
University of California
EDUCATING THE NEXT GENERATION OF CALIFORNIANS
IN A RESEARCH UNIVERSITY CONTEXT:
University of California Graduate and Undergraduate Enrollment
Planning Through 2010

Planning and Analysis
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Updated planning assumptions show that current campus plans are insufficient to accommodate projected enrollments. Therefore the University is exploring options for increasing capacity.

Some increase in capacity can be gained by changing where and when some students attend classes.

Year-round operation could significantly increase capacity, at least for some student groups.

Significant increases in capacity can occur through re-evaluation of LRDP enrollment capacity limits.

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***EDUCATING THE NEXT GENERATION OF CALIFORNIANS IN A
RESEARCH UNIVERSITY CONTEXT:
UNIVERSITY OF CALIFORNIA GRADUATE AND
UNDERGRADUATE ENROLLMENT PLANNING THROUGH 2010***

EXECUTIVE SUMMARY

California is in the midst of dramatic changes—educational, economic, demographic, and social. To carry out its mission as a public research university, to meet the changing needs of the California and national economies, and to continue to provide access for a growing population of high school graduates, the University of California must increase both its graduate and undergraduate enrollments.

This paper addresses the importance and relevance of UC's graduate education to California and the world, and the economic and societal forces that are creating a need for more students prepared at the masters, doctoral and professional levels. The paper also examines demographic forces driving growth in undergraduate enrollments.

Growth in both graduate and undergraduate enrollments is essential to the University's mission as a public research university. The growth proposed here reflects that mission. The amount of proposed growth remains within the planning parameters of the existing campus Long Range Development Plans (LRDPs). However, given the projected growth in high school graduates and the expected increases in workforce demand for graduate degree holders, it appears likely that the number of students that the University has been planning to accommodate will fall short of the number who should be accommodated. This paper examines several options for increasing UC's capacity to enroll more students. The paper should not be viewed as a finished plan but as a progress report, as of January 1999, on the significant issues associated with enrollment growth.

The unique nature of planning enrollments for a research university

A research university is a unique learning environment. By engaging both undergraduates and graduate students in research together with faculty and postdoctoral scholars, it develops creative processes and exposes students to the most current findings in each field of study. Each student population is essential to this mission, and their educational experiences play a role in carrying forward the research program, depending on their level of academic attainment and experience. Enrollment planning must take into account both graduate and undergraduate populations simultaneously. Considering them together allows us to craft the essential balance that produces the instruction and research that make UC the best public research university in the country and meets its commitments to the State's citizens.

In recent years, the fact of a growing high school population, and hence a growing undergraduate population, has dominated the discussion in higher education planning. It has been and continues to be necessary to address this issue. However, the University cannot neglect its responsibility for careful analysis and planning for graduate education.

While the University fully intends to meet its commitment to enroll all eligible California high school graduates who choose to attend as undergraduates, graduate enrollments in UC's high-quality programs are equally essential to the State's well-being and economic development and should not be cut back in order to accommodate growing undergraduate enrollments.

**I. SUMMARY OF UC ENROLLMENTS WITHIN LRDP PLANNING
PARAMETERS: 1998-99 through 2010-11**

This report addresses general campus enrollments through the year 2010-11. During this period, "Tidal Wave II"—the projected large growth in the number of California high school graduates—will become college age, the eight existing general campuses will reach the enrollment limits established by their current Long Range Development Plans (LRDPs), and UC Merced will open as the University's tenth campus. Within the planning commitments of campus LRDPs and UC Merced, we have been planning following general campus enrollments (year-average headcount¹):

| | <u>1998-99</u> | <u>2005-06</u> | <u>2010-11</u> | <u>Change from 1998 to 2010</u> |
|---------------|----------------|----------------|----------------|-------------------------------------|
| Undergraduate | 126,900 | 144,300 | 158,400 | +31,500 |
| Graduate | 26,700 | 31,700 | 34,500 | + 7,800 |
| Total | 153,600 | 176,000 | 192,900 | +39,300 |

II. GRADUATE ENROLLMENT PROPOSAL

A. Overview of Graduate Education in the University of California and in a National and Historical Context

In 1998-99 the University of California is budgeted for 26,700 general campus students pursuing masters, professional and doctorate degrees in programs that have achieved national and international distinction. The quality of UC's graduate education is also reflected in highly selective admissions, strong placement records upon degree completion, and unrivaled federal research support. UC's success in graduate education and research creates a cycle of increasing quality: the excellence of UC's graduate students and programs attracts top-ranked faculty to UC who are able to attract high levels of research funding and build excellent programs that attract high quality graduate and undergraduate students, who in turn attract higher quality faculty.

However, it seems increasingly apparent that California is under-investing in graduate education. Despite high quality programs and strong student demand, enrollments in UC's graduate programs are lower today than they were a decade ago, both in number

¹ This report discusses only general campus enrollments; planning for health science enrollments is being developed separately. Unless otherwise noted, all enrollments in this paper are presented in year-average headcount. This method allows for comparison to LRDP enrollment levels, and to projections made by the Department of Finance, Legislative Analyst's Office and California Postsecondary Education Commission. FTE enrollments better reflect the operating and capital costs required to serve students, and are used for State budgeting purposes. Section VI includes a conversion of headcount to FTE.

and percent of total enrollment, while undergraduate enrollments have continued to grow. Compared to select private and public institutions with similar missions, UC has the lowest proportion of graduate students. Compared to other states, California educates a very low proportion of graduate students, falling in the lower third of all states in terms of graduate students per state resident aged 25-64 and per state resident with a B.A. California is one of only five states in which graduate enrollments have declined in the last decade.

B. Driving Forces Underlying the Proposal for Growth in UC Graduate Enrollments

While neither high student demand nor low percentages are reasons in and of themselves for proposing increases in graduate enrollments, there are also compelling workforce needs in California and the nation that will require more graduate degree recipients of the caliber that UC produces. UC campuses are planning to increase program enrollments to respond to the following driving forces:

- *As a high-technology state, California will rely more on highly educated workers.* As a consequence, as much as a third of the proposed UC growth could come from engineering and computer science enrollments, in response to the high projected demand for highly skilled workers in these fields, especially in areas linked to high-tech industries. There are also needs in the pharmaceutical and biotechnology industries, which are especially important to California.

The high-tech economy is also spurring enrollment growth in non-science areas. These include, for example, growing emphasis within UC business programs on management of high-tech business and the development or expansion of digital arts programs.

- *California's future is tied to its leadership role in an international economy, particularly focused on the Pacific Rim.* Campuses are targeting growth in programs that will prepare leaders, entrepreneurs and professionals who understand the cultures, economies, politics and languages of Asia and Latin America.
- *California and the U.S. also face many social and economic challenges.* Campuses are proposing growth in programs that will benefit K-12 education and will address challenges arising from immigration, poverty, health care, crime, urbanization, and the environment. Drawing on their own research strengths, campuses are expanding and developing programs that will benefit their individual regions' particular economic bases, social needs, or cultural environments.
- *Some growth is proposed to meet demographically driven needs.* Campus growth proposals also assume modest increases in demand for college and university faculty across the United States, even though these projected needs are lower than projections made a decade ago. UC Ph.D.'s comprise more than 20 percent of the faculties in both the UC and CSU. With large enrollment growth projected for both systems,

many additional UC Ph.D.'s will be needed to teach the State's own college students. In addition, UC will expand its K-12 credential programs and programs to meet increased teacher demand for education beyond the credential, as well as preparing more faculty for teacher education programs throughout the state.

- *Especially as undergraduates continue to increase, growth in graduate enrollments is necessary to maintain UC's excellence in research and education—and therefore its ability to perform its missions.* More graduate students will be needed to enable campuses to recruit and retain the highest quality faculty, maintain the high level of University research productivity, and preserve the overall research environment that characterizes UC campuses at both graduate and undergraduate levels. While graduate enrollments are determined by workforce needs, program and student quality, and resources for program and student support, it is important to note graduate students' subsequent benefits to the University's several missions once they are admitted.
- *Indications are that UC graduates fare well in the job market, despite widely publicized concerns that there may be too many graduate students being educated for the jobs that will be available.* California's economy and demographic and social situation differ from the rest of the nation, and there are more opportunities and needs for a highly educated population. Furthermore, UC graduates are successful in finding employment due to the high quality of their degrees. Finally, campuses are not considering adding doctoral students in fields that are experiencing an oversupply, unless they can identify a promising niche. Rather, they are proposing to direct a substantial amount of their graduate growth toward masters education, where many new opportunities are emerging.

We will continue to monitor these trends, but also note that *California's investment in graduate education yields the State significant returns* in a number of ways: by preparing highly skilled and creative professionals for industries and professions that are important to California; by providing California with global links that give the State a competitive edge in international markets, as well as contributing to cultural and research exchanges; by contributing to the creativity and productivity of research that fuels new businesses and enhances quality of life; by bringing income and attracting businesses to the State; and by enriching California's cultural and intellectual life, helping to shape our social and physical environment, and creating the informed citizens needed to maintain a democracy in a diverse and technologically complex society.

C. Tasks Related to Graduate Enrollment

The increase of 7,800 graduate students (within LRDP planning parameters) described in this paper would restore UC's overall graduate proportion to 18.3 percent (based on FTE enrollment), about the same proportion as in 1990, before budget cuts. In order to prepare for graduate growth that will meet State and national needs, continue to foster academic quality, and accomplish both within limited resources, we must attend to a number of tasks. First, we must continue to monitor and foster quality, productivity,

flexibility, and innovation in our graduate programs, ensuring student diversity, appropriate progress to the degree and continued success in placement. Second, we must continue to monitor both workforce and social forces on the one hand and availability of resources on the other so our proposed growth is both necessary and achievable. Third, while continuing to develop individual strengths and core programs, campuses will also continue to find ways to work collaboratively in their delivery of graduate education. Finally, in addition to relying on traditional sources, campuses will develop new forms and sources of student financial support to attract the best students in a highly competitive environment and to ensure their timely progress toward their degrees.

III. UNDERGRADUATE ENROLLMENT

A. Estimating Undergraduate Demand for UC Enrollment

Unlike graduate enrollments, which are determined by annual negotiations with the State based on competing State priorities, and by institutional decisions related to program quality, student support, and workforce demand, undergraduate enrollment growth is largely driven by population growth. Under California's Master Plan for Higher Education, the University is committed to providing admission for all eligible students who choose to attend, and California's population of high school graduates is projected to grow substantially in the next decade. The State's Department of Finance (DOF) Demographic Research Unit's 1998 projections suggest an increase of almost 88,000 high school graduates between 1998 and the peak year of 2008. This growth represents about a 30 percent increase, an annual growth rate of 2.7 percent.

Using DOF projections of high school graduates, we can establish a reasonable range of demand within which to plan undergraduate enrollments by modeling various assumptions about the rate at which freshmen and transfer students will enroll. Using such a model, it appears that annual growth in undergraduate enrollment demand could range from 2.3 to 3.4 percent between 1998-99 and 2010-11, with average annual increases of 3,300 to 5,200 undergraduate students.

B. Factors that May Affect Future Demand

Many factors affect student interest in attending UC, and those factors ebb and flow over time. Because UC-eligible students are the State's best high school graduates, they have many choices of colleges and universities available to them. One factor that may influence a student's choice of college is cost, a complex topic that is intertwined with other variables (cost of the competition, economic stability, family income, availability, and attractiveness of aid packages). Other socioeconomic factors such as parents' level of education and income may also affect college-going rates in ways we cannot estimate. Enrollment behavior may also be affected in unknown ways by the increasing difficulty of being accepted by campuses that have reached capacity, by changes in UC eligibility criteria, and by the vigorous outreach efforts in which UC is engaged. While we can learn about and track these factors and look for trends, the question of whether the lower or

higher end of the planning range is more likely to occur is ultimately a matter for speculation.

C. Implications for UC's Undergraduate Enrollment Proposal

The level of undergraduate growth described in this paper (an additional 31,500 year-average headcount students), even with the opening of UC Merced in 2005, will fall short of our low estimate of demand through 2010.

D. Tasks Related to Undergraduate Enrollment

In addition to finding ways to accommodate more students, there are other tasks related to preparing for undergraduate growth over the coming decade. These include continuing efforts to help students graduate in a timely manner, to increase the number of transfer students and to ease their transition to UC, and continuing the analytical work necessary to understand and estimate undergraduate demand.

IV. OPTIONS FOR ACCOMMODATING INCREASED ENROLLMENTS

Since 1988, the University's enrollment planning has been directed to accommodating levels of enrollment established in each campus's LRDP targets. However, as the most recent analysis of undergraduate demand demonstrates, these plans fall short of the potential number of students who will choose to attend UC. In addition, the University's planning assumes that growth in graduate enrollments will keep pace with undergraduate growth so that graduate enrollments remain at approximately 18.3 percent of total general campus FTE enrollment. Current analysis shows that UC should be planning for as many as 27,500 more graduate and undergraduate students than can be accommodated within LRDP planning parameters.

To address this potential gap between campus capacity and potential levels of enrollment, the campuses are exploring a variety of options. Among them are the possibility of educating more students off-campus, expanding the use of the summer (either through increased attendance at Summer Session, or through a State-funded summer program) and increasing LRDP enrollment levels at one or more existing campuses.

V. FINANCIAL ISSUES

The University's ability to implement these plans for growth is dependent on acquiring the financial resources to support it. There are four areas of significant interest and concern with respect to resources that must be actively pursued to achieve the necessary funds: A funding commitment from the State, in the form of a new compact with the State related to funding for public higher education; efforts by the State and the campuses to provide the capital resources for expanding enrollments and renewal of an aging physical plant; increased federal support, especially for research; and, multiple-source strategies to provide graduate student financial support for growing enrollments.

INTRODUCTION

Many important changes and developments are occurring in California. The economy is becoming more oriented to the industries of the future, through the rapid development and widespread application of new technologies, and is becoming more integrated into an international context, centering on the Pacific Rim. The population is continuing to grow and become more racially, ethnically, and socioeconomically diverse. New fiscal realities are requiring public institutions to develop ways of providing their services more productively. And, as has long been the case in this state, we look to our educational institutions to prepare a workforce that can participate fully and competently, to prepare citizens who will contribute positively to their communities, and to lead the way with the development of new products, industries, and creative solutions to social and economic problems.

California has in its vast and well-established system of public education the necessary structures to address various aspects of the State's needs. The Master Plan for Higher Education has created these structures for public higher education through the differentiation of both student access and institutional function. As a result, there is little confusion in California about either educational opportunity or about institutional mission.

This paper presents the University's current planning for accommodating enrollment growth considered necessary to meet societal needs and to respond to demographic pressures. The amount of growth proposed here is influenced by several factors:

- Commitment to the Master Plan's designation of the University as a public research university, which means that UC is dedicated to providing instruction for both graduate and undergraduate students;
- Commitment to the Master Plan's guarantee of enrollment for all eligible California high school graduates who choose to attend;
- Commitment to the University's Memorandum of Understanding with the California Community Colleges which will increase the number of students who transfer to UC.
- Recognition of the planning parameters and commitments made in the Long Range Development Plans (LRDPs) at existing UC campuses and of current planning assumptions about enrollments that can be accommodated at the Merced campus.

The key to understanding this proposal is to consider it in the unique context of a research university. A research university is an integrated set of educational relationships in which no single activity or group takes precedence. It is about both research and teaching, both graduate and undergraduate education. The various components and players—faculty and students, instruction and public service, libraries and laboratories—can be described as spokes of a spinning wheel whose hub is research. Stop the spinning and pull out any one entity and its essential part in the whole is lost.

Nevertheless, from time to time we must look at individual aspects of the research university. In this paper, we look at enrollment, focusing on the two sets of players,

graduates and undergraduates, whose educational lives are intertwined, representing various points of intellectual development and mastery in the “culture of discovery.” We must plan for both populations in order to maintain our function as a research university, and must do our planning for each group with the other in mind.

Another “given” in this paper, in addition to the need to maintain our role as a research university, is that growth cannot outpace our ability to maintain quality. Part of our responsibility in meeting the State’s needs for an educated workforce and citizenry is the commitment to maintain or improve the value of this education for future generations.

Bearing this commitment in mind, we have matched our enrollment proposal to our ability to support the additional students, defined tasks we must pursue to achieve our proposal, and identified areas of potential vulnerability that our plans must take into consideration.

This paper is organized into the following parts:

- A summary of our proposed increases in graduate and undergraduate enrollments;
- Our rationale for graduate growth, and tasks we must undertake if we are to be successful in achieving this growth;
- Our proposal for undergraduate growth and tasks we must undertake if we are to continue to accommodate demand;
- A summary of financial resources that will be required for success; and
- Individual campus projections for enrollments through 2010.

We will also provide upon request three appendices that furnish more in-depth information and analysis:

- *Making Discovery Work: Graduate Education at the University of California*, a stand-alone document that describes graduate education at the University and its important contributions to California, the nation, and the world;
- “Workforce Projections and Job Market Trends for Graduate and Professional Degree Recipients,” a paper summarizing a number of relevant studies and reports that contributed to our thinking about workforce needs for graduate enrollments; and
- “Undergraduate Enrollment Demand Projection Methods,” a detailed description of the model used to produce estimates of undergraduate demand.

