIVE PROJECTION MODEL
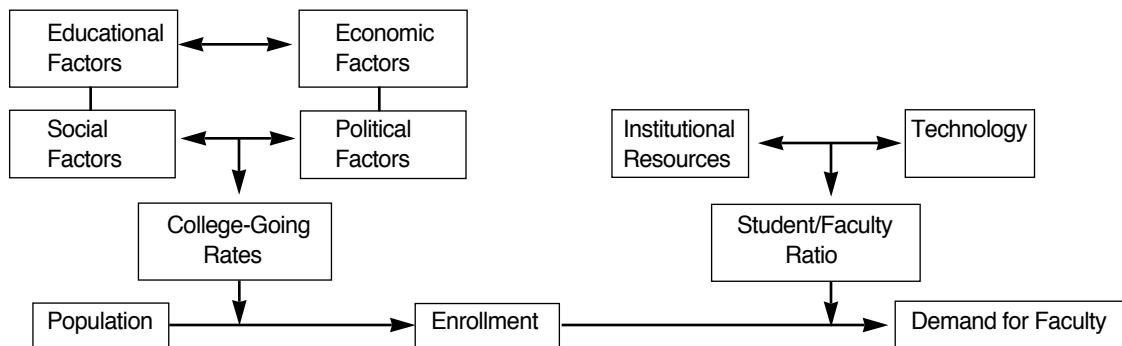
Chart 13
Student/Faculty Ratios, by Sector, 1970-1993
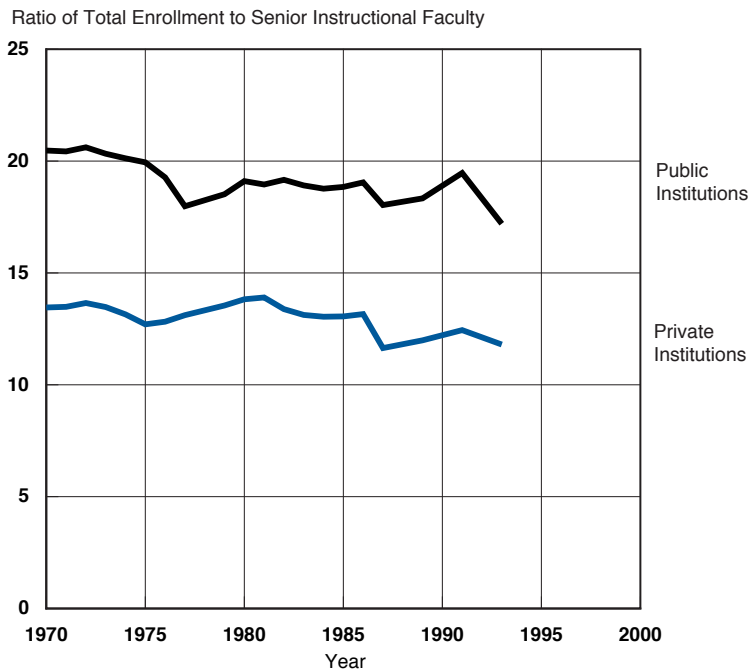
Ratio of Total Enrollment to Senior Instructional Faculty

Source: Based on data from the U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 176, Table 169; 231, Table 220 .

Note: Ratios are based on head-count data for both students and faculty. Student/faculty ratios based on full-time equivalents are about the same.

Chart 14
Percent of Full-Time Instructional Staff with Tenure, Selected Years, 1980-81 to 1994-95

Percent
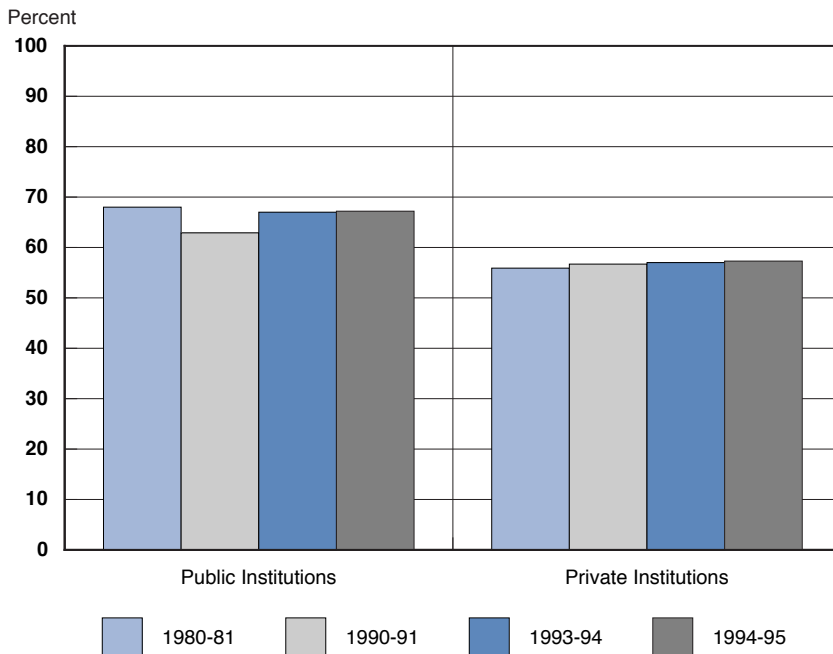
Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 249, Table 235, based on data from "Salaries, Tenure, and Fringe Benefits of Full-Time Instructional Faculty" IPEDS surveys.

been defined by a joint statement of the American Association of University Professors and the Association of American Colleges in the *1940 Statement of Principles on Academic Freedom and Tenure* and in subsequent documents. The statement describes tenure as a means to certain ends, "specifically: (1) freedom of teaching and research and of extramural activities, and (2) a sufficient degree of economic security to make the profession attractive to men and women of ability."[10]

Tenure has been under public discussion for several years, but the percentage of full-time instructional staff with tenure has remained approximately the same for the last fifteen years, averaging about 68 percent in public institutions and, noticeably lower, about 58 percent in private institutions, as shown in Chart 14. A very large share of the increase in instructional staff is accounted for by part-time faculty, almost none of whom have tenure.[11] In fact, part-time faculty accounted for only 36 percent of the faculty in 1985, but they accounted for 58 percent of the increase in the total number of faculty over the ten years from 1985 to 1995.

Conceivably, and with both positive and negative ramifications, tenure could slow the pace of change and the introduction of technology on college campuses—which, in turn, could affect the future demand for faculty, particularly by discipline.