**I. SUMMARY OF UC ENROLLMENTS WITHIN LRDP
PLANNING PARAMETERS
1998-99 through 2010-11**

| <u><i>Summary of Major Points</i></u> | | | | |
|---|----------------|----------------|----------------|-------------------------------------|
| | <i>1998-99</i> | <i>2005-06</i> | <i>2010-11</i> | <i>Change from 1998 to 2010</i> |
| <i>Undergraduate</i> | <i>126,900</i> | <i>144,300</i> | <i>158,400</i> | <i>+31,500</i> |
| <i>Graduate</i> | <i>26,700</i> | <i>31,700</i> | <i>34,500</i> | <i>+ 7,800</i> |
| <i>Total</i> | <i>153,600</i> | <i>176,000</i> | <i>192,900</i> | <i>+39,300</i> |
| <i>(year-average headcount)²</i> | | | | |

This report represents the University’s third long-term projection of enrollments in a little more than a decade. In 1988, The Regents reviewed a long-range enrollment plan that was intended to prepare for the enrollment of undergraduates and graduates through the year 2005-06. While the underlying population dynamics changed significantly enough to justify a revision that was presented to The Regents in 1995, the 1988 Plan (and 1990 modification) created a structure that still guides our planning today.

The 1988 planning effort involved the creation of campus Long Range Development Plans (LRDPs), which established limits for campus growth. While minor amendments can be made to the LRDPs, substantial changes will require new LRDPs and new evaluation of environmental impacts. The enrollment levels described in Sections I through III honor the limits placed by each campus’s LRDP. Section IV describes options for increasing campus capacity beyond these targets in order to accommodate greater numbers of students.

Another aspect of the 1988 Plan that is still a relevant part of our current planning is the need eventually to establish at least one new UC campus. Although the originally planned opening date of 1998 has been deferred, plans for UC Merced are actively being developed.

The enrollment presentation to The Regents in 1995 was primarily for the purpose of scaling back the 1988 enrollment projections to reflect significantly lower projections of high school graduates and the decreasing likelihood that the level of graduate enrollments proposed in 1988 could be achieved by 2005-06. One result of the 1995 presentation was the recognition that California is such an economically and socially dynamic state that we must review our enrollment planning assumptions annually.

² This report discusses only general campus enrollment planning; planning for health science enrollments is being developed separately. Unless otherwise noted, all enrollments in this paper are presented in year-average headcount. This method allows for better comparison to LRDP enrollment levels, and to projections made by the Department of Finance, Legislative Analyst’s Office and California Postsecondary Education Commission. FTE enrollments better reflect the operating and capital costs required to serve students, and are used for State budgeting purposes. A simple translation to year-average FTE is to multiply total headcount by 96 percent; conversion rates for undergraduate and graduate enrollments differ slightly. Section VI includes a conversion of headcount to FTE.

The review of assumptions that took place in early 1998 resulted in a revised planning framework with several unique aspects as compared to the 1995 planning framework. First, it brought all campuses to the enrollment levels established in the LRDPs. Second, it incorporated UC Merced into the planning projections. Third, it projected undergraduate enrollments through the entire period of time encompassing “Tidal Wave II,” unlike previous efforts, which stopped just as large increases in high school graduates were projected to occur. Finally, the review included a more in-depth analysis and rationale for increases in graduate enrollments than previous planning efforts have.

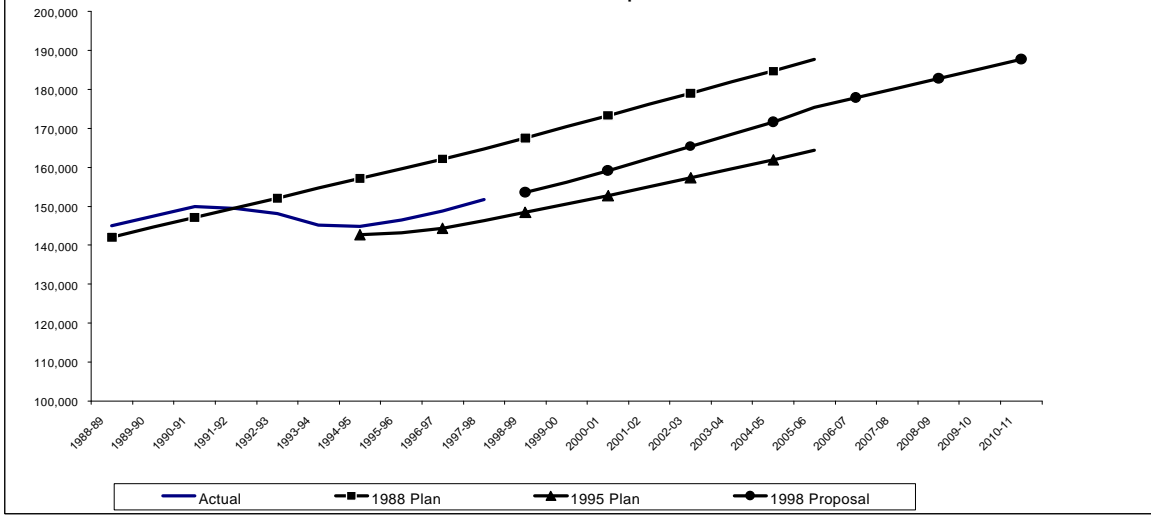
The enrollment proposal that was developed, based on assumptions current at the beginning of 1998, was as follows:

- At existing campuses, total (graduate and undergraduate) general campus year-average headcount enrollment would reach 187,700 in 2010. This represents an increase of 34,100 students over 1998-99 budgeted levels and brings campuses to their LRDP enrollment planning targets.
- UC Merced would open in 2005-06 with a headcount enrollment of 1,040 students, and grow to about 5,200 students in 2010-11.
- Total universitywide (existing campuses and UC Merced) general campus headcount graduate enrollments would increase by 7,800 between 1998-99 and 2010-11, by adding about 650 new graduate students a year. This proposal returns the existing campuses to an overall 18.3 percent graduate enrollments (based on FTE enrollments), the level they were in 1989-90 before the fiscal crisis, but still well below the 23 percent proposed in 1988.³
- Total universitywide undergraduate enrollments would increase by 31,500 over 1998-99 budgeted levels, for an annual growth rate of 1.7 percent.

Figure 1 shows the 1988 plan for Universitywide general campus enrollments, the 1995 plan, the revised proposal prepared in early 1998, and actual enrollments since 1988. Note that in 2010-11, the 1998 proposed enrollments reach the level that the 1988 plan projected would occur in 2005-06.

³ Health science and self-supporting program enrollments are not considered in this document.
February 1999

**Figure 1
Comparison of 1988 Plan, 1995 Proposed Plan,
1998 Proposed Plan, and Actual Enrollments
General Campus**



II. GRADUATE ENROLLMENT PROPOSAL

Introduction

The fundamental underlying principle of UC enrollment planning is to create plans that reflect and support the continued excellence of the UC research university environment. As California's designated public research university, UC is committed to providing the unique educational environment that attracts the best undergraduate and graduate students. Often overlooked in public discussions of the compelling need to enroll increasing numbers of undergraduates in the coming decade is the importance of also paying serious attention to graduate enrollments. A research university is a balance of both undergraduate and graduate students, and could not exist, much less thrive, as a research university without its graduate programs. Given the importance of the graduate population to our enrollment planning for UC's research university campuses, we begin this paper with a discussion of graduate enrollments.

First, we provide a context and reference data about the current and historical level and configuration of UC's graduate enrollments, and how they compare to those of other research universities and other states.

Next, we describe the compelling economic and social forces that underlie our proposal to increase graduate enrollments. This section also provides illustrative examples of specific programs in which campuses are proposing growth to address these forces. We also note ways in which campuses are changing programmatic focus in order to match student skills with employer needs.

We also address two significant issues that must be considered before embarking on growth plans—the possible oversupply of graduate degree holders, and the need to provide adequate graduate support. However, while it is important to take these issues into consideration as we plan, we also note the significant benefits of graduate education that accrue to both the State and the nation.

We close this section on graduate enrollment planning by describing four tasks that UC campuses and the system must pursue if we are to accomplish our plans.

A. Overview of Graduate Education at the University of California and in a National and Historical Context

Summary of Major Points

Graduate education at UC covers a wide range of fields, types of programs and students.

UC graduate education has achieved the highest quality: unparalleled national rankings, high selectivity, strong placement records, and unrivaled federal research support.

Despite high quality programs and strong demand, enrollments in UC's graduate programs are lower today than they were a decade ago, even while undergraduate enrollments continue to expand.

Compared to peer universities, UC's graduate percentages are the lowest.

California is under-investing in graduate education: California educates a very low proportion of graduate students on a per capita basis, and it has lost ground compared to other states, compared to other states.

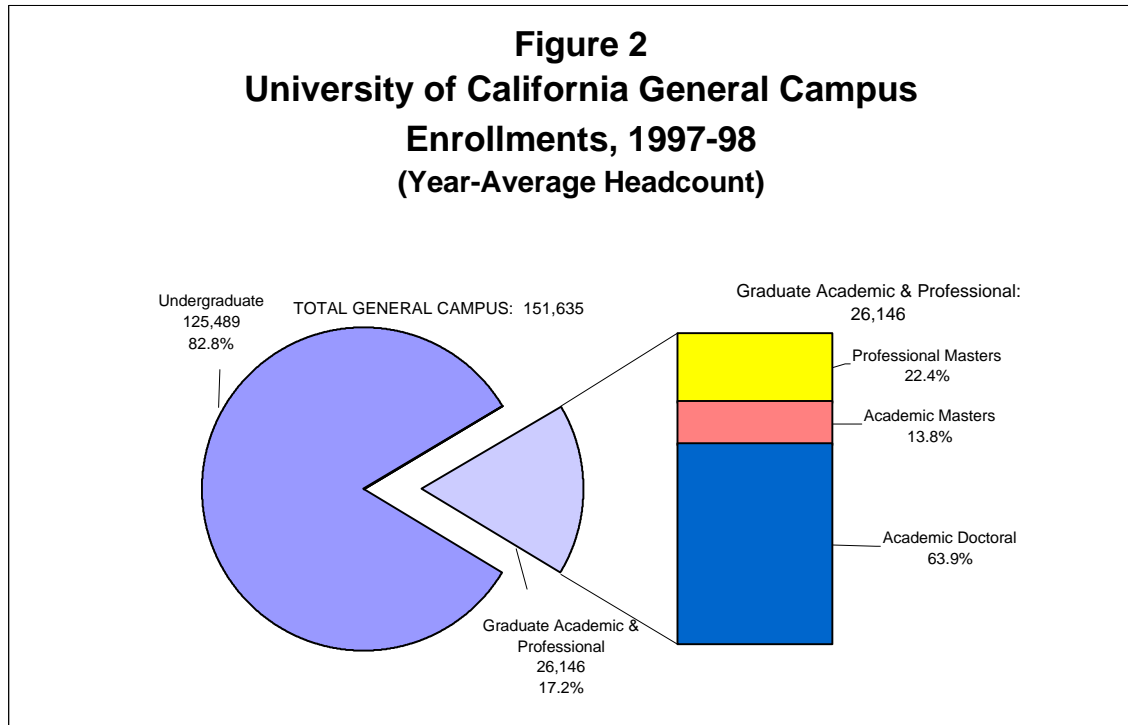
Graduate education at UC covers a wide range of fields, types of programs and students.

Together, UC campuses enroll over 26,000 general campus graduate students in academic and professional programs. They are pursuing masters, doctoral, and professional studies in over 150 disciplines, ranging from agricultural sciences to zoology, from East Asian languages to engineering, from the dramatic arts to business and law.

Graduate students as a percent of total enrollment. In 1997-98, graduate students made up 17.2 percent of general campus year-average headcount enrollments (17.6 percent of the FTE enrollments) as shown in Figure 2 below. The Berkeley and Los Angeles campuses have the largest graduate enrollments—about 7,500 year-average headcount enrollments at Berkeley (26.0 percent of campus enrollment) and about 7,000 at UCLA (23.0 percent). Santa Cruz and Santa Barbara have the smallest proportions, 9.7 and 11.8 percent, respectively.

These data do not include all graduate enrollments. They exclude the 12,000 students in

the health sciences, 10,350 of whom are students in professional degree programs,⁴ and 1,650 of whom are graduate academic students pursuing a Ph.D. or academic masters degree. Health sciences students are the subject of a separate planning effort. Also excluded are nearly 1,600 students in non-State-funded graduate degree programs (primarily in business M.B.A. programs).



General campus graduate academic and professional enrollments. Figure 2 also shows graduate enrollments by the type of program students are pursuing. Graduate academic students comprise 78 percent of general campus graduate enrollments. Most of these students are pursuing teaching and research-oriented careers, either in colleges and universities or in the private sector (for example, as research scientists in industry); and they are completing programs that require original, focused research with close faculty monitoring. The remaining 22 percent are graduate professional degree students who are enrolled in highly structured two- or three-year masters programs, most of whom are preparing for professional careers in fields such as architecture, business, education, and law.⁵

⁴ UC's health science professional programs include about 4,300 students pursuing professional degrees in medicine, dentistry, veterinary medicine, and other health sciences fields; about 4,800 medical or other residents; and about 1,300 students pursuing certain graduate professional masters or doctoral programs (e.g., Masters of Public Health).

⁵ This report defines graduate academic enrollments as including the following: All general campus graduate students in life sciences, physical sciences and mathematics, social sciences/psychology, humanities, arts, engineering, and computer sciences; and doctoral enrollments in all other general campus programs. Professional enrollments are defined as general campus masters-level enrollments in architecture, business, communications/journalism, education, law (J.D.), library and information sciences, Pacific international affairs (UCSD), public administration/public policy, and social welfare, as well as M.F.A. enrollments in UCLA's professional school of theater, film and television.

Doctoral and masters students. Another way to look at UC's graduate effort is to examine the split between doctoral and masters enrollments. In 1997, doctoral students represented 64 percent of UC's total general campus graduate enrollments, and masters students about 36 percent, with nearly two-thirds of these in graduate professional programs. By contrast, in 1987, masters students comprised 43 percent of UC's general campus graduate enrollments. Between 1987 and 1997, both the number and proportion of masters students dropped in virtually every broad field except business and law, where enrollments remain above 90 percent.

Student diversity. Sixty-three percent of UC's domestic graduate students in 1997 were white, with Asian students making up another 18 percent. Forty-three percent of all graduate students were female. About 14 percent of UC's total graduate enrollments were international students, down from 16 percent a decade earlier. The largest concentrations of foreign students are in engineering and computer science, mathematics, and agriculture and natural resources.

UC graduate education has achieved the highest quality: unparalleled national rankings, high selectivity, strong placement records, and unrivaled federal research support.

UC graduate programs have achieved a level of quality and effectiveness that few other institutions can match, as indicated by several measures.

Highest national rankings. The quality of UC's graduate training—not just at two or three campuses but at all UC campuses—cannot be overemphasized. Studies of doctoral programs and faculty research consistently confirm that few other institutions can match the quality of UC's doctoral programs. The National Research Council's (NRC) study of doctoral programs found, for example, that eight UC doctoral programs ranked number one in their academic fields in terms of faculty quality (a key indicator of doctoral program quality), and more than one-third of all UC programs evaluated—at eight UC campuses—ranked in the top ten. More than half of the 229 UC doctoral programs evaluated ranked in the top 20 in their fields, a record unmatched by any other university system in the nation.⁶ Another national study, by researchers Hugh Davis Graham and Nancy Diamond, reaffirmed the extraordinary productivity and quality of faculty research at all UC campuses and made particular note of the remarkable rise to excellence of UC's newer campuses at Santa Barbara, Riverside, and Santa Cruz.⁷ UC's professional schools of business, education, engineering, law, medicine, public policy, and veterinary medicine rank very highly, too, according to ratings by *U.S. News and World Report (USN&WR)*.⁸ Six of UC's eight general campuses belong to the Association of American Universities (AAU), a prestigious group of 62 U.S. and Canadian institutions. The extraordinary quality of graduate education and research at each of the nine campuses is briefly summarized in Figure 3.

⁶ National Research Council, *Research-Doctorate Programs in the United States: Continuity and Change* (Washington, D.C.: National Academy Press, 1995).

⁷ Hugh Davis Graham and Nancy Diamond, *The Rise of American Research Universities: Elites and Challengers in the Postwar Era* (Baltimore, MD: The Johns Hopkins University Press, 1997).

⁸ *U.S. News and World Report*, 1998 rankings.

**Figure 3 – Selected Indicators of Graduate Education and Research Quality
at UC Campuses**

| | |
|---------------|---|
| Berkeley | Ranks #1 in U.S. in number of top-10 Ph.D. programs (36) in NRC study. Per faculty member, ranks #1 in overall research performance in Graham-Diamond study. USN&WR ranks professional programs in education #1, engineering #2, public policy #5, law #7, and business #10. AAU member. |
| Davis | NRC study ranks four Ph.D. programs in top 20. Per faculty member, ranks #11 among public universities in total number of journal publications, in Graham-Diamond study. USN&WR ranks veterinary medicine program #1. AAU member. |
| Irvine | NRC study ranks five Ph.D. programs in top 20. Per faculty member, ranks #3 among public universities in publications in leading science journals and #6 in total number of journal publications, in Graham-Diamond study. AAU member. |
| Los Angeles | Ranks #14 in U.S. in number of top-10 Ph.D. programs (13) and #3 in number of top-20 programs (31) in NRC study. Per faculty member, ranks #4 among public universities in overall research performance in Graham-Diamond study. USN&WR ranks programs in education #5 and business #8. AAU member. |
| Riverside | Per faculty member, ranks #1 among public universities in total number of journal publications, #4 in prestigious arts and humanities awards, and #6 in publications in leading social science journals, in Graham-Diamond study. |
| San Diego | Ranks #10 in U.S. in number of top-10 Ph.D. programs (14) in NRC study. Per faculty member, ranks #1 among public universities in federal R&D funding, #1 in publications in leading science journals, and #2 in total journal publications, in Graham-Diamond study. AAU member. |
| San Francisco | NRC study ranks six of the nine Ph.D. programs it reviewed in the top 10. USN&WR ranks its medical school #7. |
| Santa Barbara | NRC study ranks 10 Ph.D. programs in top 20. Per faculty member, ranks #2 among public universities in overall research performance (including #2 in prestigious arts and humanities awards) in Graham-Diamond study. AAU member. |
| Santa Cruz | NRC study ranks 2 of its 17 rated Ph.D. programs in top 10. Per faculty member, ranks #1 among public universities in publications in leading social science journals and #6 in prestigious arts and humanities awards, in Graham-Diamond study. |

Student selectivity. UC graduate academic and professional programs are both highly attractive to students and highly selective. Applications to UC’s general campus graduate programs are now over 67,000, an increase of seven percent over the previous decade, despite widely publicized concerns about a weak Ph.D. job market in recent years. Overall, UC’s graduate programs accept only 28 percent of these applicants; by comparison, nationally, 44 percent of applications to graduate programs are accepted.⁹ Graduate programs in fields like psychology and the arts are even more selective, admitting only 13 percent and 18 percent, respectively, in 1997. Nearly half of those who are admitted (44 percent overall in 1997) decide to enroll, a proportion that has remained relatively stable for more than a decade.

Strong placement records. Contrary to popular impressions, the unemployment rate among Ph.D. recipients from U.S. universities is quite low—lower than the current 4.5 percent rate for the U.S. civilian labor force as a whole. Ph.D.’s have low unemployment rates even during economic recessions, such as during the early 1990s, although during such times some new Ph.D.’s may accept types of jobs different from those they had expected to find and for which they were trained. In 1995 (the most recent year for which national data are available) overall unemployment for recent U.S. Ph.D.’s (one to

⁹ Peter D. Syverson and Stephen R. Welch, *Graduate Enrollments and Degrees: 1986 to 1996* (Washington, D.C.: Council of Graduate Schools, 1998).

three years after the degree) in the sciences, engineering, and social sciences was 1.9 percent, ranging from 0.5 percent in psychology to 4.3 percent in chemical engineering, and it was 3.0 percent in the humanities.

Moreover, new UC Ph.D.'s have better placement records than do Ph.D.'s nationally, especially in engineering/computer sciences and in physical sciences/mathematics fields. For example, by the time they had completed their degree programs, 81 percent of UC Ph.D.'s in engineering or computer sciences who graduated in 1994 to 1996 and who wanted to enter the labor force immediately (rather than pursue postdoctoral work) had already secured jobs or were negotiating for them, compared to only 73 percent nationally. In the physical sciences/mathematics, 84 percent of UC Ph.D.'s who were pursuing postdoctoral positions, and 71 percent of those who sought immediate employment, had secured or were negotiating for these positions by the time they had completed their degree programs, compared to 77 percent and 68 percent, respectively, of Ph.D.'s nationally.¹⁰ It is important to note that these numbers are based on *placements at the time of filing the dissertation*—that is, immediately after completing their degrees. Campus information suggests that most of the remaining UC Ph.D. recipients secure positions within a few months.

New UC Ph.D.'s find employment quickly and do well even in fields with difficult job markets. For example, a study by UC San Diego of recent Ph.D. recipients found that within a few months of graduation, 95 percent had secured jobs or postdoctoral appointments or were pursuing further education. A survey by UC Irvine's Department of English and Comparative Literature found that 90 percent of Ph.D.'s awarded since 1992 are employed in academic positions, with others finding employment in the private sector.

Placement of UC professional degree recipients is also strong. For example, at UCLA's Anderson School of Management, 99 percent of the class of 1997 had accepted full-time offers or developed entrepreneurial opportunities by September 1997, with about two-thirds taking positions in California. Placement information from UC Berkeley's Haas School of Business showed that 90 percent of the 1997 M.B.A. graduates had accepted job offers less than three months after graduating, with an average annual salary over \$76,000. Business schools at the other UC campuses had equally strong placements. In law, unemployment rates for the 1996 graduates of UC's three law schools—a class that faced a difficult job market—were below the national average of 11 percent; between 69 and 88 percent of UC graduates had obtained full-time legal employment within six months after graduating, with others taking full-time positions outside law or part-time legal positions, according to campus placement information.

Unrivaled federal research support. A final aspect of the "UC-advantage" in offering graduate studies is the unrivaled success of the University in attracting research support, particularly from the federal agencies. In 1997-98, excluding funding for the national laboratories, UC received almost \$2.2 billion in contract and grant awards, about \$1.5 billion of which came from the federal government. Three UC campuses (San Diego,

¹⁰ Comparisons are based on data for 1993-94, 1994-95, and 1995-96 U.S. doctorate recipients from the National Research Council's Survey of Earned Doctorates: UC's NRC data files and a special analysis of national NRC data provided by the National Opinion Research Center. Includes those who were returning to predoctoral positions, those who had secured definite commitments, and those who were negotiating with one or more specific organizations.

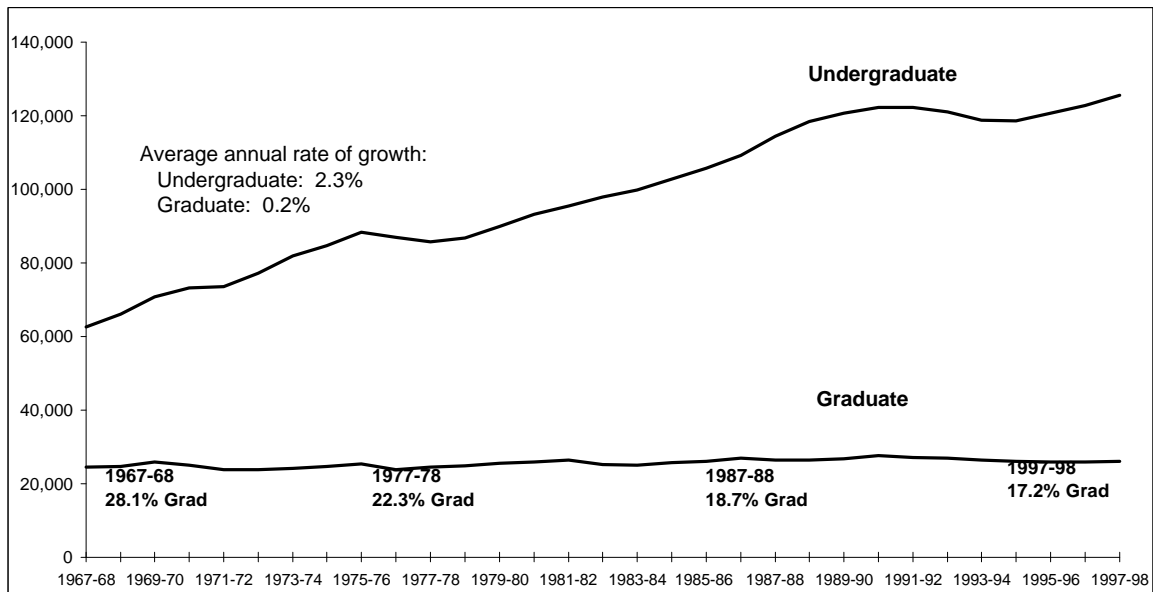
Los Angeles, and San Francisco) are among the top ten institutions in the country in federal R&D expenditures, and all nine campuses rank in the top 27 percent of institutions that had federal R&D expenditures in 1996-97. This success has unquestionable benefits for the University, because it creates a cycle of increasing quality: when faculty attract high levels of support they are able to build excellent programs to which they are able to attract high quality graduate and undergraduate students, who in turn attract higher quality faculty who attract more support.

The success in attracting research support and all its implications for ensuring the excellence of the University, however, has even greater benefits for California. As noted later in this report, the benefits of the University's research have accrued to California in measure far beyond the original investment. One example, however, gives an indication of the impact of UC research, which is possible only with the joint effort of University teams of faculty and graduate students, and often postdoctoral scholars and undergraduates: UC and its affiliated national laboratories produce more research leading to patented inventions than any other public or private research institution in the U.S. The National Institutes of Health and the National Science Foundation—UC's two largest federal research support agencies—received increases of over 14 percent (total budget) and 10 percent (basic research budget), respectively in fiscal year 1998-99, and both Congress and the President have pledged continued strong support for basic research funding. Such continued support could make a real long-term difference to California, if UC is positioned to take advantage of the increased funding.

Despite high quality programs and strong student demand, enrollments in UC's graduate programs are lower today than they were a decade ago, even while undergraduate enrollments continue to expand.

Despite the widely recognized high quality of UC's graduate and professional programs and increasing demand for admission, UC's general campus graduate enrollments are lower today than they were a decade ago, both in numbers and in percentage of total enrollment. By contrast, undergraduate enrollments have increased 10 percent over the past decade. In fact, over the past 30 years, graduate enrollments have increased only seven percent, compared to a 100 percent growth in undergraduate enrollments. As a result, the proportion of general campus graduate students to total students has declined from 28.1 percent in 1967-68 to 17.2 percent in 1997-98, as Figure 4 shows.

**Figure 4 – University of California General Campus Enrollments, 1967-68 to 1997-98
(Year-Average Headcount)**



UC's steady state in graduate enrollments was not expected in 1988 when The Regents approved the last long-range enrollment plan. That plan projected an increase of nearly 8,800 general campus graduate enrollments between 1988-89 and 1997-98, an increase of 34 percent. This would have allowed each of the campuses in the UC system to achieve at least 20 percent general campus graduate enrollments by 2005-06.

The main reason for the lack of graduate enrollment growth over the past decade is clearly not lack of student demand or concerns about quality. Rather, unlike undergraduate enrollments, which are driven primarily by demographic factors (i.e., student participation rates among those eligible to enroll), State-funded graduate enrollments are negotiated with the State during the budget process. Graduate enrollments have remained flat because higher priority has been given to meeting undergraduate demand within constrained State-funding limits and because many graduate programs also reduced their expectations and, in some cases, the number of students they admitted, in response to concerns about program funding, student support, or workforce demand.

Compared to peer universities, UC's graduate percentages are the lowest.

As Figure 5 below shows, UC's graduate enrollment as a percentage of total campus enrollment is lower than the percentage at our four public comparison universities, our four private comparison universities,¹¹ and eleven public university members of the

¹¹These eight institutions are those agreed to by UC and the California Postsecondary Education Commission as UC's comparison universities, for use in setting the level of UC faculty salaries. The four public ones are the Universities of Illinois at Urbana-Champaign, Michigan-Ann Arbor, Virginia, and SUNY-Buffalo. The private ones are Harvard, MIT, Stanford, and Yale.

Association of American Universities (AAU), institutions similar to UC in their research and graduate education missions.¹²

The table also shows that UC's percentage in various subcategories of enrollment is in almost all cases lower than any of the comparison groups.

Figure 5 – Graduate Enrollments as a Percent of Total Campus Enrollments, Fall 1997¹³

| | University of California % | Public Comparison % | Private Comparison % | 11 Public AAU Institutions % |
|-----------------------------------|----------------------------|---------------------|----------------------|------------------------------|
| Total percent Graduate Enrollment | 18.1 | 27.0 | 51.3 | 24.7 |
| Graduate Academic | 13.3 | 15.4 | 30.9 | 15.7 |
| Letters and Science | 9.3 | 8.7 | 17.6 | 9.8 |
| Engineering/Computer Science | 2.9 | 4.8 | 11.0 | 3.9 |
| Professional Doctoral | 1.1 | 1.9 | 2.4 | 2.0 |
| Graduate Professional (Masters) | 4.8 | 11.5 | 20.4 | 9.0 |

California is under-investing in graduate education: California educates a very low proportion of graduate students on a per capita basis, and has lost ground compared to other states.

A 1998 analysis by the Council of Graduate Schools comparing graduate education across the 50 states, plus Washington D.C. and Puerto Rico, revealed some significant trends and comparisons.¹⁴ As Figure 6 below shows, California has the highest graduate enrollment—159,000 students—slightly ahead of New York, and 40,000 more than Texas, the third-ranked state. However, controlling for size presents a different picture. Graduate enrollments divided by state residents 25-64 years old place California in the bottom third of the United States. Graduate enrollments per state resident with a B.A. rank California even lower. What is more, over the past decade, California actually lost graduate enrollments, one of only five states to have fewer graduate students in 1996 than in 1986, and it had by far the greatest numerical decline in graduate enrollments of any

¹² These include UC's four public comparison universities plus other public AAU institutions for which comparable enrollment data were available: the Universities of Colorado-Boulder, Minnesota-Twin Cities, North Carolina-Chapel Hill, Ohio State University, Texas-Austin, Wisconsin-Madison, and Washington. As noted earlier, six of UC's eight general campuses belong to the AAU.

¹³ For comparability with other institutions, UC proportions in Figure 5 include enrollments in non-State-funded graduate degree programs. The percentages are therefore higher than figures shown elsewhere in this document, which reflect only State-funded enrollments.

¹⁴ Syverson, Peter D., "State Comparisons of Graduate Enrollment: An Exploration," *Communicator*, June 1998, pp. 9-12.

state.¹⁵ Yet, California benefits more than most states in terms of federal R&D dollars it receives per enrolled graduate student, as Figure 6 also shows.

Figure 6 – California’s National Ranking on Selected Comparative Measures

| Measure | CA Measure (Includes All CA Higher Education Institutions) | Top Ranked States | CA Rank Compared to All States | CA Rank Compared to 15 Most Populous States |
|---|---|---|---------------------------------------|--|
| Total graduate enrollment | 159,002 | NY – 156,773 TX – 119,978 IL – 107,435 | 1 | 1 |
| Graduate students per 100 state residents 25-64 years old | 1/100 | DC – 12/100 MA – 3/100 UT – 2/100 | 36 | 11 |
| Graduate students per 100 state residents with B.A. degrees | 3/100 | DC – 30/100 AZ – 7/100 SC – 7/100 | 39 | 14 |
| Federal R&D dollars per graduate student | \$10,492 | MD – \$23,755 AK – \$17,086 VT – \$15,531 | 9 | 2 |

As we move into the 21st century, several emerging forces will require growth in the number of highly educated individuals, if California and the U.S. are to sustain and enhance economic strength and social well-being. The next section discusses some of these driving forces, which underlie the proposed growth in UC graduate enrollments to the year 2010. As is evident from the discussion above, UC has the potential to meet these changes from a position of considerable strength—in terms of program and student quality, student demand, strong student placement records, and research and programmatic strengths well situated to take advantage of developing needs and opportunities for California and the U.S.

¹⁵ The other states with declines in graduate enrollments between 1986 and 1996 were Arkansas, Connecticut, Kansas, and Oklahoma.
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B. Driving Forces Underlying the Proposal for Growth in UC Graduate Enrollments

Summary of Major Points

As a high-technology state, California will rely more on highly educated workers.

California's future is tied to its leadership role in an international economy, particularly focused on the Pacific Rim. Leadership will require business entrepreneurs as well as those who understand the cultures, economies, politics and languages of Asia and Latin America.

California and the U.S. also face many social and economic challenges. We will need thinkers, problem-solvers, and community builders to address these problems.

Some growth is proposed to meet demographically driven needs.

Especially as undergraduate enrollments continue to increase, growth in graduate enrollments is necessary to maintain UC's excellence in research and education—and therefore its ability to perform its missions.

Our proposal is not just about enrollment growth. Campuses are also shaping and modifying their programs to meet changing needs.

Inter-university and national comparisons help establish context and benchmarks, but they do not, in and of themselves, justify increases in graduate enrollments. Rather, graduate education should grow when there are societal needs for highly educated individuals. We now turn our attention to some of the forces at work that are driving the need for increases in graduate enrollments at UC. While much of our focus is on California's economy and society, it is important to note that UC graduate students, particularly doctoral students, enter a national and international workforce. It is also important to note that UC-trained graduate alumni become not only highly skilled workers but leaders who shape their work, political, and cultural environments – for example, through their cutting-edge research and technological development, their prominent positions as policy advisers and policy makers on state and national levels, and their educating of the next generation of the nation's youth.

As a high-technology state, California will rely more on highly educated workers.

As much as a third or more of the proposed UC graduate growth could come in engineering and computer science enrollments alone. The U.S. Department of Commerce and industry associations are among those who argue that as a result of our transformation to a knowledge-based economy, a critical shortage of high-technology workers currently exists, especially for computer programmers, systems analysts, electrical engineers, and other information technology workers. This shortage will get worse over the next decade, unless efforts are taken to prepare more such workers,

including those at the masters and doctoral level.¹⁶ Increased demand is also expected for bioengineers and those entering the burgeoning field of digital arts.