Faculty Retirement The demand for new faculty hires is affected not only by enrollment changes but also by retirement of currently employed faculty. The age distribution of full-time and part-time faculty engaged in instruction is shown in Table 6 and Chart 15.[12] Approximately 164,000 faculty employed (112,00 full-time and 52,000 part-time) and about 18 percent of the 905,000 total employed in 1992 are between the ages of 55 and 64. If something like 90 percent of these faculty retire and leave teaching over the ten years from 1995 to 2005, then approximately 148,000 additional slots would open.

If the estimated 148,000 replacement demand for faculty is added to enrollment-driven demand of 134,000 to 197,000, then demand for new faculty

hires over the ten years from 1995 to 2005 might be in the range of 282,000 to 345,000.

Note that under expected scenarios, the demand for faculty over the period 1995-2005 is likely to be driven almost as much by retirement of currently employed faculty as by increases in enrollment.

It would be quite hazardous, however, to project future demand for faculty based only on past experience without taking into consideration how new realities might affect those projections. The additional factors that could also affect demand for faculty include forces for change not only in education but also in economic, financial, political, and technology domains.

Additional Factors Affecting Future Demand for Faculty

A number of factors other than direct enrollment changes and faculty retirements are also likely to influence faculty demand in varying degrees. These include: educational quality improvements; the state of the U.S. economy, as reflected in economic and financial developments; faculty salary structure; funding for faculty research; college tuition rates; availability of public support for institutions and students; and technological changes.

Quality Factors Many colleges and universities have embraced aspects of total quality management (TQM) and continuous quality improvement (CQI). These processes frequently have reflected collegial efforts to improve faculty teaching and student learning, aimed at enhancing students' whole college experience.[13]

If the quality of student experiences is to be strengthened through greater contact with faculty, the faculty may take on increased mentoring roles and closer student contacts. Because a larger proportion of the students in the near future will be coming from the younger, traditional age groups, we could consequently expect some increased demand for faculty, in spite of the availability of technology designed to deliver education from a distance.

Thus, the quality movement with its broad commitment to improve the outcomes along the whole academic spectrum, from elementary and secondary through postsecondary education, could increase demand for college faculty.

Improvements in Primary and Secondary Education The publication in 1983 of *A Nation at Risk* under the leadership of Secretary of Education Terrel H. Bell stimulated intensified efforts to reform elementary and secondary education.[14] The National Education Goals Panel now publishes an annual report on progress toward higher performance levels of students in almost every state.[15]

One strategy for improving K-12 edu-

Table 6
Age Distribution of College and University Faculty, 1992
Full-Time and Part-Time Instructional Faculty and Staff

	All Faculty	Full-Time	Part-Time	Percent Part-Time
All Age Groups	904,935	528,260	376,675	41.6
Under 30	28,119	7,636	20,483	72.8
30-34	71,326	35,418	35,908	50.3
35-39	125,680	66,757	58,923	46.9
40-44	160,200	90,175	70,025	43.7
45-49	165,674	97,705	67,969	41.0
50-54	139,945	94,852	45,093	32.2
55-59	96,096	67,332	28,764	29.9
60-64	67,552	44,609	22,943	34.0
65 or older	50,343	23,778	26,565	52.8

Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 236-37, Table 225, based on data from the National Study of Postsecondary Faculty (NSOPF), 1993.

Chart 15
Age Distribution of College and University Faculty, 1992
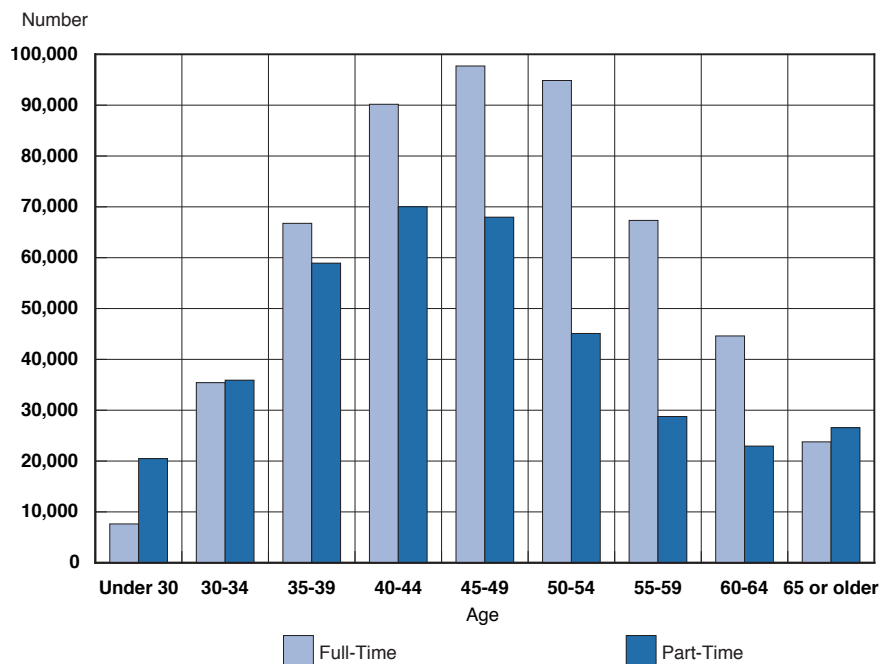
Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 236-37, Table 225, based on data from the National Study of Postsecondary Faculty (NSOPF), 1993.

Chart 16

Faculty Salary Trends: Average Salary of Full-Time Instructional Faculty on 9-Month Contracts in Institutions of Higher Education, 1970-71 to 1994-95
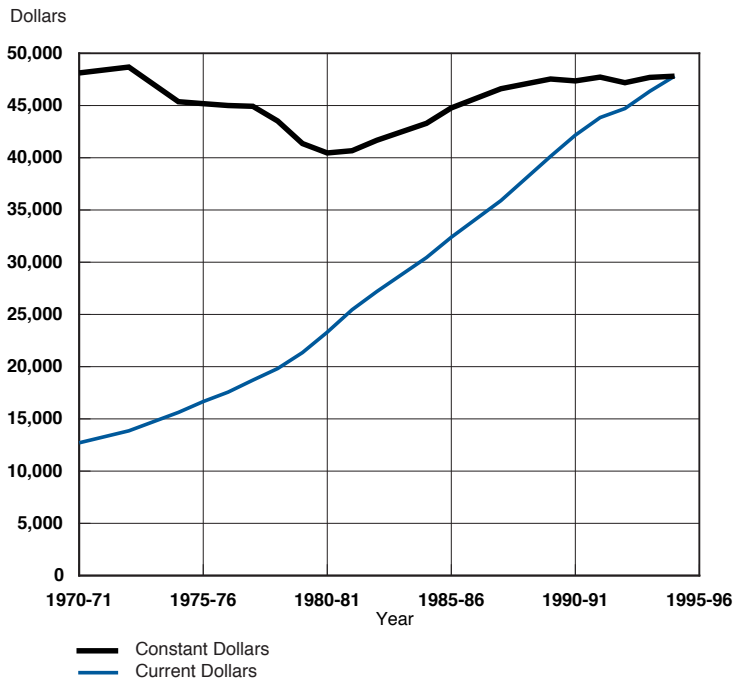
Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 242-43, Table 229, based on data from the Integrated Postsecondary Education Data System (IPEDS) "Salaries, Tenure, and Fringe Benefits of Full-time Instructional Faculty" surveys.

Chart 17

Tuition Trends: Average Annual Undergraduate Tuition and Fees Paid by In-State Students in Institutions of Higher Education, 1965-66 to 1995-96
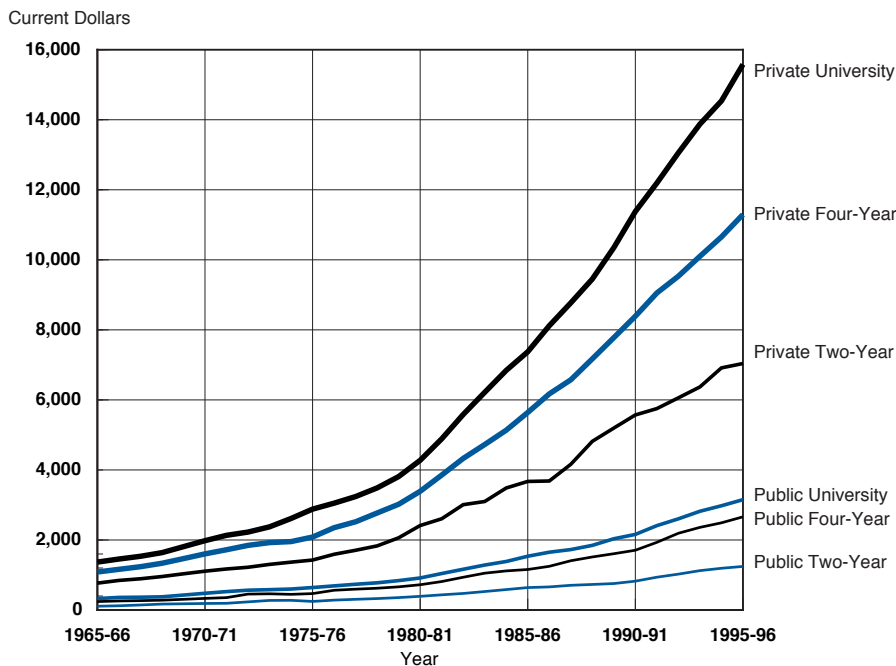
Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 320-21, Table 309, based on data from the Integrated Postsecondary Education Data System (IPEDS), "Fall Enrollment in Institutions of Higher Education" and "Institutional Characteristics of Colleges and Universities" surveys.

cation is to reduce class size. In some states, such as California, small classes have been mandated by recent state legislation. Increasing numbers of 5- to 17-year-olds in K-12 classes and smaller class sizes would require more K-12 teachers. In turn, more K-12 teachers would ordinarily result in more college faculty needed to prepare them.

Economic Conditions Economic developments that affect the financial condition of colleges and universities may have as much influence on changes in the level of demand for faculty as do demographic and enrollment factors. These factors include higher rates of return on college endowment funds, increased revenues, and lower rates of inflation.

The increase in faculty hires experienced in recent years may reflect a combination of improvements in the economy and opportunities for making up for a lack of hiring during the earlier period of greater financial constraints.

Inflation High inflation eroded the financial bases of the colleges and universities in the 1970s and 1980s. The dramatic reduction in inflationary pressure in the 1990s has been enormously beneficial in improving the financial condition of institutions and in providing the resources to hire additional staff.
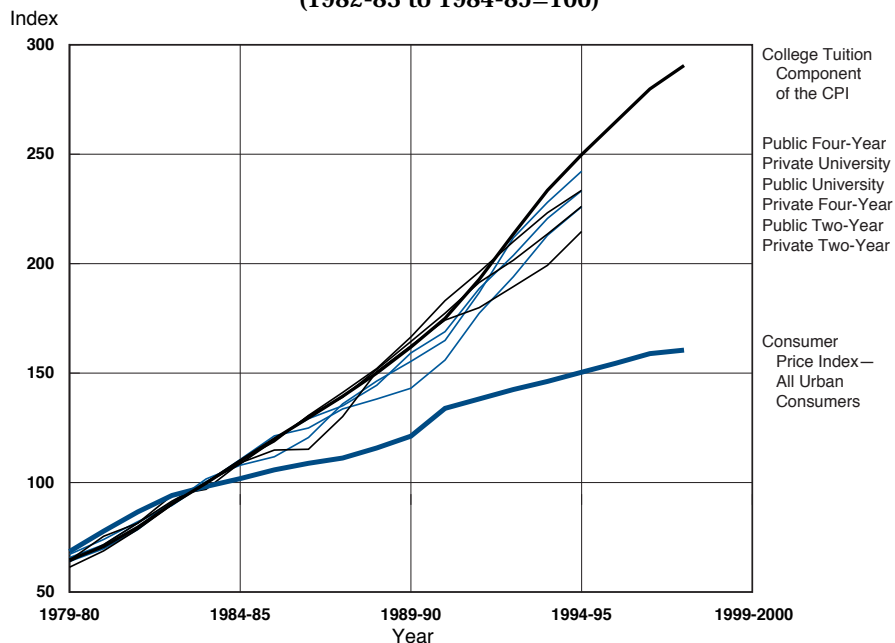
Relative Salaries Comparatively more faculty are being hired in the 1990s than in the 1980s, reflecting—as economic theory would suggest—increased demand for faculty services. Yet it does not appear—contrary to what economic theory would lead us to expect—that the increase in demand has been accompanied by an increase in the relative economic position of those entering the teaching profession, and therefore, in the attractiveness of the teaching profession itself.

The loss of relative economic position of academics was caused, in part, by the high rates of inflation in the late 1970s, together with the inability of nonprofit educational institutions to adapt to rising prices as well as firms operating in the business sector.

There are direct relationships between trends in enrollment, tuition charges, total tuition revenues, and faculty salaries. In

Chart 18

Chart 18

**Comparison of Trends in College Tuition and the Consumer Price Index,
1979-80 to 1994-95**

(1982-83 to 1984-85=100)

Index

300

250

200

150

100

50

1979-80   1984-85   1989-90   1994-95   1999-2000

Year

College Tuition
Component
of the CPI

Public Four-Year
Private University
Public University
Private Four-Year
Public Two-Year
Private Two-Year

Consumer
Price Index—
All Urban
Consumers

Source: Tuition indexes are calculated for each sector of higher education, using data from the U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 320-21, Table 309.