In California, workforce needs and job opportunities for computer scientists and engineers in high-tech oriented fields are expected to be especially strong. For example, jobs in computer services, which include many advanced degree holders, are expected to grow by more than 80 percent between 1997 and 2005. In addition, professional services (which includes computer services and engineering personnel, among others) and high-tech manufacturing are two of the four major sectors expected to propel California's economic base forward to 2005,¹⁷ but this will only be possible if we have sufficient individuals educated in these fields. As just one example, the Davis campus cites Intel Corporation's plans to hire 2,000 engineers over the next three years at its Folsom facility alone. About 55 percent of them are expected to have advanced degrees—90 percent of them with masters and 10 percent with Ph.D.'s. Moreover, because of the growth of high-tech industries in other states and countries, California may be less able in the future to import engineers or computer scientists to help meet its needs.

Campuses are developing academic plans and proposals to meet these needs for engineers and computer scientists. Each campus is considering its existing areas of strength, the needs of employers in its region, and its capacity for expansion. Riverside, for example, is planning a joint art/computer science program in digital arts. Some probable areas of growth are in biomedical engineering, microelectromechanical systems, environmental engineering, digital arts, nano-engineering, and all aspects of information and communication technologies.

Most graduate growth in engineering and computer sciences will be at the masters level. However, there will be some growth in Ph.D.-level enrollment, both to meet expanding industry needs for researchers and to replenish and expand faculty positions across the nation.

The life sciences are another area in which campuses are considering some growth, given California's special needs. Although a recent report by the National Research Council (NRC) projected an oversupply of life science Ph.D.'s for research positions nationally and therefore recommended that universities not expand life science graduate enrollments, it noted that some expansion might be warranted if it were directed at specific needs, such as providing trained researchers for emerging new fields. Among the emerging fields that the NRC named as providing promising opportunities are neuroscience, gene therapy, bioinformatics and environmental issues,¹⁸ which are prominent among the fields in which UC campuses are proposing growth. Moreover, expected growth in the pharmaceutical and biotechnology industries, which are

¹⁶ U.S. Department of Commerce, Office of Technology Policy, "America's New Deficit: The Shortage of Information Technology Worker" (September 1997).

¹⁷ Center for Continuing Study of the California Economy (CCSCE), *California Economic Growth, 1998 Edition* (Palo Alto, CA: CCSCE, 1998). The other two sectors are foreign trade, and tourism and entertainment. It is important to note that CCSCE's projections are based on total growth by industry, not occupation, and that CCSCE concludes that increased productivity in high-tech manufacturing could result in relatively steady job levels in this sector. See also projections by the U.S. Bureau of Labor Statistics, *1998-99 Occupational Outlook Handbook* (Washington, D.C.: U.S. Government Printing Office, 1998).

¹⁸ National Research Council, Commission on Life Sciences, *Trends in the Early Careers of Life Scientists* (Washington, D.C.: National Academy Press, 1998).

particularly important to California, will require more Ph.D. and masters-level life scientists. California industries should provide good employment opportunities for UC graduates, especially given the strong linkages between UC campuses and many biotech firms, many of which were developed by UC faculty or alumni. UC campuses therefore are proposing some growth in the life sciences to address these needs. As one example, Santa Cruz wants to expand enrollment in molecular, cellular, and developmental biology, focused on preparing both professionals for the biotech industry and future college faculty.

The NRC report also recommended greater emphasis on master-level programs, which is consistent with some UC campuses' plans. For example, San Diego is proposing masters-level training in biology for individuals who want to enter or advance in biotechnology-related fields, and for whom a baccalaureate education is insufficient. Graduate academic students in the health sciences, while not included in the general campus enrollment numbers being proposed in this document, are also the subject of campus consideration for growth to meet these developing workforce needs.

Somewhat less growth is expected in the physical sciences and mathematics. Doctoral employment in these fields suffered from the sharp cutbacks in defense-related research of the early 1990s as well as from industry downsizing, and the job market in some fields remains weak. However, increased demand in some physical science areas, such as chemistry, is expected in the next decade, especially in the industrial sector, and campuses are considering targeted enrollment growth in such areas. For example, Irvine, Santa Barbara, and San Diego are expanding or considering new masters programs in areas such as chemical and materials physics, applied chemistry, and computational physics. Campuses are also focusing on interdisciplinary programs that combine knowledge from the physical, biological, and social sciences to solve complex problems. For example, Santa Cruz is proposing a new program in environmental toxicology with a special emphasis on aquatic issues.

The high-technology economy is spurring growth in non-sciences areas as well. For example, the management of high-tech businesses is one focus of Irvine's business program, including the management of start-ups and of new types of businesses, and the management of information technology businesses. The arts are playing an increasingly important role in the high-technology economy, as entertainment and communications technologies become increasingly graphics-based. Many campuses are considering the development or expansion of digital arts programs, among them Santa Barbara, Irvine, Riverside, and Santa Cruz. San Diego is proposing a Master of Fine Arts in Technical Direction and Production, to train individuals for work in the complex electronic and mechanical technologies used today in theater productions.

California's future is tied to its leadership role in an international economy, particularly focused on the Pacific Rim. Leadership will require business entrepreneurs as well as those who understand the cultures, economies, politics, and languages of Asia and Latin America.

Foreign trade, especially with Pacific Rim nations, is the third of the four major economic sectors projected to propel California's economic base in the next decade.¹⁹ Campuses

¹⁹ CCSCE, *California Economic Growth, 1998 Edition*.
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are considering targeted areas of growth that will address the need for more professionals who understand international business, economics, politics, culture and tradition. Perhaps the most obvious of these needs is for business, technical, and public policy professionals trained to work in an international context. For example, San Diego is proposing a new masters program in International Technology Management, and Los Angeles is considering a professional masters in international policy.

However, it is also important to develop and expand areas that will aid our understanding of the diverse international cultures with which California is working, and which also are increasingly populating our State as new residents and citizens. Therefore, even though campuses are not generally expanding the more traditional humanities fields, such as English or U.S. history, they are considering some growth targeted to studies that will contribute to our understanding of Pacific Rim cultures and peoples. For example, both Davis and Santa Barbara are considering new programs in East Asian languages and culture, with Davis's program tied to its proposed growth in Second Language Acquisition. Riverside is expanding its Hispanic Studies department and developing a graduate-level interpretation and translation program. San Diego is proposing growth both in Asian and Asian-American literature and in Chinese, Japanese, and Latin American history, while Santa Cruz is developing a program in Latin American and Latino Studies.

California and the U.S. also face many social and economic challenges. We will need thinkers, problem-solvers, and community builders to address these problems.

One of California's most pressing needs is to improve K-12 education. While CSU educates the majority of California's schoolteachers, UC plays a role as well, by preparing classroom teachers with strong graduate-level academic training and by providing extensive professional development programs for teachers. Campuses are examining their potential for expanding specific areas that take advantage of their research capacity and orientation. For instance, several campuses are proposing additional masters programs that focus on areas of need such as math, science, Spanish, and educational technology. San Diego is considering a masters program in biological oceanography geared toward the needs of both high school teachers and lab technicians in the biotech industry. Campuses are also considering new doctoral programs, including joint programs with CSU campuses, to prepare educational leaders for California's schools.

California faces many social challenges arising from immigration and the melding of diverse populations, often accompanied by poverty and social dislocation. Some campuses are proposing targeted growth in the social sciences, to address these problems through research and the associated training of masters-level professionals and Ph.D.'s. For example, Riverside is developing an applied anthropology focus for Ph.D.'s interested in health and education issues of diverse populations. The issues of cultural diversity, as they are manifested in the Central Valley, could also become a strong research and graduate focus for the new UC Merced campus.

Campuses also see a need to develop other programs to address broader issues facing Californians and the nation—issues related to health care, crime, poverty, and the problems of urbanization, as well as challenges of caring for the environment, including management of toxic materials and waste, transportation, air and water quality, and food

supply. For example, Davis is considering growth to respond to recommendations of the Commission on the Environment to focus on California's watersheds, with associated issues of water quality, transport processes, and soil sustainability. Riverside is considering needs for enrollment growth in pest management, conservation biology, and agricultural biotechnology. Irvine plans to expand both masters and doctoral programs in urban and regional planning to address the problems of increasing urbanization. UC Merced is likely to have a specialization in issues relating to the Sierra Nevada.

In addition to addressing state and national challenges, each campus has a regional community for which it is a resource. Depending on both projected population growth and expected areas of economic concentration in these regions, campuses want to initiate or expand programs that will be of benefit to their immediate neighbors. These programs may focus on preparing individuals needed to expand the region's economic base, or to address the unique social needs of the area.

Some enrollment growth is proposed to meet demographically driven needs.

College and university faculty: UC is one of the State's and the nation's most important sources for the next generation of college and university faculty. Our best estimate is that California and the U.S. will see a moderate increase in demand for faculty in the first decade of the 21st century, both to teach the projected surge in undergraduates expected to enter college in those years and to replace retiring faculty. UC also has an obligation to prepare college faculty to help meet expected demand.

- *Enrollment growth.* In addition to the growth we are projecting for UC, CSU enrollments are projected to increase over 23 percent—from 350,900 to 432,000—between 1998 and 2005, according to 1998 Department of Finance projections, as Tidal Wave II enters college in the early years of the 21st century.²⁰ Although debate continues regarding the specifics of different enrollment projections, there is no question that enrollments in California's public four-year institutions will increase significantly. Growth of 22,840 undergraduate and graduate students at UC to 2005, and over 81,000 at CSU could require roughly 5,200 to 5,550 new faculty in the next seven years, with still more faculty needed as enrollments continue to grow beyond 2005-06. Since UC Ph.D.'s comprise more than 20 percent of the faculties at both the UC and CSU (and no doubt a substantial proportion of faculty at California's private institutions) a significant number of new UC Ph.D.'s will be needed to teach the state's own college students.²¹

UC also contributes to the nation's college and university faculty and researchers. Nationally, enrollments in four-year institutions are projected to increase about eight percent between Fall 1998 and 2005—from 8.9 million to 9.6 million students, with

²⁰ California Department of Finance, Demographic Research Unit, "California Public Postsecondary Enrollment Projections, 1998 Series." CSU figures are projected Fall headcount enrollments.

²¹ We limited our analysis of both California and national faculty needs to four-year colleges and universities, because a great majority of faculty in these institutions has Ph.D. degrees. By contrast, only about 17 percent of full-time two-year college faculty in the U.S. (or roughly three to four percent of all full-time faculty) hold doctoral degrees.

faster enrollment growth after 2005.²² This enrollment growth will require colleges and universities to hire more Ph.D. faculty. In addition, if more working adults return to school for advanced education, new opportunities for faculty hiring may open.

- *Faculty retirements.* Large numbers of faculty, both in California and in the U.S., were hired in the 1960s to teach the “baby boom” generation, which not only enrolled in college in large numbers but also enrolled in higher proportions than their predecessors. As many of these faculty reach retirement age in the next decade, colleges will be hiring new faculty to replace them. Nationally, nearly half of all full-time faculty in the U.S. were aged 50 or older as of 1992. Of the nearly 11,000 full-time faculty at the California State University, 58 percent of full-time faculty were 50 years or older in 1997, and 16 percent were 60 years or older. At UC, 45 percent of tenure-track faculty were 50 years or older in 1997, and estimates for new faculty to replace retiring UC faculty and others who leave the University indicate a need for 2,500 faculty over the next 15 years. Overall, colleges and universities may be looking to replace close to half of their current faculties in the next 15 years, assuming that institutions maintain more-or-less the same ratio of faculty to students.²³
- *Hiring in specific disciplines.* New faculty will be required across a range of fields, although demand will surely vary among individual disciplines and among subareas within disciplines. Moreover, in some fields, while demand may increase, the supply of new Ph.D.’s may outpace that demand. Our best guess is that needs for additional Ph.D.’s for faculty positions will be strongest in such fields as computer science, engineering, public administration, and some psychology areas, such as clinical psychology. By contrast, the supply of new Ph.D.’s for academe may continue to outpace demand in such disciplines as anthropology, English, philosophy, and some foreign languages, and in many areas of history, mathematics, physics, political science, and sociology. Nevertheless, within each of these disciplines, there likely will be demand in particular areas of specialization.²⁴

K-12 teachers: Another area of demographically driven need is for K-12 teachers. As noted earlier, CSU has primary responsibility for educating the new teachers, but demographic pressures will also affect UC’s enrollments. Over the next decade, California schools will need an estimated 250,000 new teachers. UC is proposing expansion of its credential programs, for example, through the implementation of a

²² U.S. Department of Education, National Center for Education Statistics (NCES), *Projections of Education Statistics to 2008* (Washington, D.C.: U.S. Government Printing Office, 1998). Middle alternative projections for enrollments in 4-year institutions.

²³ U.S. Department of Education, NCES, *Digest of Education Statistics – 1997* (Washington, D.C.: U.S. Government Printing Office, 1997); CSU, Faculty and staff data, Fall 1997; UC, Academic Personnel Report 9, October 1997.

²⁴ These estimates are based on projections by the Bureau of Labor Statistics, *1998-99 Occupational Outlook Handbook*, job trends and expectations presented by various disciplinary associations, and undergraduate major patterns, as reported by the U.S. Department of Education, NCES, *Digest of Education Statistics – 1997* (Washington, D.C.: U.S. Government Printing Office, 1997). See Appendix 2, “Workforce Projections and Job Market Trends for Graduate and Professional Degree Recipients,” for further discussion.

summer-session credential program. The growing population of teachers will also influence the need for more advanced education beyond the credential, for those looking to improve specific skills. As described earlier, campuses are proposing masters and doctoral programs to address these needs. Finally, there will be a need to prepare more faculty for the major teacher education programs in the state, including at CSU and private institutions.

Except for fields already mentioned, campuses are not proposing other demographically driven graduate enrollment growth. While it could be argued that growth in population drives the need for more professionals, such as lawyers, social workers, or architects, the picture is usually more complex. With lawyers, in particular, there are continuing questions about whether there is an appropriate balance between supply and demand. At this time, despite relatively good employment prospects for UC's highly regarded law school graduates, campuses are not proposing increases in law school enrollments.

Especially as undergraduate enrollments continue to increase, growth in graduate enrollments is necessary to maintain UC's excellence in research and education—and therefore its ability to perform its missions.

Especially as undergraduate enrollments continue to increase, more graduate students will also be needed to enable campuses to recruit and retain the highest quality faculty, maintain the high level of University research productivity, and preserve the overall research environment that characterizes UC campuses at both graduate and undergraduate levels. While graduate enrollments are determined by workforce needs, program and student quality, and resources for program and student support, it is important to note graduate students' subsequent benefits to the University's several missions once they are admitted.

The quality of the University's teaching and research programs is dependent in large measure on the quality of its faculty. High-quality faculty are attracted to UC by the opportunity to teach and work with excellent graduate and undergraduate students, and they rely on graduate students as apprentices and colleagues in conducting research. Graduate students are a critical part of the research teams that have enabled UC to attain the highest levels of research excellence and productivity; without them, faculty's ability to secure extramural funding and produce research would be weakened. Graduate students are often faculty members' only true colleagues in specialized subfields.

Graduate students contribute to the climate of discovery, excellence, and excitement that defines both undergraduate and graduate education at the University. As teaching assistants, graduate students enhance UC's undergraduate instructional mission by leading small discussion groups and laboratory sections, under faculty supervision. In large-enrollment courses, these discussion groups give the whole class a cohesion and energy that might otherwise be difficult to achieve. Their presence makes it possible for UC to offer undergraduates a wider range of perspectives and delivery modes. Graduate students, especially women and minority students, often serve as mentors for undergraduates from underrepresented groups, encouraging such students to pursue advanced education.

Our proposal is not just about enrollment growth. Campuses are also shaping and modifying their programs to meet changing needs.

Academic departments regularly engage in reviewing their programs not only for quality, resources, and student demand, but for continued relevance to the world of employment their students will enter, whether in an academic setting, in private industry, or in the nonprofit sector.

In response to major changes in demand, resources, or research and instructional priorities, UC campuses have continually shifted enrollments and, where appropriate, eliminated programs to meet higher-priority needs. For example, in recent years, Davis suspended graduate enrollments in communications and in exercise science, and it eliminated programs in Russian and classics, which had become too small to be viable. Over the past decade, San Diego reduced the number of its sociology graduate students by over 40 percent, and UCLA reduced graduate enrollments in anthropology, English, and history by about one-fourth in each program. Several campuses have reorganized and refocused graduate enrollments, such as UCLA's recent reorganization of several professional schools, which combined the schools of education and library and information sciences, established a new school of public policy and social research, reconstituted the school of the arts and architecture, and disestablished the schools of social welfare and of architecture and urban design. And, Universitywide, between 1990 and 1995, in response to weaker job markets, budget constraints, and faculty early retirement programs, every broad Letters and Science field reduced the number of graduate students admitted.