Note: Academic years 1982-83 to 1984-85 are used as a base period, with the base value set to 100 in order to correspond as closely as possible to the calendar years 1982-84 currently used by the Bureau of Labor Statistics (BLS) as the base period for the CPI. More recent data are available from the BLS than from the National Center for Education Statistics, in part because the BLS data are based on samples and the NCES data are based on total counts, which take longer to collect and refine.

The Consumer Price Index—All Urban Consumers (CPI-U) data were obtained from the BLS home page. The college tuition component of the CPI-U is derived from a sample of urban institutions and is weighted at 1.606 to reflect its relative importance in the total CPI-U market basket. The tuition component of the CPI-U is currently increasing at a faster rate than the tuition index derived from reports to NCES of approximately 3,500 higher education institutions. The institutional reports of tuition charges are weighted by NCES by enrollment to derive a weighted national average.

the 1970s and 1980s, college enrollment was projected by many analysts to decline because of the expected decline in the traditional college-age population. Though these projected enrollment declines never happened, tuition levels were held comparatively low in an atmosphere characterized by expectations of weak student demand. Revenues rose at a slower pace than costs, and budgets were balanced at the expense of faculty whose salary increases for many years did not keep up with increases in the cost of living.

Faculty salaries measured in real, or constant, dollars of 1994-95 purchasing power declined dramatically—by close to 20 percent—in the 1970s, as shown in Chart 16. Salary increases in the 1980s made up for most of the losses to inflation, but by the mid-1990s faculty salaries had been restored only to levels that were reached twenty-five years earlier.

Tuition Trends The rapid escalation of student tuition has eased somewhat in recent years, but costs of attendance are still increasing faster than the Consumer Price Index. Tuition levels affect overall demand for college education and choices students make among institutions. Chart 17 shows tuition trends in current dollars for each of the six major sectors of higher education, public and private universities, other four-year institutions, and two-year institutions.

Chart 18 shows the tuition data con-

verted into indexes to facilitate comparison of tuition trends with the trend in overall price levels as measured by the Consumer Price Index (All Urban Consumers—CPI-U).

The annual percentage increase in tuition skyrocketed in the early 1980s—reaching as high as 14 percent in 1982. The rate of increase has eased considerably in recent years, moving down into the range of 6 to 8 percent by the early 1990s. Though the rates of tuition increase have come down substantially, they still remain higher than the rate of increase in the Consumer Price Index as shown in Chart 19.

Tuition increases at public colleges and universities are driven more often by shortfalls in state funding than they are by increases in faculty salaries, whereas tuition increases at private colleges and universities are driven in large part by increases in aid to students paid out of general funds to make up for shortfalls in federal grant aid.[16]
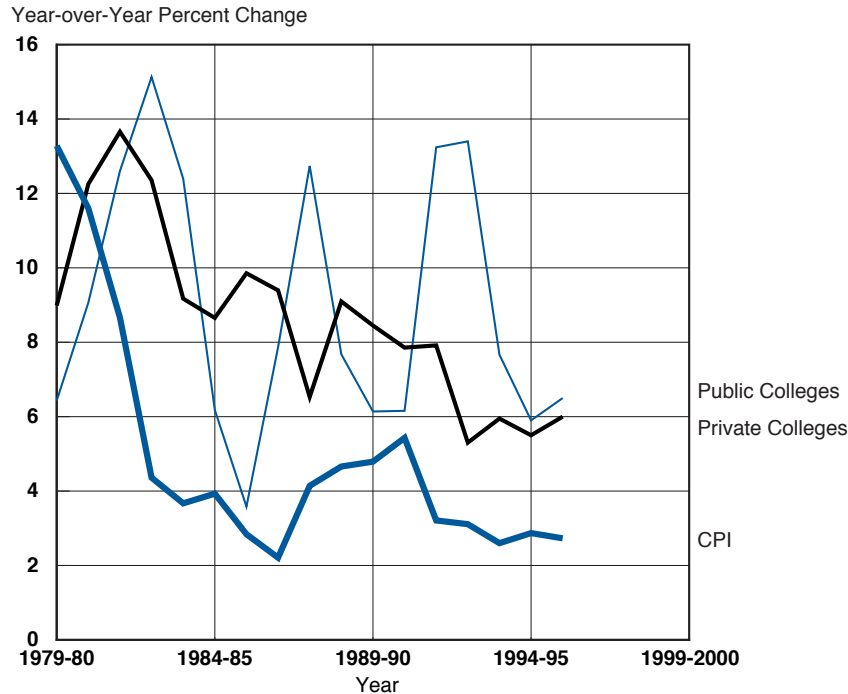
Public Policy Factors The economic and financial factors affecting the future demand for faculty merge into public policy factors, particularly as reflected in federal and state budget priorities. Among the economic/political dynamics are state funding levels and the availability of federal and state student financial aid.

State Funding Levels Unexpectedly, the slowdown of enrollment growth shown in Department of Education data is all in the lower-priced public sector, not in the higher-priced private sector, as can be seen by looking again at Chart 1 on page 2. This suggests that the much slower growth in the public sector may be influenced strongly by state policy and shortfalls in funding, leading some state-supported institutions to implement explicit policies to limit admissions and cap enrollments.

The weakening of state support can be seen in Chart 20, which shows, for each of the fifty states, along with the national average, the net change in state dollars appropriated for the operating expenses of higher education institutions per $1,000 of personal income (which is used as a measure of the states' comparative ability to support education).

Chart 19

Comparative Annual Increases in College Tuition and the Consumer Price Index: Public and Private Four-Year Colleges, 1979-80 to 1994-95

Year-over-Year Percent Change

Public Colleges
Private Colleges
CPI

Source: Calculated using data from the U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 41, Table 37 (CPI data); and 320-21, Table 309 (tuition data).

Availability of Student Financial Aid
Even though funding of student aid has increased, it has not kept pace with student costs, so that a larger share of the total costs of college education continues to be shifted to students and their families.[17]

To make up for shortfalls in federal and state student aid, colleges and universities have greatly increased the scholarships and fellowships that they fund themselves. By the mid-1990s, the total amount of institutionally funded aid awarded students from both unrestricted general funds and funds restricted or designated specifically for student aid has soared to over $12 billion.[18] The growth of this aid in the 1980s and 1990s is shown in Chart 21.

Much of this institutionally funded student aid is, in effect, paid for by students who do not receive any aid and who pay a commensurately higher tuition. The institutionally funded student aid becomes a charge to unaided students that averages around 10 percent of tuition revenues and can reach as high as 25 percent or more at some private colleges and universities.[19]
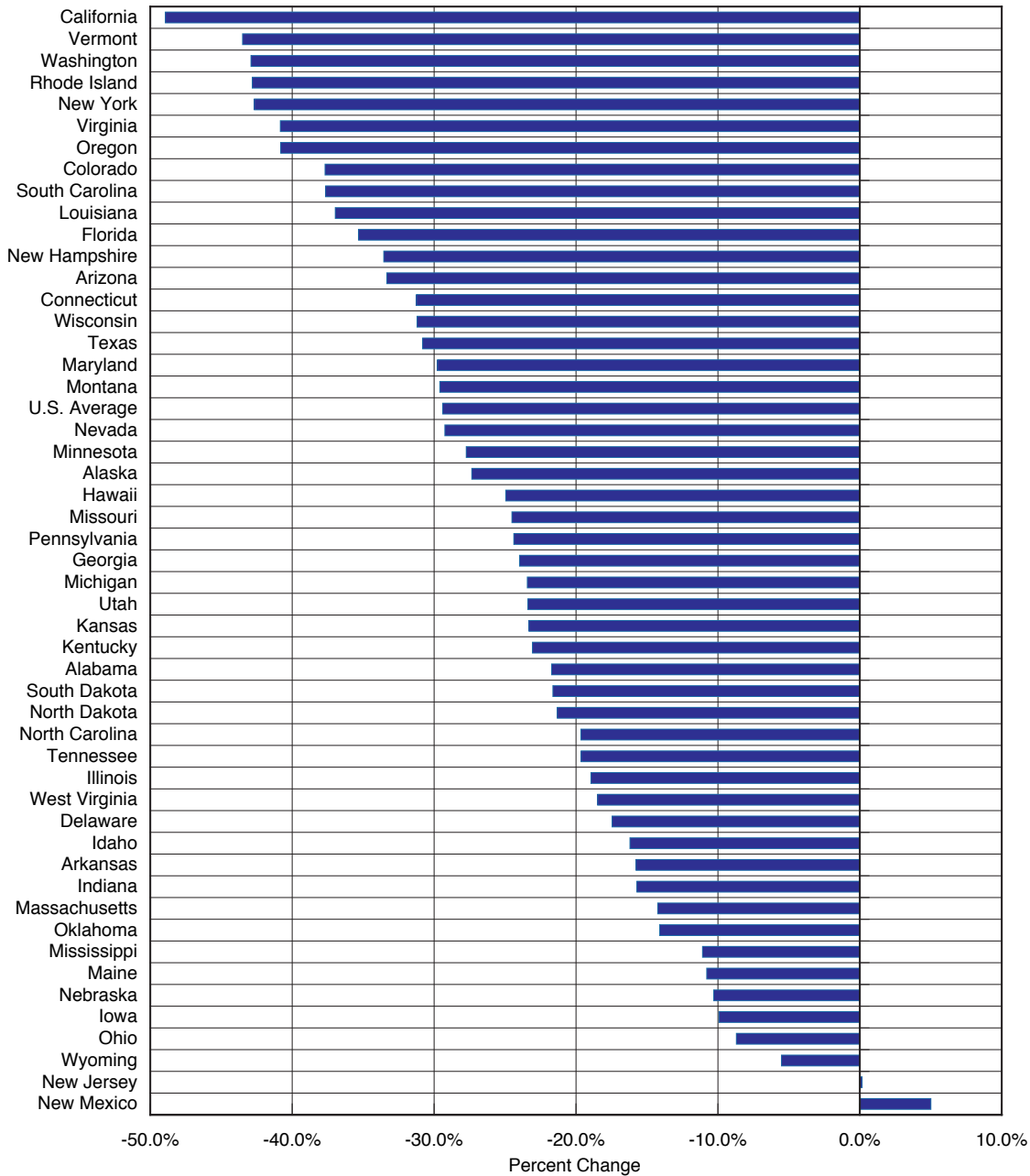
Institutionally funded student aid is among the fastest-growing components of private college and university budgets, though the pace of increase has slowed in recent years.[20] This aid affects the level and composition of student demand, which in turn affects net revenues and the total numbers of people employed and the occupational mix.

Federal Funding of Research and Development American colleges and universities are distinguished from those of most other nations by the mutually enriching combination of teaching and research performed in the same institution. Faculty employment statistics include both those members involved in teaching and those involved in research.

In the 1960s, federal funding of research performed by colleges and universities was a very significant factor in providing the resources for hiring faculty and for the capital investment in plant and equipment that helped to expand the higher education sector. In the mid-1960s, for every $1 of college and university investment in research, as much as $9 was provided by the federal government, as calculated from National Science Foundation data and shown in Chart 22.

Since the 1960s, however, the relative levels of federal support for research performed by colleges and universities has declined. Indeed, all outside sources of financial support for research have eroded, with the result that the institutions are now self-funding a much larger share of research.

By the mid-1990s, that comparative funding level had declined by two-thirds, so that for every $1 of self-funding, only a little over $3 was provided by outside sources. This dollar of self-funding, which is used as the baseline for computing the ratio to funding from other sources, is shown as a straight line in Chart 22.

Meanwhile, federal funding of research performed by industry has increased substantially, and industry itself is funding more of the research and development it performs. Of the $50 billion total that industry currently spends on research and development, only about $1 billion—or 2 percent—of that is spent at the colleges and universities.[21]

With the research-support balance shifted, industry has gained a stronger position to compete with higher education for faculty/research professionals in many scientific fields. Industry may compete on a basis of higher salaries, larger staffs, and better-equipped laboratories. Indeed, in many fields the leading edge of research has migrated from higher education to industry. This migration could ultimately decrease the demand for college and university faculty to teach and do research.

Social Values and Political Choices Social values and political choices are also important in considering the complex connections of population trends, college enrollment projections, and the future staffing needs of our educational institutions. As mentioned, there are also larger questions of priorities for public expenditures with respect to student aid funding, tax treatment of investment in education,

Chart 20
Percent Change in Appropriations of State Tax Funds for Operating Expenses
of Higher Education per $1,000 of Personal Income, 1979-80 to 1995-96

Source: Based on data generated by Thomas G. Mortenson and published in *Postsecondary Education Opportunity*, P.O. Box 127, Iowa City, Iowa 52244.

and state and local budgets affecting public education. The politics of research support also affects faculty demand.