As UC campuses look toward the next decade, they are continuing to reshape their programs to meet emerging needs for an educated workforce and for creative thinkers and leaders in scientific, policy, and cultural spheres. Themes that are currently emerging across the University as faculty reshape their programs include the following:

- Departments are revising traditional fields and developing new interdisciplinary graduate programs to address problems and issues that transcend disciplinary boundaries.
- UC is creating programs that prepare students for emerging occupations that require a broader and more diverse set of skills. For example, California's expanding entertainment industry requires individuals who can integrate computer technology with various traditional art forms to develop new approaches to the creation of music, graphic design, animation, stage and movie sets, and special effects, as well as contribute to new forms of multimedia entertainment such as CD-ROMS, computer games, and "immersive environments."
- UC is blending academic and professional studies to prepare students for careers that cross these traditionally separate borders. These programs integrate research-oriented arts and sciences disciplines with professional approaches to problem solving. While a number of University programs have long been leaders in bringing together academic and professional perspectives, this merger is taking on new momentum. One example of such new programs is Santa Barbara's new School of Environmental Science and Management, where masters students acquire both scientific knowledge and policy analysis skills to diagnose and assess environmental problems and the effectiveness of public and private environmental practices.
- Campuses are broadening educational experiences to prepare Ph.D.'s for employment

beyond traditional academic roles. Currently, the private sector (primarily industry) employs over half of all U.S. physical science Ph.D.'s, 60 percent of engineering Ph.D.'s, and growing numbers of life science and social science Ph.D.'s. Campus efforts to prepare students for industry as well as academe echo the recommendations of a national task force comprised of leading scientists and educators. This committee urged graduate programs to provide options that allow students to gain a wider variety of skills and experiences, including communication skills, multidisciplinary knowledge, teamwork experiences, and opportunities for off-campus internships in industry or government.²⁵ More recently, the Woodrow Wilson National Fellowship Foundation has recommended similar attention to non-academic opportunities for humanities Ph.D.'s and has established grant programs to help humanities Ph.D.'s explore careers in, for example, entertainment, media, and technology fields.²⁶

- Campus programs are also revising educational experiences for Ph.D. students planning to become college faculty, which remains the main Ph.D. career objective in many fields. As colleges and universities change or expand their traditional methods of instruction to incorporate technology, and as they are called upon to teach an ever more diverse student population, including many first-generation college students, UC programs are considering ways to strengthen these skills among future faculty. CSU, which hires a significant number of UC Ph.D.'s, has urged greater attention to these kinds of needs.
- Finally, in addition to creating new professional masters programs for a traditional graduate student population, campuses are also considering new approaches to educating larger numbers of working adults who are seeking advanced degrees. While the focus of this paper is on full-time graduate enrollments, UC programs now educate a small but significant number of students in advanced degree programs tailored to working adults. The newly approved Masters of Advanced Study, designed to meet the needs of full-time working professionals pursuing their studies part-time and paying full costs, will significantly expand educational options for working adults.

²⁵ Committee on Science, Engineering, and Public Policy (COSEPUP) of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine, *Reshaping the Graduate Education of Scientists and Engineers* (Washington, D.C.: National Academy Press, 1995).

²⁶ Denise Magner, "Foundation Issues Plan to Expand Job Opportunities for Humanities Ph.D.'s," *Chronicle of Higher Education* (December 11, 1998), p. A12.

C. Issues to Consider While Planning for Growth

Summary of Major Points

Although there are widely publicized concerns that there may be too many graduate students being educated for the jobs that will be available, indications are that UC graduates fare well.

Graduate growth must be sustained by adequate student financial support.

California's investment in graduate education yields the State significant returns.

The preceding sections have described the context and history of our graduate enrollments, provided the reasons campuses believe it is necessary to expand their enrollments through 2010, and noted ways in which campuses are modifying programs to prepare students for employment in the future. However, there are two significant issues that should be addressed when assessing the appropriateness of graduate enrollment growth.

First, there has been concern in both government and higher education that universities may be educating more graduate students than the job market requires. Second, faculty and University administrators are concerned about being able to support increased graduate enrollments adequately.

While these important factors must be taken into consideration in our planning, we also note in concluding this section the considerable benefits that graduate education brings to California's economy and culture and to future generations of Californians.

Although there are widely publicized concerns that there may be too many graduate students being educated for the jobs that will be available, indications are that UC graduates fare well.

In recent years, there have been a number of studies and reports citing the difficult job market that recent graduates, especially those with Ph.D.'s, have been facing. There have also been studies projecting a variety of possible employment trends; these studies lead to conflicting conclusions. Appendix 2, which summarizes employment trends and projections across a wide range of fields, as well as the findings of a number of major studies of projected Ph.D. workforce needs, describes the strengths and shortcomings of these studies, attempting to put them into overall perspective. Campuses consider such employment trends and projections along with other factors when they plan their own enrollment growth. In addition to reviewing national employment trends and projections, it is important to note the following factors when assessing the University's proposal:

- California's situation differs from the rest of the nation. As in so many cases of comparison, California's economy and social and political environment do not necessarily reflect national trends or norms. Because UC educates students not only

for a California job market but for a national and international market, it is important to be aware of national trends. However, many UC graduates remain in California. This is especially true of graduates of UC's professional programs, the great majority of whom work in California; but many Ph.D. recipients, especially in engineering and the physical sciences, take jobs in California as well. Over the next decade, the California economy, especially that related to high-tech industries, is projected to be stronger than that for the U.S. as a whole, and college enrollments will grow at a faster rate. Moreover, California's internationally oriented economy and society, its great demographic diversity, and ongoing environmental concerns, will present different workforce needs and greater opportunities than may be true nationally.

- UC graduates are successful in finding employment due to the high quality of their graduate and professional degrees. As noted earlier, UC graduates from each of our campuses find postdoctoral scholar positions and jobs.

Furthermore, campuses adjust their graduate enrollments and programs to meet changing job market needs. Departments strive to produce graduate students who are able to find work in their fields, because successful placement is an indicator of the program's quality and effectiveness. Campuses can cite many examples of departments reducing new enrollments or suspending them altogether if necessary, when job markets are tight.

- Campuses are proposing growth at both the masters and Ph.D. levels. Many of the concerns about job opportunities arise from difficulties faced by recent Ph.D. recipients. Campuses are not considering adding doctoral students in fields that are experiencing an oversupply, unless they have identified a developing and promising niche. As has been noted above, there are many opportunities emerging for students educated at the masters level, and therefore campuses are proposing to direct some of their graduate growth toward masters enrollments.
- The job market for graduate and professional degree students has begun improving as well, as both the California and national economies have rebounded in the past two to three years, and most economists expect the economy to remain strong. Consequently, although problem areas remain, we are less concerned about oversupply of graduate students, particularly Ph.D.'s, than we were earlier in the decade, and we are encouraged by opportunities for students in masters and professional programs. However, we will continue to monitor job market studies and analyses, as well as our own placement data, in order to inform our planning in the years to come.

Graduate growth must be sustained by adequate student financial support.

Responsible planning for growth at the graduate level involves consideration of many factors: workforce and societal needs, institutional capabilities, and the adequacy of program funding. It also requires consideration of whether there is sufficient student support available for UC to compete successfully for the best students and to ensure their timely progress toward their degrees.

Virtually all graduate students who enroll in the University of California are self-supporting and consequently nearly all receive some financial support. This support

takes many forms—from fellowships and grants to research and teaching assistantships to loans. Its amount and nature vary significantly among different disciplines, but its importance in developing and sustaining graduate and professional programs of excellence is evident.

Excellent graduate students are an essential ingredient in any high quality graduate program. They are also in demand. While the excellence of the University of California's programs is a major draw for good students, adequate financial support is also a prerequisite. To attract high quality students in a competitive environment, and to facilitate the timely achievement of their degrees, the University must ensure that financial support is available in adequate amounts, appropriate forms, and for a period of years appropriate to each student's program of study.

In the long period of time in which there has been little or no growth in graduate programs, the University has developed an approach to graduate support that involves a complex mix of fund sources. The State provides funding for teaching assistantships because of its interest in undergraduate instruction, and the federal government provides research assistantships, some fellowships and training grants, and subsidized loans. In addition, support has begun to come from industry, private foundations, and gifts and endowments, as well as from allocations within the University's budget to cover fee increases, provide greater numbers of teaching and research assistantships where those are needed, and create fellowship programs to attract the best students.

Figure 7 shows the proportion of funding from major sources in 1996-97. In 1996-97, it cost \$723 million to support the University of California's graduate students, including health science professionals. About \$563 million of that amount involved assistance and loans of various kinds. Figure 7 shows that 46 percent of such assistance and loans came from the federal government, 22 percent from the State of California (including the California Student Aid Commission programs), and another 31 percent from student fees, private fellowships, and University funds. However, when we add in the personal income (from savings, outside work, or other sources) that students themselves provide to support their graduate studies, UC graduate students contribute fully 22 percent from their own personal resources.

**Figure 7 – Sources of Support for Graduate Students, University of California Systemwide
All Graduate Students, Including Health Sciences Professionals
1996-97 (in millions of dollars)**

| | University Programs | | | | Sub-Total | Personal Income | Total |
|---|---------------------|---------------------|-------------------------------|------------------|----------------|-----------------|----------------|
| | Federal Programs | State General Funds | Student Fees University Funds | Private Programs | | | |
| Fellowship | \$35.9 | \$10.4 | \$87.7 | \$9.4 | \$143.4 | | \$143.4 |
| Research Assistantship | \$68.0 | \$13.5 | \$42.4 | \$0.0 | \$123.9 | | \$123.9 |
| Teaching Assistantship | \$0.3 | \$93.8 | \$15.4 | \$0.0 | \$109.5 | | \$109.5 |
| Total Merit-Based Assistance | \$104.2 | \$117.7 | \$145.5 | \$9.4 | \$376.8 | \$0.0 | \$376.8 |
| Need-Based Grants | \$0.0 | \$8.4 | \$16.8 | \$0.0 | \$25.2 | | \$25.2 |
| Loans | \$154.4 | \$0.0 | \$2.0 | \$1.4 | \$157.8 | | \$157.8 |
| Work-Study | \$2.4 | \$0.0 | \$0.4 | \$0.0 | \$2.8 | | \$2.8 |
| Personal Income | | | | | | \$159.9 | \$159.9 |
| Total Need-Based Assistance and Self Support | \$156.8 | \$8.4 | \$19.2 | \$1.4 | \$185.8 | 159.9 | \$345.7 |
| Total Support—All Sources | \$261.0 | \$126.1 | \$164.7 | \$10.8 | \$562.6 | \$159.9 | \$722.5 |
| Percent of Subtotal--w/o personal income | 46% | 22% | 29% | 2% | 100% | | |
| Percent of Total | 36% | 17% | 23% | 1% | 78% | 22% | 100% |

Source: University of California, Office of the President, Office of Student Academic Services
Teaching Assistantship and Research Assistantship categories include fee remissions.

The type of aid and its duration can matter as much as the amount. Doctoral students, because of the length of time involved in attaining their degrees, need multiyear support that is closely tied to their learning experiences. Fellowships are an especially important element in their support, allowing a new student the freedom to explore the subject matter before committing to a research area in depth. Master's students in shorter-term professional programs, many of whom are entering well-paying fields, can and are willing to take on greater amounts of debt while they are in school. Figure 8 clearly demonstrates this. However, it is important to be sensitive to the increasing debt burden borne by students in professional programs, which has doubled in the past decade.

**Figure 8 – Per Capita Student Financial Support,
University of California Systemwide
1996-97**

| | Academic | | | Professional | | |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|--------------------|
| | Doctoral | Masters | Total Academic | Masters | Health Science | Total Professional |
| Fellowship | \$5,728 | \$2,968 | \$5,266 | \$1,745 | \$2,430 | \$2,041 |
| Research Assistantship | \$5,835 | \$3,297 | \$5,411 | \$308 | \$135 | \$234 |
| Teaching Assistantship | \$4,895 | \$3,635 | \$4,682 | \$560 | \$161 | \$387 |
| Total Merit-Based Assistance | \$16,458 | \$9,890 | \$15,358 | \$2,613 | \$2,726 | \$2,663 |
| Need-Based Grants | \$423 | \$684 | \$467 | \$791 | \$1,635 | \$1,155 |
| Loans | \$1,748 | \$3,327 | \$2,013 | \$8,544 | \$9,182 | \$8,819 |
| Work-Study | \$60 | \$109 | \$68 | \$89 | \$122 | \$103 |
| Personal Income | \$2,340 | \$3,617 | \$2,540 | \$8,234 | \$7,614 | \$7,981 |
| Total Need-Based Assistance and Self Support | \$4,571 | \$7,737 | \$5,088 | \$17,658 | \$18,553 | \$18,058 |
| Total Student Budget | \$21,029 | \$17,627 | \$20,446 | \$20,271 | \$21,279 | \$20,721 |

Source: University of California, Office of the President, Office of Student Academic Services
Teaching Assistantship and Research Assistantship categories include fee remissions.

Finally, financial support for nonresident students presents a special problem. If the University is to attract the nation's and the world's very best students to California, it must find ways to make competitive support offers.²⁷ In the past decade, nonresident tuition has doubled, now costing out-of-state students \$9,384 in addition to the University and campus fees (ranging from about \$4,400 to \$5,200) paid by in-state residents in

²⁷ Attracting and educating an appropriate number of highly qualified students from other states and other countries is essential not just to the quality of UC graduate programs but ultimately to the strength of California and the U.S., as discussed in the next section.

1998-99. These large tuition increases have had a disproportionate impact on graduate education because a higher fraction of graduate students than undergraduates are nonresidents, especially in their first year, and a higher fraction are dependent on student support fund sources (e.g., fellowships, research assistantships, teaching assistantships) that are not growing as rapidly as the fee increases. While the University has found ways to reduce the problem for later-stage nonresident doctoral students, by offering them the incentive of reduced tuition when they are advanced to doctoral candidacy, the annual increases in nonresident tuition (implemented to ensure comparability with other public universities in accordance with State policy) pose a significant problem in trying to find funding for offsets so that UC wins competitions for the best students.

California's investment in graduate education yields the State significant returns.

Finally, it must be noted that graduate education brings considerable benefits to California as well as to the world. As the UC Council of Graduate Deans has noted, "Strong graduate programs are strategically important for . . . economic stability and growth within the State of California. Human resources are the most critical assets required for economic development. Education and training are key strategies for nations and states seeking to improve their economic performance and the quality of life of their citizens."²⁸

Graduate education at UC provides substantial benefits to the economic, social and cultural vitality of California. Among the most important benefits are the following:

- UC's graduate programs prepare highly skilled and creative professionals for industries and professions that are important to California. UC programs prepare individuals who not only are highly skilled but who also have the ability to solve problems and to imagine and implement ideas that do not yet exist. These individuals are capable of meeting both current and changing workforce needs; indeed they will help shape and create California's and the nation's future. These facts are the foundation of much of our rationale for expanding graduate enrollments, as described above, and are particularly important because so many of our doctoral students, and most of our professional degree students, remain in California after completing their degrees.
- UC's graduate programs provide California with global links that give the State a competitive edge in international markets, as well as contributing to cultural and research exchanges. Graduate education, in its pursuit of all that can be known or discovered, transcends regional and national boundaries. One way this is evident is through the education of international students, which brings many benefits to California. Nationally, about half of the international students who receive U.S. Ph.D.'s remain in the U.S., to contribute to our research, economy, and culture.

Those international alumni who return to their home countries contribute to California as well, by helping us develop international connections that strengthen our

²⁸ University of California Council of Graduate Deans, *Excellence at Risk: The Future of Graduate Academic Education in the University of California* (April 1997), p. 3.

own research and creative endeavors, as well as developing trade and other business enterprises that directly benefit California. Many UC international alumni who return home increasingly look to California for research or business collaborations. Many start up business and production enterprises in their own countries, and California becomes their natural trading partner. In short, they are more than competitors; they are our links to an increasingly global economy, forming ties that are crucial to the continued economic well-being of California. Many others become political, scientific, and cultural leaders in their home countries. Educating international students contributes to the furthering of democratic traditions and to the development of an economic, educational, and scientific infrastructure that not only creates better global neighbors but opens doors for expanded trade and opportunities for cultural, political, and scientific interaction.

- Graduate education contributes significantly to the research that fuels new businesses, enriches society, and contributes to our quality of life. Most Californians recognize that research conducted in our universities plays a critical role in the economic growth, medical breakthroughs, and scientific advances that improve individuals' lives, as well as in helping us to understand and enhance our society, culture, and the life of the mind.

However, it is not always well understood how central graduate education is to university research. According to the Association of American Universities, "To a far greater extent than in other countries, graduate students contribute to the creativity and productivity of U.S. academic research . . . In this country, graduate education and research are conducted in the same place by the same people, and both activities are enriched by their fundamental interconnections."²⁹

Industry depends on academic research, much of it performed by research teams that include graduate students. A 1991 study of seven major industries in the U.S. found that about 10 percent of new products and processes could not have been developed without recent academic research, without very substantial delay. In the pharmaceutical industry, the figure was close to 30 percent.³⁰ Other studies have found that academic research has been especially important in enhancing industrial research and development (R&D) in biotechnology and electronics. In electronics, for example, industry managers in a 1994 study stated that academic research was often the source of radical, breakthrough inventions.³¹

Through collaboration with UC faculty and on their own, UC graduate students have contributed to the development of the microelectronic, biotech, and other industries; they are contributing to efforts to solve some of society's pressing problems; and, as

²⁹ Richard Attiyeh, Testimony submitted to the U.S. House of Representatives Committee on Education and the Workforce subcommittee on Postsecondary Education, Training, and Life-Long Learning, June 17, 1997, on behalf of the Association of American Universities and other associations.

³⁰ Edwin Mansfield, "Academic Research and Industrial Innovation," *Research Policy*, 20 (February 1991), pp. 1-12.

³¹ Nathan Rosenberg and Richard R. Nelson, "American Universities and Technical Advance in Industry," *Research Policy*, 23 (May 1994), pp. 323-348.

part of their education, they learn to “push the envelope” of knowledge, contributing to California’s well-deserved reputation for being a world center for innovation.

UC Ph.D. and masters degree recipients often continue the research they began in graduate school in their positions as researchers in industry and the public sector. Indeed, when they enter their chosen careers, these individuals represent the University’s most successful form of *technology transfer*, taking the latest knowledge and research techniques from UC’s labs, classrooms, libraries, and studios into industry and the workplace. They also maintain their links with former faculty members and other research colleagues, broadening their employer’s access to knowledge. UC faculty, on their part, often maintain productive and long-lasting collaborations with former graduate students, to the benefit of both UC and the organizations for which these alumni are working.

- Graduate education creates an environment attractive to businesses who need to be near university research in order to thrive. Several surveys have found that firms choose to locate near research universities that can provide access to high quality faculty and graduate students.³² Indeed, around each of UC’s campuses, with their highly regarded faculty, graduate students, and postdoctoral scholars, industries have grown up, many of them spun off from research originally developed by UC research teams or in partnership with local firms, some of which were started by UC alumni. The biotechnology industry is but one example: California biotechnology companies provide an estimated 40,000 jobs in California, the majority of them near UC campuses, where related research activity continues to be an investment magnet.

Recognizing the importance of their contributions to their regions, each UC campus is developing proposals for new or expanded graduate programs that extend the benefits of their research. For example, Davis’s proposed professional masters program in viticulture and enology will directly support the region’s wine industry, with which the campus already has strong ties, just as Riverside’s proposed increases in pest management and other agricultural areas will benefit farms and agribusiness in the Inland Empire. Berkeley’s and Santa Cruz’s proposed increases in engineering and computer science will both benefit and benefit from their ties to Silicon Valley. San Diego’s and San Francisco’s biological and biomedical programs will continue to foster the biotech industries that have grown up around those campuses. Irvine, Los Angeles, and Santa Barbara, surrounded by entrepreneurs in the arts and entertainment sectors, are proposing programs in visual and performing arts, often combined with technology. All campuses have these special links to their communities, and their graduate program proposals bear their interests in mind.

- Graduate education enriches California’s cultural and intellectual life, helps shape our social and physical environment, and creates the informed citizens needed to maintain a democracy in a diverse and technologically complex society. The benefits that result from expanding graduate education extend far beyond economic impacts. Basic research performed by graduate students in the biological and health sciences and by UC-trained scientists in those fields has expanded our knowledge about

³² National Science Board, *Science and Engineering Indicators-1996* (Washington, D.C.: U.S. Government Printing Office, 1996).

fundamental life processes, as well as making possible medical advances that extend people's lives. In the social sciences, it has given us a better understanding of the nature of our society and the tools with which to enhance it.

In the humanities and arts, UC graduate education and the scholars it produces transmit, interpret, and extend our cultural and intellectual heritage. "Graduate education in the humanities, social sciences, and the arts produces the teachers and scholars who preserve our national heritage and transmit it to succeeding generations of students, enriching their capacity for critical thinking by applying the lessons of the past to current problems and future challenges, and expanding their understanding of the intellectual, ethical, and aesthetic dimensions of the human condition. From humanities graduate education have come books that have changed people's lives and informed public debates on cultural values and national goals."³³

UC's graduate professional and academic degree programs develop critical thinking and analytical skills important to maintaining a democratic society. University-trained graduate degree recipients are needed not just to create, promote and stimulate the technical and economic growth vital to California, but also to comprehend, evaluate and review them, as citizens and consumers, as well as experts and developers. As the National Science Board notes, "Scientific research not only teaches about science, it teaches about the process of thinking itself. It helps to promote a culture of reasoned discourse, and the economic and social significance of this effect alone could be quite substantial."³⁴ The same holds true for systematic research and scholarship in sociology, history, or literature. Graduate study in the humanities and social sciences may in some respects provide even more value because they train individuals to think and deal critically in an environment that is *not* fully controlled, which (unlike the controlled environment of the experimental laboratory) is the environment in which we spend most of our lives.

- Graduate education brings income to California. As noted, graduate students play a key role in the teamwork of University research, and it is through the quality of this research that UC faculty are among the most successful in the nation in receiving external support from both the federal government and private organizations. Indeed, as prospects for federal support for research appear to be improving, growth in quality UC graduate programs could bring additional income to California. Also, as noted above, a significant portion of graduate student financial support comes from outside California.

Professional and doctoral degree recipients on the whole have higher lifetime earnings than do those with less education.³⁵ Therefore, they have more discretionary income that feeds the local economy and produces higher tax revenues. Some exploratory studies suggest that the growth of a more technologically oriented and

³³ Richard Attiyeh, Testimony submitted to the U.S. House of Representatives Committee on Education and the Workforce, Subcommittee on Postsecondary Education, Training, and Life-Long Learning, June 1997.

³⁴ National Science Board, *Science and Engineering Indicators-1996*.

³⁵ George T. Silvestri, "Occupational Employment Projections to 2006," U.S. Bureau of Labor Statistics, *Monthly Labor Review*, 120 (November 1997), pp. 58-83.
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knowledge-based economy may further increase the salary differential between highly educated employees who have skills commensurate with new technologies and those less educated. Without advanced education, individuals and their communities may both be disadvantaged.

- UC graduate professional and academic students contribute to their communities and the larger society in many other ways as well. Through their presence in the community, large numbers of UC-trained architects, educators, lawyers, and business people, among others, have shaped their environment in ways strongly influenced by their UC educations. This shaping is literally true for graduates of Berkeley's College of Environmental Design, who have had an enormous impact on California's environment, including buildings, wetlands and parks. UC student interns in professional programs such as those in education, public health, urban planning, and social welfare serve clients in their local communities; and, at each UC campus, UC graduate students are deeply involved in educational outreach efforts to students in California's public schools, as well as in many other area of community service.
- Graduate education creates a bridge to the future. Perhaps the most lasting contribution of graduate education is that, in addition to creating new knowledge, it ties that knowledge to the students, workplaces, and society of the future. This knowledge transfer happens not only as graduate students enter the teaching ranks, but also as they continue their own research in higher education or business, government and industry.

D. Tasks Related to Graduate Enrollment

Summary of Major Points

Task 1: Fostering continued quality, productivity, flexibility, and innovation through appropriate policies and processes.

Task 2: Committing to targeted, well-planned growth, while continuing to balance needs and resources.

Task 3: Leveraging all campuses' strengths through the complementary approaches of individual campus development and intercampus cooperation.

Task 4: Strengthening graduate and professional education by ensuring adequate student support.

A responsible plan for increasing the number of graduate students must include more than a proposal for admitting and enrolling more students. Just as our campuses have done during periods of limited growth, we must ensure that graduate programs are well designed and regularly examined if we are to meet State and national needs, continue to foster academic quality, and accomplish both within limited resources.

There are a number of ways in which the University system and its campuses exercise that oversight now—regular reviews of existing programs, periodic studies of special issues, and continuing processes that ensure thoughtful allocation decisions. We intend to use these processes to maintain and, where possible, increase the excellence and productivity of our graduate programs, to ensure that they remain at the cutting edge of research and workforce developments, and thereby meet our commitments to California's and the nation's future. Four tasks that are receiving special attention because of plans for growth are described below.

1. Fostering continued quality, productivity, flexibility, and innovation through appropriate policies and processes.

In their 1997 examination of graduate education (primarily for Ph.D.'s) at the University of California, the UC Council of Graduate Deans concluded that UC graduate education remains excellent but that this excellence is "at risk" unless steps are taken to maintain quality in a more constrained environment. One of their key recommendations is that the UC system and campuses must "tie selective graduate academic enrollment growth to indices of sustainable quality, program vitality, societal need, and adequacy of support for programs and students."³⁶ We intend to pursue this recommendation.

³⁶UC Council of Graduate Deans, *Excellence at Risk*, p. 36.

Quality: The quality of graduate and professional education depends upon such key factors as faculty expertise, student abilities and diversity, the adequacy of student support, program coherence, and the inclusion of the latest research findings and professional developments. In determining new programs and enrollment growth, the University as a whole, and each program within it, must continue to monitor such quality factors rigorously. This includes, for example, monitoring programs' selectivity and "take" rates (i.e., the proportion of applicants accepted and the proportion of those accepted who enroll), the adequacy of student support, and overall program quality in comparison with other UC campuses and other institutions. Periodic campus reviews of existing graduate programs and regular attention by the Graduate Deans to key issues and indicators are actions that can safeguard the quality of graduate programs during this period of growth.

Productivity: Because resources for higher education will likely remain tight, continued improvement in the productivity of graduate programs will enable UC to serve larger numbers of students with the same resources in order to meet students' and society's objectives. Degree completion rates and the length of time students take to complete their degree programs are two important measures of program productivity. Performance on such measures of productivity is very high in UC's principal professional programs (law, business, and the health science professions). On average, over 90 percent of all law, business, and medical students, for instance, complete their professional degree programs; and because these programs have fixed curricula and requirements, students complete them in the scheduled time (three years for law, two for M.B.A. programs, and four for medicine).

Ph.D. programs are far more individualized than are professional programs. Their main purpose is to enable students to become effective scholars and researchers. Because doing so requires that students develop and demonstrate both deep knowledge of a subject area and the ability to perform independent research and scholarship, including completion of a substantial piece of original research or creative work, Ph.D. study almost always requires more time to complete than does either undergraduate or professional study. Nevertheless, there has been concern nationally that many Ph.D. students are taking too long to complete their degrees and that too many are dropping out without completing their programs.

- *Time-to-doctorate.* Overall, UC doctoral students appear to be making appropriate degree progress, compared to doctoral students at other institutions—although there are programs where we must take steps to help students shorten the time it takes to complete their degrees. On average, UC students at the eight general campuses take about six years total (from time of entry into the doctoral program) to complete their degrees, ranging from 5.5 years in engineering/computer sciences to 7.6 years in fine arts fields; this includes time when students may be on leave or in full-time jobs. If we look just at time when students are actually registered, average time to doctorate is less than five and one-half years, ranging from 5.0 years in engineering/computer sciences to 6.0 years in humanities fields.³⁷

³⁷ Does not include Berkeley, for which registered time data are not available.

UC's elapsed (i.e., total) times to doctorate by field are virtually identical to those for the average of our four public comparison universities, of our four private comparison universities, and of all AAU institutions, according to a recent analysis.³⁸

In recent years, UC campuses have taken a number of steps to reduce time-to-doctorate, which should show improvements in future years. Most campuses have instituted regular evaluations of students, requirements for continuous student enrollment with only limited leaves of absence, and monitoring of individual departments' effectiveness in ensuring appropriate student degree progress. Several campuses have instituted strict time limits within which students must advance to candidacy and complete their Ph.D.'s in order to remain eligible for financial support. As a result of strict time-limit policies implemented at San Diego, for example, the campus has reduced average time-to-doctorate by about one-half year.

Campuses have also developed a wide range of support services, including counseling, dissertation workshops, job placement support, and summer mentoring programs. For example, Santa Barbara has facilitated a forum for humanities students to learn about nonacademic career opportunities, and it plans a similar effort in the social sciences. Campuses are also taking steps to increase student financial support, since adequate student support is an important factor both in reducing time-to-degree and increasing the proportion of students who complete the Ph.D. For example, Riverside is developing plans for a major fund-raising campaign to support graduate student fellowships. Campuses are committed to continuing to monitor degree times and to implementing constructive policy and procedural changes, as necessary, to expand on efforts to reduce time-to-doctorate.

- *Doctoral completion rates.* The other key productivity measure is completion rate. Nationally, some studies suggest that 50 percent or more of Ph.D. students may leave without completing the Ph.D., although obtaining adequate data on attrition has been extremely difficult.³⁹ The UC Office of the President and the campus graduate divisions recently completed a major year-long effort to define and measure completion and attrition rates for UC doctoral students, which provides concrete data on these measures for the first time. Overall, 55 percent of UC doctoral students on the eight general campuses who began their studies in the mid-1980s completed their degrees by the end of 10 years, ranging from 69 percent in life sciences to 40 percent in arts and humanities. However, a substantial proportion of those who did not

³⁸ This analysis was completed, at the request of the Office of the President, by the National Opinion Research Center (NORC), based on the National Research Council's Survey of Earned Doctorates. UC times to degree are based on institutional data from campus graduate divisions. While there are some differences between the two sets of data (e.g., the NRC data are based on student-reported rather than institution-reported information), the measures were designed to be as similar as possible. It is important to note that both the UC and the NORC-generated data differ from commonly reported national time-to-doctorate data, which include *all* time since award of the baccalaureate degree, even if individuals were not pursuing doctoral study or were in graduate programs unrelated to their eventual doctorate; we estimate that this measure adds nearly two years of registered time and over four years of total elapsed time to national averages. We believe that our measure, which is based on time since entry into the program from which the student received the doctorate, is a more accurate reflection of time to degree.

³⁹ National Research Council, *The Path to the Ph.D.: Measuring Graduate Attrition in the Sciences and Humanities* (Washington: National Academy Press, 1996).

complete their doctoral programs did obtain a masters degree—43 percent of overall drop outs, and 61 percent of those in engineering/computer sciences; it is likely that many of the latter decided that a masters degree met their career goals.

Contrary to popular impressions, most doctoral students do not drop out “ABD” (“all but dissertation”). Rather, across all fields, the greatest attrition occurs by the end of the first two years after entering a doctoral program. Such early attrition has several policy implications. First, if programs are going to improve persistence significantly, expanded efforts to assist students during their first two years will likely be helpful. Second, if a student or program decides that the Ph.D. is not appropriate, it is better to determine this early, before substantial time and resources are invested. Finally, it is important to note that this analysis looked at students who began their studies in the mid-1980s and that campus programs have made efforts in recent years to improve student persistence through better mentorship, student financial support, and other steps. By conducting further analyses that focus on more recent cohorts’ persistence at the end of two and four years, we will be able to identify trends and the impacts of more recent campus and program efforts. The Office of the President will continue working with the campuses to develop useful data on persistence and to identify additional effective policies and practices.

Effectiveness: Placement following degree completion is the key external measure of program effectiveness. As noted earlier, UC has a strong placement record for both academic and professional degree recipients. Nevertheless, we need better and more complete information on the career patterns of UC graduate and professional degree recipients, including how quickly they obtain appropriate career positions, how their graduate training has contributed to their careers, and where there may be problems. Several steps are now being taken to obtain better career information on UC graduate degree recipients. For example, Maresi Nerad and Joseph Cerny of the Berkeley campus are now analyzing data from their national study on “Ph.D.’s—Ten Years Later.” This study examines employment and career patterns, in both academic and nonacademic market sectors, of over 6,000 Ph.D.’s in six representative fields from 61 research universities. These investigators will also complete a special substudy that examines career outcomes of Ph.D.’s from all nine UC campuses. Results of these studies are expected to be released within the next one to two years. In addition, several campuses have recently initiated more systematic follow-up and monitoring of graduate alumni. These efforts will assist campuses as they consider and plan for growth in specific graduate programs.

Flexibility and innovation: “Flexibility” will become a watchword. To ensure that graduate programs continue to meet societal and student needs, as well as to support the undergraduate and research missions of the University, faculty and administrators are actively seeking ways to ensure that new campus programs are implemented as quickly as possible without diminishing UC’s high quality standards. At the system level, the Academic Senate and the Academic Planning Council have made significant progress in streamlining systemwide program approval and review processes and continue to propose procedural improvements. Campus faculty committees and administrators must also continue their efforts to ensure adequate procedural flexibility to accommodate change. In addition, administrators at both systemwide and campus levels are identifying ways to maintain some budgetary flexibility to enable them to invest in valuable new initiatives.

Because workforce demand and opportunities in the private sector are growing more rapidly than academic employment in many fields, flexibility also requires that UC programs encourage graduate students to consider careers in industry, government and the non-profit sectors (as well as in academe) and provide students opportunities to gain the skills and experiences needed in these settings. The private sector is already the principal employer of Ph.D.'s in engineering and in several science fields, but needs and opportunities are increasing in the social sciences and humanities as well. A number of programs are instituting ways to encourage and facilitate such broader career choices.

Administrators and faculty must also strengthen communication with employers, graduate students and alumni, and public officials to ensure that appropriate innovations are identified and implemented so that graduate and professional programs can continue to meet State needs and help students gain the skills they need to be successful. To accomplish this, many UC schools and departments already include practitioners and business and community leaders on advisory committees that meet regularly with faculty, graduate students, and administrators.

2. *Committing to targeted, well-planned growth, while continuing to balance needs and resources.*

In order to plan responsibly for enrollments through 2010, campuses and departments must continue monitoring both the driving forces of the external environment as well as their internal capacity to accommodate growth. As they do now, they will adjust their enrollment proposals in light of workforce needs, placement records, student quality and progress, adequacy of funding, and program capabilities to meet needs for specific skills and areas of expertise. The Office of the President will continue to assist campuses by surveying job market trends, and by working with campuses to develop meaningful and useful measures of program effectiveness and quality. Informed by data and analyses, campuses can adjust their enrollment proposals appropriately.