Impact of Technology on Future Demand for Faculty

Of all the forces shaping the relationship between college enrollment and faculty employment, technology may become the most powerful, yet the potential impact of technology is perhaps the least understood.[22]

Immense technological capabilities already exist and advances are coming on-line at a dizzying pace. In the future, the connection between enrollment and employment in higher education may be greatly affected by technology. Capabilities already exist that could completely change the relationships between teachers and students, perhaps eliminating the usefulness of many class-

Chart 21
Institutionally Funded Scholarship and Fellowship Awards,
**1965-66 to 1993-94**

Dollars
(Billions)
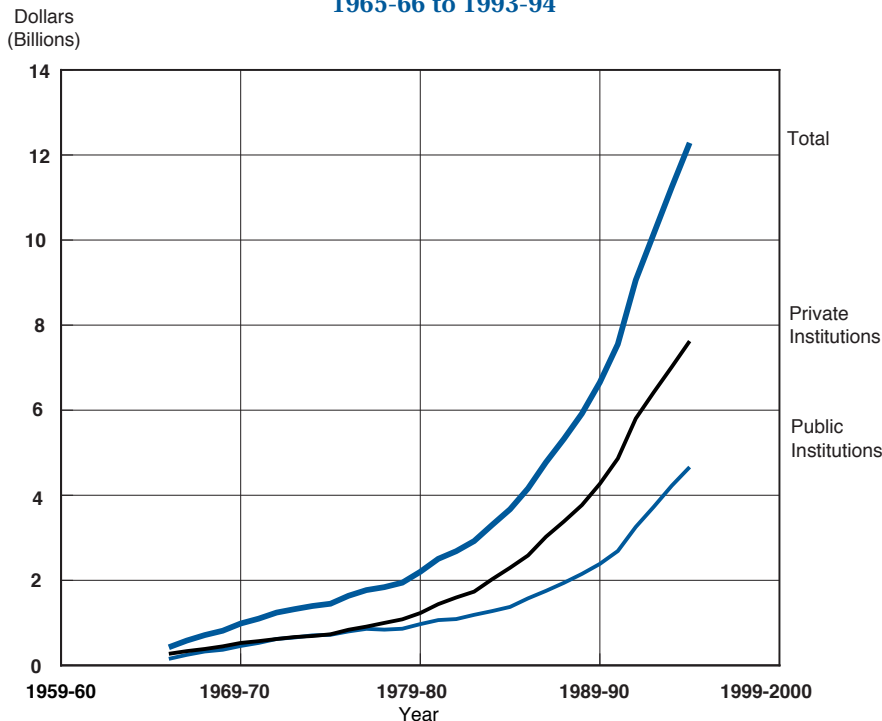
Source: U.S. Department of Education, NCES, *Digest of Education Statistics: 1996* (NCES 96-133), 330, Table 318.

rooms, changing administrative imperatives, and substantially altering staffing needs.

The relevant question for the educational community is how fast technology will spread across the academic world, and how to factor in these developments in assessing future staffing needs. The rate of diffusion of the technological innovations in higher education will depend on campus attitudes toward change, costs and capital requirements, the financial conditions of the institutions and the resources available for new investment, faculty training and incentives to use technology, and competition among the colleges and universities, as well as with other current and potential providers of educational services.

The application of technology to teaching and learning will also differ substantially by type of student. Older students who have families and jobs are placebound and have fewer choices of times and locations for taking classes. The older students will welcome the convenience of accessing education from their homes or

Chart 22
Federal Dollars of R&D Support for Research Performed by Colleges and Universities,
per Dollar of Self-Funding, 1955-1995

Dollars
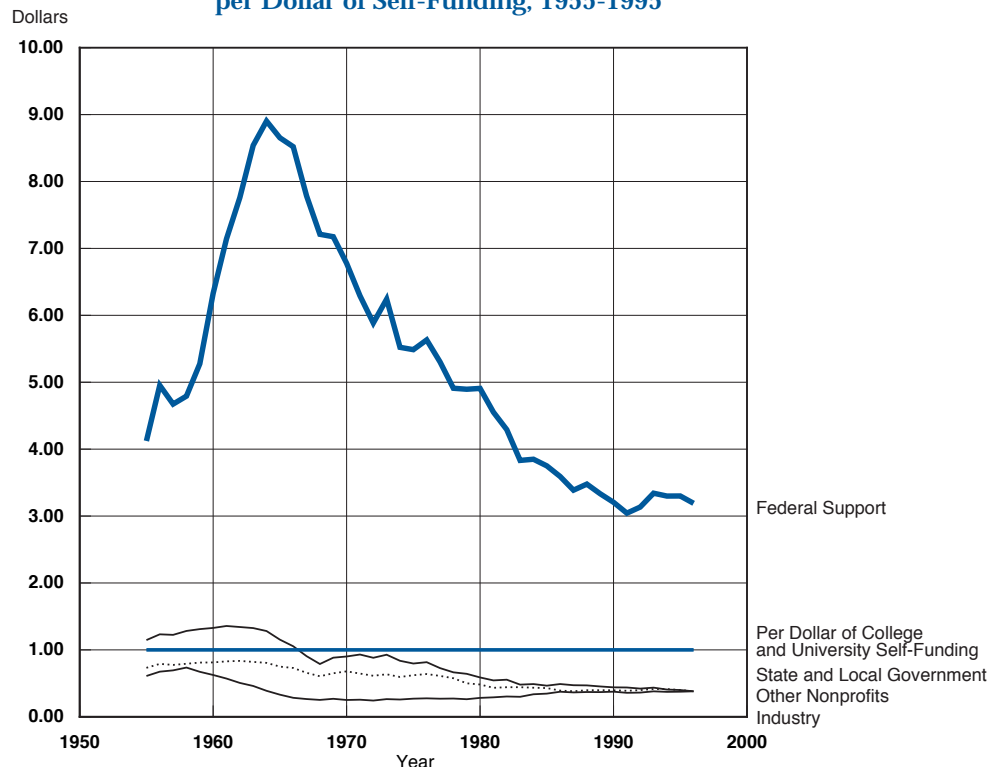
Source: National Science Foundation, Division of Science Resources Studies, *National Patterns of R&D Resources: 1996* (NSF 96-333, November 1996), 75-76.

job sites. Technology may be utilized primarily to deliver fairly conventional content, asynchronously, to students at many different times and places.

Some younger students might avoid commuting by means of short- or long-distance learning. But most will prefer the combination of learning and socializing while being on campus and interacting directly with their professors and fellow students.

The role of the faculty member may shift from that of an authority in front of a largely passive class, speaking from previously well-ordered text, to that of a leader of a joint learning adventure that may take the class in altogether new and unexplored—but potentially highly productive—directions.

Technology will be used to enrich education and will stimulate new course content and redesign of the curriculum. The insight and pace with which it can be effectively integrated into courses and the curriculum will depend on the intellectual capital invested in the change processes, primarily by full-time faculty, not part-time faculty. Paradoxically, greater reliance on part-time faculty to save money could impede the introduction of technology, which is also intended to save money.