One facet of graduate enrollment that requires diligent attention is the need to increase student diversity. Throughout this paper we have noted the benefits of graduate education to the state, nation and world. If growth is also accompanied by increased racial, ethnic, and socioeconomic diversity, we will be making a significant social contribution by extending the benefits of graduate and professional education to groups who are still underrepresented in our graduate programs. The professions, especially, such as business, law and engineering, provide major gateways to upward mobility. Increased diversity will also benefit the programs themselves as students bring a variety of perspectives to bear on their work—perspectives that may enable them to “think outside the box” and identify important new research directions.

Another factor to monitor is the extent to which other universities plan increases in their graduate enrollments so that we can help avoid a future oversupply. At this time, based on conversations with representatives of a number of public universities belonging to the Association of American Universities, we do not expect top public research universities in other states to increase their doctoral enrollments in the near future. Moreover, even if some U.S. doctoral-granting institutions (as differentiated from research universities) add graduate students, few are competitive with UC's doctoral programs, so growth in UC enrollments does not necessarily diminish employment prospects for our students. Nor will other states fill California's needs for professionals.

Finally, targeted growth must complement, not compete with, graduate education at the California State University. We believe that for the most part it does. For example, most CSU masters students are part-time students who are older, working adults who have returned for a specific masters degree, often to strengthen their skills in their current profession. Over one-quarter of CSU masters degrees are in education; many if not most of these students are current K-12 teachers who are strengthening their pedagogical skills or pursuing advanced study in the specific subjects they teach. By comparison, most students in UC's masters programs are full-time residential students, and most UC letters and science masters students are en route to a doctoral degree, rather than planning to leave after completing the masters degree. UC campus academic planners are deliberately seeking to build on the strengths of UC's existing doctoral programs and to integrate UC research into their plans to expand existing professional masters programs and to develop new masters degrees for working professionals (the Masters of Advanced Study degree). Given anticipated growth in needs for masters programs, both systems will have an expanded role to play.

3. ***Leveraging all campuses' strengths through the complementary approaches of individual campus development and intercampus cooperation.***⁴⁰

Individual campus development: We believe California will be best served by ensuring that research programs and graduate education are strong at all the UC campuses. One of the University's great strengths is that it is a single research university with campuses spread across California. This provides opportunities for education at the highest level across the state and creates multiple centers of research and development, strengthening all of California's regional economies. Businesses and industries develop and settle where skilled researchers and professionals are located because they value access to UC's knowledge and capacities. Graduate enrollment planning should take into consideration the potential benefits of and needs for various programs not only for the state as a whole but for regions and communities within the state.

To provide this service well, each individual UC campus must have a configuration of core disciplines to support its emphases. No campus needs to offer all specialties in a field, but the basic disciplines form an essential foundation on which campus emphases are built. It is, for example, unthinkable to offer a program in environmental sciences without being able to train students in biology and chemistry. Similarly, an emphasis in urban planning must be based on solid training in economics and political science. The challenge for UC's developing campuses during this period will be not only to choose their emphases well, but also to ensure that the core programs on which these emphases depend are strong.

Cooperation and specialization: At the same time, the University of California, as a system, offers its campuses a unique ability to place individual campus development within the context of the system's overall academic strengths and specializations. In the past several years, due initially to the pressures of budgetary limitations, campus faculty in certain key disciplines have been deliberately encouraged to develop new and stronger

⁴⁰See the recommendations on these points by the UC Council of Graduate Deans, *Excellence at Risk*, p. 37.

relationships with their colleagues across the system, particularly in order to identify opportunities for instructional collaboration. One of the most successful examples at the graduate level so far is in the area of history. Cooperation among history departments in the offering of specialized courses, for example in Russian history and in Latin American history, has enabled campus departments to provide advanced-level work that would otherwise not be feasible, and joint meetings of history faculty and graduate students from across the UC system have generated substantial research excitement and set in place networks that will be invaluable in students' careers. In classics, a new joint doctoral program among three UC campuses (Irvine, Riverside, and San Diego) will share faculty and other resources across the three campuses, to enable a program of study not otherwise possible. Similar collaborations in physics have taken root, and collaborations in other disciplines are being developed. In addition, UC campuses have developed a number of joint doctoral programs and other types of collaborations with CSU campuses, and more are being explored.

Innovative uses of technology may also provide opportunities to expand the use of shared resources and to create multidisciplinary collaboration. Distance learning, video conferencing, and e-mail networks are examples of technology that now make it possible for two or more campuses to collaborate in teaching specialized graduate courses. Such collaboration is particularly beneficial when faculty expertise or student enrollments on a single campus are inadequate to warrant specialty courses; hence, it can significantly broaden the educational and research opportunities available to graduate students. The new California Digital Library, a collaboration of all nine UC campuses that is selecting and building digital scholarly collections and designing online tools that help make the resources of UC's libraries and those of partnering institutions widely available, is a prominent example of the use of technology to share resources virtually without borders. Technology can also link individuals across disciplines; this will enhance students' education as the workplace puts more reliance on teams of individuals with complementary multidisciplinary skills, such as humanists and social scientists working with scientists and technically oriented personnel.

4. Strengthening graduate and professional education by ensuring adequate student support.

If the growth is to occur in a responsible way, we estimate that the University will need to generate additional graduate student support. Preliminary analysis indicates that as much as \$76 million may be needed to support growth through 2005. The actual amount will depend on the configuration of masters and doctoral enrollments and on the disciplines in which they enroll. To accomplish this increased support, each campus must give an appropriate priority to the generation of more graduate student support and the nine must work together, as well as individually, to identify and secure sufficient funds. This will require a multiple-part strategy.

First, it will be essential to ensure that the traditional sources for graduate financial support maintain and increase their commitments for this purpose, including

- Continuing UC's agreement with the State that provides marginal cost for additional students that keeps pace with both growth and inflation; this is an important source of funds for teaching assistantships.

- Securing a continued strong federal commitment to subsidized loans and basic research funding and actively facilitating faculty acquisition of the contracts and grants that supply research assistantships.
- Sustaining the University's commitment to use at least one-third of additional student fee revenue for financial aid to ensure access for those who can least afford to attend.
- Sustaining the current proportion of each campus's operating budget devoted to graduate support.
- Keeping students' personal income contributions at current levels.

Second, since preliminary analysis indicates that support from these traditional sources may not be sufficient, it will also be necessary to develop new forms and sources of support to secure the funds. This could involve any or all of the following activities:

- Develop requests for State funding for support in areas important to California, for example to address the shortage of high-tech scientists and engineers, to support programs that link UC programs in the arts and the needs of the entertainment industry, or to expand disciplines that foster international connections, preserve and clean up the environment, or look for solutions to major social and educational problems facing California.
- Pursue industry relationships to provide research assistantships and fellowships for graduate students. The training of researchers, particularly in the physical and life sciences, has been the source of uncounted inventions and entire new industries, which keeps the private sector healthy and vital. Carefully thought-out programs that match educational interests with opportunities for guided work in industrial settings, or that involve bringing industry researchers into the University for appropriate joint projects that support graduate students could be pursued.
- Aggressively increase fund-raising for graduate fellowships. As campus development staff seek the support of private foundations and individuals, the crucial importance of fellowship funding in all fields should be advanced, not only for doctoral students but also in fields in which debt levels are becoming very high. If UC's campuses are to continue to compete with comparable universities nationally, many of whom are conducting campaigns for graduate student support, UC must do the same.
- Pursue creative international opportunities. The recently negotiated agreement between UC and the Mexican government's science and engineering agency, CONACYT (Consejo Nacional de Ciencia y Tecnología), which provides block grant funding for promising Mexican graduate students, is a model that should be more widely pursued with other national agencies.

Finally, the University must implement growth carefully, when student support can be reasonably assured. Prior to approving new graduate program proposals and campus graduate enrollment plans, the Academic Senate, campus administrations, and the Office of the President must be satisfied that the support plan is realistic and achievable, and that it projects adequate and appropriate financial support to attract and retain outstanding graduate students. In addition, the Office of the President and each Chancellor must

closely monitor per capita student support on each campus to ensure that planned increases in student support are implemented.

The faculty also has a role to play in ensuring that students are not admitted without adequate support. In recent years, many departments have taken this charge seriously and admitted fewer students than they were authorized to admit in order to match their financial capabilities. These decisions have most often affected international enrollments, because departments have sometimes found it difficult to fund the large amounts required for a permanently nonresident student. These responsible, though painful, choices are and will remain an important part of the graduate admissions process during the coming growth years.

Increasing graduate enrollment at the University requires serious and careful thought and preparation. We believe the needs of society and the workforce for such increases are compelling. However, growth must be supported by adequate funding, not just for students, but for the entire institution. We address some of these needs in Section V—Financial Issues. Also, as we have stressed, increases must be based on the real needs of society, and on continued careful analysis of program offerings so that we modify or discontinue programs that are no longer needed for changing times. Campuses and departments are proceeding with caution as they propose new graduate enrollments, so that they can continue to maintain the quality of their programs, and thereby meet their commitment to serving the State of California and to the nation as a whole.

III. UNDERGRADUATE ENROLLMENT PLANNING

Introduction

Undergraduate enrollment planning is tied more directly to demographics than graduate planning, which is a process of negotiation driven by workforce and societal needs and the institution's ability to support additional students. Under the California Master Plan for Higher Education the University is committed to providing access—that is, enrollment somewhere within the UC system—to all eligible California high school graduates who choose to attend. In addition, however, the University is committed to providing for those students the unique type of education found in a research university. Access to the University of California therefore is a matter not solely of accommodating numbers of students but also of ensuring their admission to a world where undergraduates, graduate students and faculty join in an ongoing partnership of discovery and learning.

In this section on undergraduate planning, we present a three-part framework in which we fit our proposed enrollments:

- First, we describe how, as a research university, UC has a mission to provide a special type of undergraduate education.
- Second, we describe the results of a modeling methodology that allows us to estimate a range of undergraduate demand based on current population projections.
- Third, we consider some of the factors that may affect students' decisions about whether to enroll at UC, demonstrating the difficulty of making accurate projections.

We then present the level of undergraduate enrollments, which (along with our proposed graduate enrollments) can be accommodated at our existing campuses by 2010, within the LRDP enrollment agreements. Comparing this level of enrollment to our most conservative estimate of demand indicates that we will fall short of accommodating undergraduate demand. The opening of UC Merced will provide some alleviation. In Section IV we propose and assess additional solutions for campuses to consider in order to close the gap.

Finally, as with graduate enrollments, we conclude with the tasks it is necessary to pursue as we continue preparing for increased undergraduate enrollments.

A. Undergraduate Education in a Research University

Summary of Major Points

UC's undergraduates benefit from the unique and valuable educational experience of a research university.

Graduates of research universities such as UC will continue to be highly valued for their particular type of educational background.

UC's undergraduates benefit from the unique and valuable educational experience of a research university.

There are many types of undergraduate baccalaureate institutions in the United States offering different types of educational experiences. They share many similarities—most are structured around four-year courses of study, students pursue a major in which they gain some depth of knowledge and skill, and graduates are rewarded by our society by generally receiving higher income, increased social mobility and positions of influence.

Nevertheless, there are important distinctions among the different types of undergraduate institutions. An undergraduate at any UC campus—each of them a research university of national stature—is engaged in and shaped by the following circumstances:

- Affiliation with intellectual peers of the highest academic ability, who represent a range of socioeconomic, racial/cultural, and geographic origins.
- Instruction from and interaction with mentors and teachers, also of exceptional ability, whether relatively new graduate TAs or the most experienced emeriti faculty.
- Immersion in a “culture of discovery”—a community of faculty, graduate students, and postdoctoral scholars whose daily interactions revolve around not only maintaining and transmitting a body of accepted knowledge but also pursuing new knowledge.
- Opportunities to engage in undergraduate research projects, mentored one-on-one by active, highly accomplished researchers.
- A full-time, generally residential experience that performs an essential although not always easy transitional function between the dependent status of the high school student and the independence of a college graduate in his or her early to mid-20s.
- Participation in a large and complex educational delivery system shaped by the institution’s research activities. This research orientation shapes the academic content and intellectual values of the institution, and defines the structure for the distribution of tasks among the many partners responsible for instruction.

Graduates of research universities such as UC will continue to be highly valued for their particular type of educational background.

There is much evidence that California in the 21st century will require increasingly well-educated citizens: more doctoral, professional, and masters graduates to fuel the sophisticated advances on which our economy now depends, as well as more high-school graduates better prepared to work successfully than is now the case. The greatest need will be for most Californians eventually to have at minimum two years of college education, and an increasing proportion of the workforce will need at least baccalaureates.⁴¹ As we have just noted, there are many types of undergraduate institutions—and perhaps more to be developed as proprietary and public “virtual universities” take shape—and each will have a role to play in offering its particular type of education to meet the State’s needs. We believe that the specific kind of education the University of California provides for undergraduates, as a research university, will continue to serve the State well.

The undergraduate experience at UC prepares citizens to push the envelope of traditional knowledge and to operate from the assumption that problems can be solved through research, analysis, creative thinking, and collaborative effort. Not content to rely on knowledge and skills gained during college, and believing that knowledge is always being expanded, refined and reinterpreted, UC graduates are inclined toward lifelong learning and are accustomed to managing independently their learning processes. They are sophisticated participants in complex organizations, and many have gained valuable leadership experience in their diverse, multifaceted academic communities.

Whatever California needs from its future college-educated population—increased vocational training, more internationally oriented citizens, an expanding pool of lifelong learners—it is certain the State will also continue to need the kind of college graduate that UC, as a research university, is organized to produce. It is the underlying premise of our enrollment planning that this is the type of educational experience UC intends to continue to provide its undergraduates.

This description has important implications for enrollment planning. It says that we do not expect the age range of our undergraduate students to change substantially, that we will continue to foster undergraduate involvement with research, and that we expect to maintain, if not improve, the current student-faculty ratios and proportion of graduate students in order to sustain UC as a research university within which to educate undergraduates.

⁴¹ Controller’s Quarterly, “California’s Education Gap, pp. 5-7, March, 1997.
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B. Estimating Undergraduate Demand for UC Enrollment

Summary of Major Points

Undergraduate enrollment growth is driven by population growth. California's population of high school graduates is projected to grow substantially in the next decade.

By modeling various participation rate assumptions, we can establish a reasonable range of demand within which to plan undergraduate enrollments.

Undergraduate enrollment growth is driven by population growth. California's population of high school graduates is projected to grow substantially in the next decade.

In some respects, undergraduate enrollment planning in the University of California is simple: the University's commitment to California's Master Plan for Higher Education guarantees admission to all eligible students (although not necessarily to the campus or program of their first choice). The University has established academic criteria, which are reviewed periodically, in order to identify the top 12.5 percent of the public high school graduating class, in other words, the UC-eligible population. From this pool of eligible students, we can estimate, within a range of probability, the proportion that might choose to attend UC. Thus, unlike graduate enrollments, which are a negotiated number, undergraduate enrollments are population-driven.

The State's Department of Finance (DOF) Demographic Research Unit projects the number of public high school graduates, which forms the basis for projecting UC enrollments. There are additional nuances to the projection methodology, such as estimation of the number of private high school graduates, and transfer students and the proportion of students who will continue their enrollment instead of leaving the University. However, because most of UC's undergraduates come directly from high school, undergraduate enrollment planning is largely tied to projections of public high school graduates.

Over the last decade the University has produced two enrollment studies previous to this one, based on very different assumptions. In 1988, we presented to The Regents plans for undergraduate enrollments through 2005 that assumed both high projections of high school graduates and high participation rates. There appeared to be so much potential demand for a UC education at that time that we proposed the expansion of existing campuses to their physical capacity and the addition of up to three new campuses.

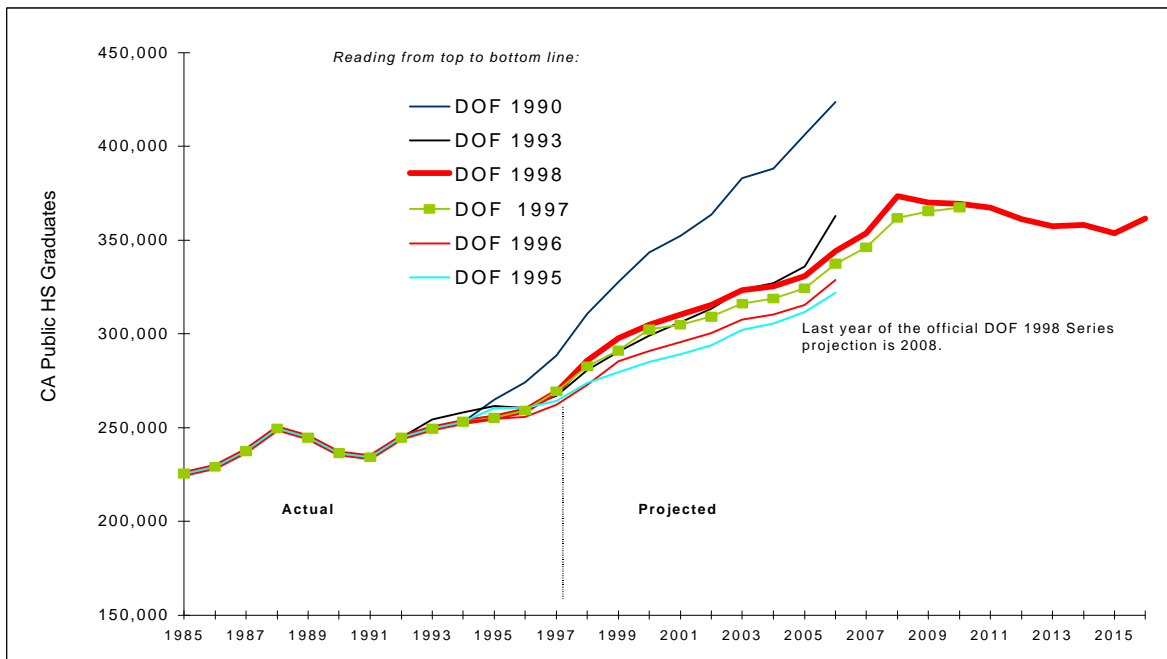
In 1995 we reviewed those 1988 estimates. The state was just recovering from severe economic conditions, and the base population of school-age children had declined considerably as families moved out of California and relatively few people moved in. In addition to the greatly reduced potential pool of high school graduates, a lower percentage of them were choosing to enroll at UC. Indeed, participation had dropped to its lowest level in more than a decade. In the revised projections presented to The

Regents in May 1995, most existing campuses were projected to grow more slowly than in the 1988 Plan. The projections continued to show the need for one additional campus, but with an opening date delayed by more than five years.