Even though technology may shift more of the responsibility for successful learning experiences to students, faculty may have a much greater workload in trying to evaluate and organize their rich but disparate resources. Students may also tend to develop closer, more collegial relationships with their professors and seek to spend more time, not less, interacting with them face-to-face or by E-mail. The applications of technology thus do not necessarily decrease but rather may increase the workload of individual faculty members.

While technology may help promote the careers of a few superstars, whose teaching can be broadcast to large audiences, it does not seem to reduce the desire of students to interact with faculty. Consequently, it does not appear that technology will reduce future demand for faculty, at least not any time soon.

From an organizational perspective, technology will affect the demand for particular disciplines, possibly shifting the centers of influence toward those open to innovation and away from the technophobes, or possibly altering relationships among the newer and the more established faculty. Technology will lead to the creation of new, synergistic knowledge networks linking colleagues on campus, and around the world.

The information explosion may require, and information technology may facilitate, greater specialization by individual professors and a narrowing of programmatic focus on the part of institutions. On the other hand, it could have the opposite effect, leading to the need for synthesizing generalists and lowering the costs of multiple offerings.

In neither case is it clear that the demand for faculty will be reduced as a result of technology. A major reason is that technology is useful for simple processing of information, counting or searching, for instance, but so far technology is not useful for more complex information processing such as evaluating sources.

There are, however, altogether different aspects of technology that may affect future demand for faculty, possibly increasing it.

Most obviously, employer needs for techno-literate workers will increase student demand for advanced education and training, and consequently the need for faculty prepared to teach them.

Technology also permits colleges and universities to redefine their markets, both with respect to the geographic area they can reach and with respect to the types of students they can serve. Sophisticated production facilities enable lead institutions with specialized capabilities to deliver education systemwide, statewide, or even worldwide. American business schools are beaming classes to China.

Technology is also helping to bring underprepared students up to speed with remedial work, thus broadening the potential market for higher education. It may, however, broaden the potential market and at the same time widen the gap between the information haves and have-nots. In creating more options, technology has the potential to narrow the gap, but in reality the "information rich" tend to have more resources, and therefore, to get richer.

To the extent that technology enables education markets to be redefined, it thereby intensifies and broadens competition, both cost competition and quality competition. Then, the next question is: Will technology enable new producers to enter education markets, possibly from industry, to compete successfully with the colleges and universities, reducing their market share and reducing their demand for faculty? Probably not, for two reasons.

First, industry enthusiasm for ventures into the education world based on business expectations of greater productivity and profitable bottom lines has often dampened quickly in the face of complexities they did not foresee but that educators understand. Educators therefore enjoy a competitive advantage in education markets. Industry will do its own in-house training but will probably not launch many new competing education ventures. In fact, with industry downsizing and outsourcing, industry may even contract with colleges and universities for more of the training currently done in-house.

The second reason is that most colleges and universities, and their faculties, are remarkably resilient in responding to necessity and to opportunity. Remember that a huge proportion of the technological innovations applicable to teaching and learning were created by scientists and engineers on college campuses. To compete successfully in education technology applications, the colleges and universities have only to utilize more effectively their own products.

On balance, based on experience so far, technology—while fantastic in its potential for enriching educational experiences—will not necessarily reduce demand for faculty responsive to student needs. This is, however, by no means a time for complacency on the part of faculty but a time for faculty to share in the responsibility for expanding and protecting education markets.

Summary

As the year 2000 approaches, we can summarize expectations of enrollment and faculty demand as follows:

High School Graduation Rates

- The number of 17-year-olds will increase by about 600,000 from 3.6 million in 1995 to about 4.2 million in 2005, an increase of just over 16 percent.

- The percentage of 17-year-olds who graduate from high school has remained, however, at about 70 percent for the last decade and a half.

- This means that after years of attempting to improve the outcomes of elementary and secondary education through active efforts to reform the schools, there has been, on balance, virtually no improvement in the overall high school graduation rate.

College-Age Population Upswing

- 1997 marks the end of a sixteen-year decline in the traditional 18- to 24-year-old college-age population.

- 1998 marks the beginning of an upswing in the numbers of 18- to 24-year-olds that will continue past 2010.

College Enrollment Increase

- At current college-going rates, college enrollment over the ten-year period 1995-2005 will increase by about one million students simply because of the growth of the U.S. population.

- If college-going continues to increase at conservatively estimated rates, the increase in college enrollment will double to two million students by 2005.[23]

- With a growth of one million students (at constant college-going rates), enrollment would increase from about 14.7 million to 15.7 million, or just under 7 percent. With a growth of two million students (at slightly increasing college-going rates for the younger age groups), enrollment would increase from about 14.7 million to 16.7 million over the ten years, or about 14 percent.

Growth of Enrollment by Age

- More than half of the increase in college enrollment from 1995 to 2005 will be in the traditional age group of 18- to 24-year-olds.

- This will contrast sharply with the experience from 1970 to 1990 when older students, age 25 and over, accounted for the largest share of the increase in college enrollment.

Growth of Enrollment by Race

- White students will account for about half of the increase in college enrollment, whether the college-going rates stay about the same or increase slightly, because of the increase in the white college-age population.

- This contrasts sharply with the recent past when all of the net increase in enrollment was accounted for by minority students, while the numbers of white students actually decreased.

Technology, Enrollment Growth, and Faculty Demand

- In the past, there has generally been a positive relationship between the growth in the numbers of students on college campuses and growth in the numbers of faculty employed to teach them, over most of the economic cycles.

- In the future, information technology looms as a factor with great potential impact on teaching/learning processes and venues that could dramatically alter traditional student/faculty ratios.

- In thinking about the potential impacts of technology on education, it is essential to distinguish between the impacts for younger, traditional students and older students, more of whom are nontraditional.

- Younger students are likely to want and to claim their opportunity for the socializing experiences they seek on college campuses—and they will constitute the majority of the new students. For younger students, information technology will most likely be used to enrich the classroom experience rather than replace it.

Concluding Observations

The factors that affect college enrollments are numerous, nonlinear, and interrelated. They include population trends, trends in elementary and secondary education, trends in family income, college tuition trends, amounts of student grants, availability of student loans, and the consequent ability and willingness of students and parents to pay for college directly or through borrowing.

Since 1992, according to NCES data, there has been very little growth in college enrollment. If these data are accurate, the trend in enrollment has been relatively flat in spite of renewed national policy statements of commitment to broadening educational opportunities.

We have discerned a positive relationship between growth in the number of students and the number of faculty employed to teach them; however, the relationship is not so evident in some periods. Particularly over longer periods (depending on those chosen) the correlation does not appear to be close. But when the data are broken down into cycles defined by directional change in enrollment growth, i.e., periods starting and ending when trend-growth slopes change from slow to fast, and vice versa, the more clearly demarcated periods do show a reasonably close relationship between student enrollment and faculty employment. Even here, though, there may be differences among cycles with respect to how trends in one factor may either drive or respond to trends in the other.

Recently, faculty employment appears to have been growing, even though enrollment has been edging sideways for about five years, according to Department of Education data. Growth in part-time faculty is certainly taking place. This growth of employment—both full-time and part-time employment—is occurring in spite of the recent talk about re-engi-

neering and downsizing on college campuses to emulate industry in a search for increased productivity and lower costs.

There are many factors that influence the relationship between student enrollment and staffing needs, adding to the complexity—and risk—of making projections. Internal education factors are involved, including the occupational mix of faculty and nonfaculty on the campuses, class sizes, the numbers of graduate students who serve as teaching and research assistants, the employment of part-time and adjunct faculty instead of full-time faculty, and tenure.

The increase in the college-age population could be expected to increase college enrollment and staffing needs; however, a very large share of the population increase is accounted for by groups with lower college-going rates. Prospects for increases in those rates may not be bright unless positive actions are taken to increase participation in educational opportunities.

Responding to the educational needs of potential students may be less a matter of building new capacity—whether that capacity is based on conventional modes of delivery or on new technically sophisticated modes—than it is on working more closely with elementary and secondary schools to prepare students for college-level work and to motivate them to higher educational and career aspirations. Here, change will depend less on technical innovation and more on social values. Educators have a propensity to overestimate the importance of technological change and underestimate the importance of social change.

In the economic domain, favorable conditions resulting from continuing growth, low unemployment, and low inflation could generate additional resources—but they will not be allocated to education unless educators, still operating in the "do more with less" mode, switch gears and go after them.

Our projections of population trends, college enrollment, and expected higher education staffing requirements will be better to the extent that we not only take into consideration the usual demographic trends but also incorporate a better and more comprehensive understanding of the potential impacts of economic, financial, and educational trends as well as social, cultural, and political values.

Beyond this, the ultimate conclusion of this report is that the outlook for education will depend less on making better projections, and then merely adapting to outside forces, but infinitely more on whether educators take an active role in determining the direction of change and the shape of the future. As Peter Drucker reminds us, the best way to predict the future is to create it.[24] ■

Endnotes

[1] These estimates of the percentages of students included in NCES reports of enrollment compared with the actual numbers of students enrolled were obtained from telephone interviews with Roslyn Korb of the National Center for Education Statistics and Rosalind Bruno of the Bureau of the Census.

[2] Calculated using data obtained from the U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics: 1996,* NCES 96-133 (Washington, D.C.: U.S. Government Printing Office, 1996), 174, Table 167. The private for-profit, or proprietary, institutions grew when their students qualified for financial grants and loans. The growth slowed, however, when the federal government began to crack down on institutions whose former students were defaulting on their loans.

[3] U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census, "Population Projections of the United States by Age, Sex, Race, and Hispanic Origin, 1995 to 2050," *Current Population Reports,* P25-1130 (Washington, D.C.: U.S. Government Printing Office, 1996).

[4] Ibid.

[5] U.S. Department of Education, Office of Educational Research and Improvements, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), "Fall Staff" survey, 1993.

[6] Ibid.

[7] Ibid.

[8] Ibid.

[9] Ibid., updated with data from the Integrated Postsecondary Education Data System (IPEDS) "Fall Staff" survey, 1995.

[10] American Association of University Professors, *Policy Documents & Reports* (Washington, D.C.: AAUP, 1990), 3.

[11] Some institutions exclude their nontenure track faculty from their count of the total number of faculty and therefore significantly overstate their tenure rates. Ernst Benjamin, director of the AAUP Salary Survey, in a letter to the author dated December 11, 1997, estimates that the full-time faculty and instructional staff tenure rate is currently closer to 50 percent and has been declining slightly in recent years.

[12] National Center for Education Statistics, *Digest of Education Statistics: 1996,* 232-33, Table 222.

[13] American Association for Higher Education, Continuous Quality Improvement Project, "TQM: Will it Work on Campus?" Article reprinted from *Change Magazine* 2, no 3 (May/June 1993).

[14] The National Commission on Excellence in Education, *A Nation at Risk: The Imperative for Educational Reform* (Washington, D.C.: U.S. Government Printing Office, 1983) .

[15] National Educational Goals Panel, *The National Education Goals Report: Building a Nation of Learners* (Washington, D.C.: U.S. Government Printing Office, 1996).

[16] Carol Frances, *What Factors Affect College Tuition: A Guide to the Facts and Issues* (Washington, D.C.: American Association of State Colleges and Universities, 1990).

[17] College Board, T*rends in Student Financial Aid* (Washington, D.C.: College Board, 1997).

[18] Note that the trend in institutionally funded student aid is shown in current dollars because it is usually compared with other series, including tuition revenues or other sources of student financial aid, which are also reported in current dollars. Adjustment of student aid for inflation is typically done using the CPI, which is wrong because it seriously understates the increases in costs that students actually face and therefore overstates the "real" value of the aid received.

[19] Interviews with members of the National Association of College and University Business Officers.

[20] National Center for Education Statistics, *Digest of Education Statistics: 1996,* 350, Table 336.

[21] National Science Foundation, Division of Science Resource Studies, Surveys of National Expendi-

tures for R&D by Performing Sectors and Sources of Funds: 1955-96.

[22] Among the most thoughtful analysts of the possible impacts of technology on higher education is Marshall Van Alstyne, who, while completing a Ph.D. at the MIT Sloan School of Management, presented a paper at the October 1996 Stanford Forum on Higher Education Futures on "Applying a Theory of Information and Technology to Higher Education." See also Steven W. Gilbert and Kenneth C. Green, *Information Technology:* *A Road to the Future* (Washington, D.C.: National Education Association, 1995); Kenneth C. Green, "The 1997 National Survey of Information Technology in Higher Education," *The Campus Computing Project* (October 1997), P.O. Box 261242, Encino, California 91426-1242; Gerald C. Van Dusen, "The Virtual Campus: Technology and Reform in Higher Education," *ASHE-ERIC Higher Education Report* (Washington, D.C.: The George Washington University, Graduate School of Education and Human Development, 1997), vol. 25, no. 5; William F. Massy and Robert Zemsky, "Using Information Technology to Enhance Academic Productivity," National Learning Infrastructure: www.educom.edu. program/nlii/keydocs/massy/html.

[23] See Table 5, page 12.

[24] See Peter F. Drucker, *Innovation and Entrepreneurship—Practice and Principles* (New York: Harper & Row, 1985).

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