In the late 1990s we are again seeing an increase in California’s population. First, the late childbearing patterns of the so-called baby boomers have created a second “boom” generally referred to as Tidal Wave II. Second, some parts of the population are experiencing high birth rates. Finally, California has rebounded from its economic downturn. Migration patterns, while not projected to return to previous high levels of the 1980s, are resulting in significant population growth, reversing the net out-migration that occurred between 1992-1995. So long as the economy remains strong, which it is projected to do, it is reasonable to believe that relatively few Californians will leave the State, and that there will continue to be an influx of newcomers.

Figure 9 shows the effect this population growth is expected to have on the part of the population of particular interest to us, public high school graduates.⁴² For purposes of comparison, the figure also shows selected projections from previous years.

Figure 9 – Department of Finance 1998 Projection of California Public High School Graduates Compared to Earlier Projections



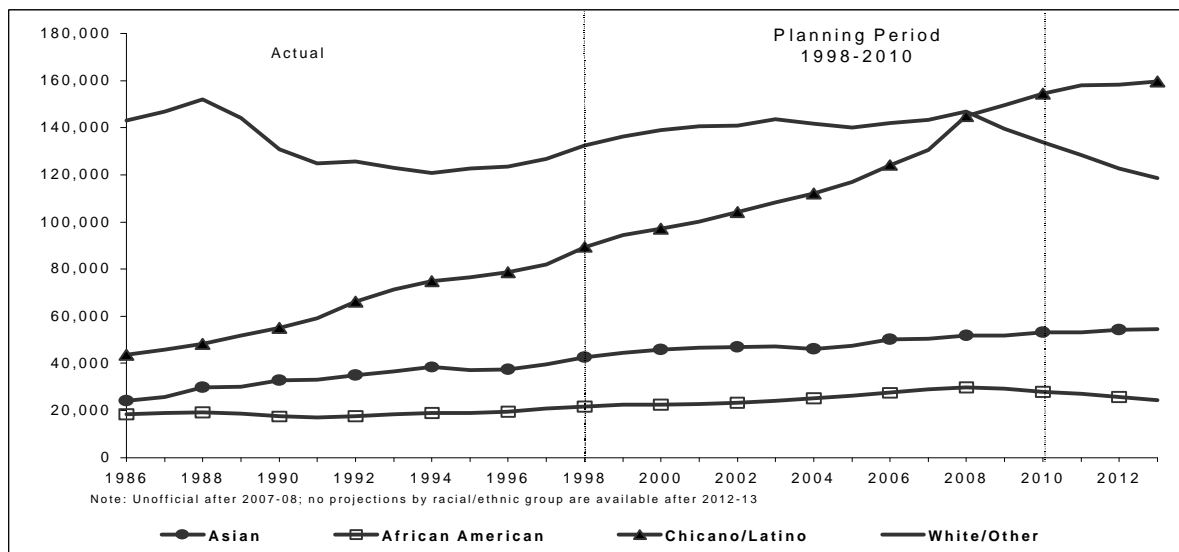
After the 1990 projection there was a substantial drop, resulting in the lowest line of projections in the 1995 series. The projections began to climb again to the point where the 1998 series now exceeds virtually all the projections made since the 1993 series. The line peaks in 2008, and then declines for several years. (Recall, however, that students graduating from high school in those years have not even started elementary school as of

⁴²DOF’s 1998 projections officially go to 2007-2008. For purposes of this paper, we are extending the planning time frame through 2015, using unofficial projections that the DOF Demographic Research Unit has prepared for our use.

1997-98 so there is no grade progression data on which to build a reliable long-range estimate.) The 1998 series shows an increase of almost 88,000 public high school graduates between 1998 and the peak year of 2008, a 31 percent increase and an annual growth rate of 2.7 percent.

DOF has also projected high school graduates by California’s racial and ethnic groups. Figure 10 shows the variation in growth rates of the four primary population groups. The Chicano/Latino population is growing at a rate that outpaces all other groups, and it will become the single largest population group by 2007-08. The size of each population group, and the variation in eligibility and participation rates of each group, play an important role in the estimation of undergraduate enrollment demand.

Figure 10 – California Public High School Graduates by Major Racial/Ethnic Group Actual (1985-86 to 1997-98) and Projected (1998-99 to 2012-13)

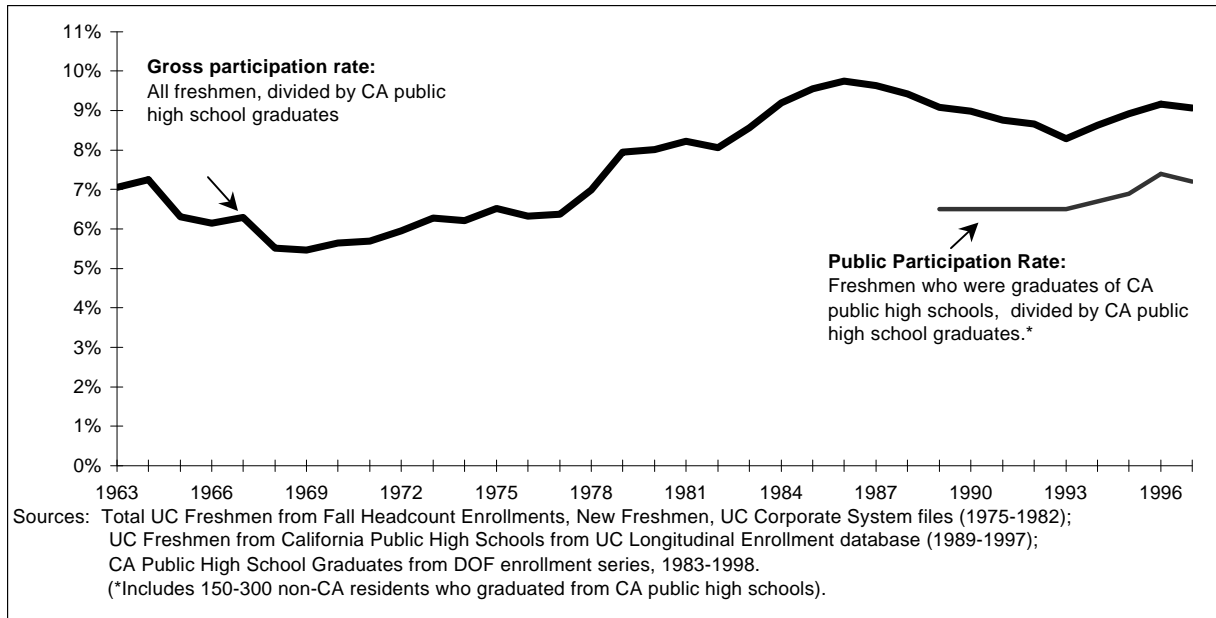


By modeling various participation rate assumptions, we can establish a reasonable range of demand within which to plan undergraduate enrollments.

The real challenge of projecting undergraduate enrollment is in estimating the proportion of California high school graduates that will choose to enroll at UC. California’s brightest students have many options and their choices can shift toward or away from UC for many reasons. However, by using a variety of methods and assumptions about future growth, it is possible to create with some certainty a boundary around what the future is likely to hold. First, for historical reference, Figure 11 displays the history of freshman participation.⁴³

⁴³ There are many ways to calculate participation rates, with this Figure demonstrating two of them. The higher line is the “gross participation rate.” It is a useful measure because it can be easily applied to DOF California public high school graduate projections to project total new Freshmen, but because it includes out-of-state and private school students it cannot be meaningfully compared to the Master Plan’s 12.5 percent. The lower measure limits the calculation to public high school graduates, and is useful when making comparisons to the Master Plan, which refers only to public high school graduates. That is, this so-called “public participation rate” gives a fairly accurate representation of what portion of the top 12.5 percent are attending UC. Both measures include a small number of new freshmen who were admitted “by exception,” i.e., students who were not in the top 12.5 percent.

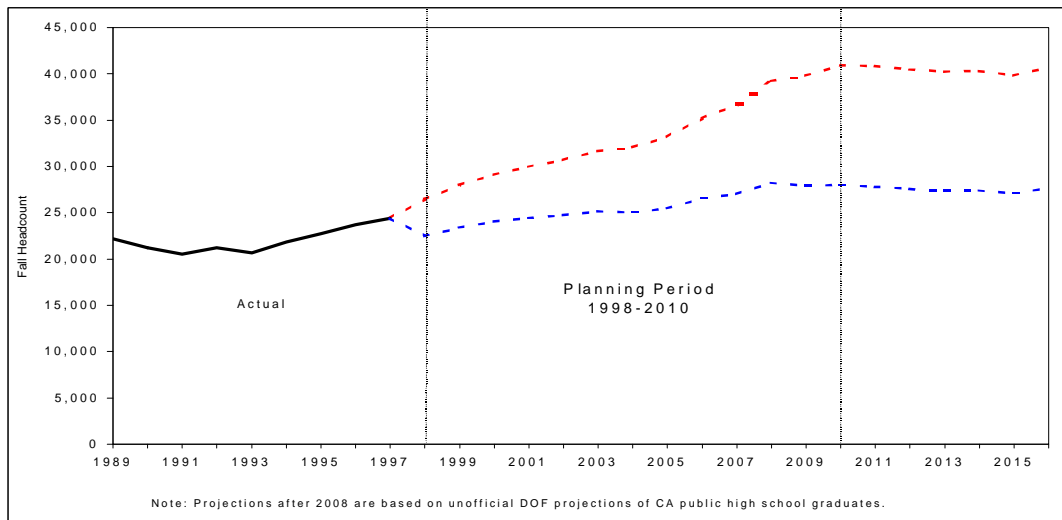
**Figure 11 – Ratio of New UC Freshmen to California Public High School Graduates:
All Freshmen and Freshmen from California Public High Schools**



In order to predict future demand, we have developed a model that disaggregates UC enrollment data from 1989 to 1997 for each racial/ethnic group from public and private California high schools, to identify participation rates for each group. The model then can be used to estimate future undergraduate demand based on population projections and varying assumptions about the participation rates of each population group.

Presented below in Figure 12 are the results of a modeling activity that provide a set of outer boundaries for new freshman demand. (At the end of this section we show total undergraduate demand, adding transfers and continuing students.) A technical discussion of the modeling methodology is included in Appendix 3.

Figure 12 – Range of Maximum and Minimum Estimated New Freshman Demand, 1998-2016



Estimates of maximum and minimum demand. Figure 12 represents participation behavior that has not occurred, but could under certain circumstances. The “maximum demand” line assumes that by no later than the year 2010-11 every population group would be participating either at its 1997 rate or at 7.2 percent, whichever is higher. The 7.2 percent participation rate represents the average of the Fall 1996 California resident public high school participation rate (7.3 percent) and the Fall 1997 rate (7.1 percent). In 1997 participation rates for the two largest currently underrepresented groups, African-Americans and Chicano/Latinos, were 4.4 and 3.8 percent, respectively. In order for their participation to increase to 7.2 percent, larger numbers of these two population groups will have to become eligible for UC. Current eligibility rates⁴⁴ of 2.8 percent for African-American high school graduates and 3.8 percent for Chicano/Latino graduates will have to grow substantially to a level that could yield a 7.2 percent participation rate.⁴⁵ The maximum demand line would result in a total hypothetical gross participation rate of 11.1 percent in 2010, which is higher than any historical level of UC freshman participation.

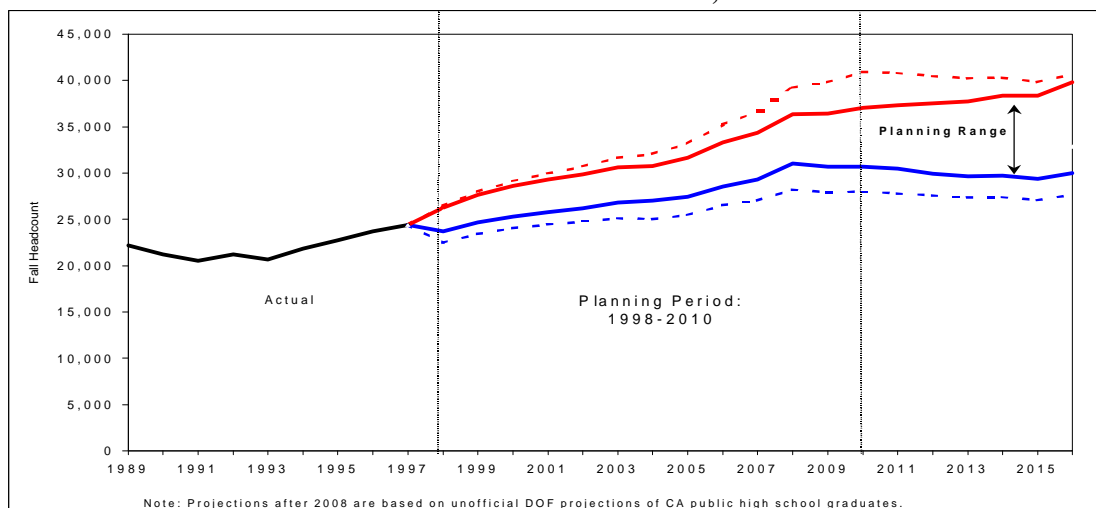
The “minimum demand” line shows what would happen by applying the lowest actual participation rate for each racial/ethnic group in the past nine years. With rates ranging from 3.8 percent for Chicano/Latino to 16.8 percent for Asians, this set of assumptions produces a hypothetical gross participation rate of 7.6 percent.

Reasonable planning range: While the high and low ranges have some possibility of materializing, we believe their assumptions are too extreme to provide a framework for meaningful enrollment planning. We therefore looked to other combinations of assumptions that might provide a more plausible range of estimated freshman demand. Figure 13 shows the results.

⁴⁴California Postsecondary Education Commission, “Eligibility of California’s 1996 High School Graduates for Admission to the State’s Public Universities.”

⁴⁵This high estimate of demand does not assume any reduction in *participation* of other groups, even though the potential size of their combined *eligibility* pool would be reduced if the eligibility rates for African-Americans and Chicano/Latinos were to increase.

Figure 13 – Maximum, Minimum and Reasonable Planning Range of Estimated New Freshman Demand, 1998-2016



The high end of the planning range, which reaches about 37,100 freshmen in 2010, reflects a 3.3 percent annual growth rate, and would potentially materialize if by 2010 each racial/ethnic group were to return to the highest participation rate previously achieved during any of the past nine years. Such a result would be equivalent to a gross participation rate of 10 percent.

The lower end of the range yields approximately 30,700 new freshmen and reflects about 1.8 percent annual growth rate. This is the level of enrollment that would occur if the assumptions used in our 1995 study were to materialize, which were based on the lowest gross participation rate in recent years—8.3 percent (see again Figure 11).

Summary of projections of new freshmen demand: Figure 14 shows these four projections of new UC freshmen. For reference we also include DOF’s 1998-series projections of new UC freshmen.⁴⁶ The base from which growth is calculated is 24,400 new freshmen in Fall 1997.

Figure 14-Summary of New Freshman Demand Estimates for UC

| | New CA freshmen in 2010 | Total increase in new CA freshmen (1997-2010) | Average annual growth rate (%) (1997-2010) | Estimated Participation Rates | |
|--------------------------------|-------------------------|---|--|-------------------------------|----------|
| | | | | Gross % | Public % |
| Maximum | 40,900 | 15,000 | 3.9 | 11.1 | 8.7 |
| High Reasonable Planning Range | 37,100 | 11,200 | 3.0 | 10.0 | 7.8 |
| DOF | 33,600 | 7,700 | 2.2 | 9.1 | 7.2 |
| Low Reasonable Planning Range | 30,700 | 4,800 | 1.4 | 8.3 | 6.5 |
| Minimum | 28,000 | 2,100 | 0.7 | 7.6 | 6.0 |

⁴⁶ DOF’s methodology assumes that rates for first-time freshmen will gradually return to the average of 1986-1992 rates over the next ten years. The gross and public participation rates are coincidentally the same as the 1997 rates for new UC freshmen.

Total Undergraduate Demand. In order to estimate total UC enrollment demand, we must add to the freshman projections both transfers and continuing students.

- Projecting transfer students is difficult because there is no demographic driver that would form the basis for calculation. However, the University has recently signed a Memorandum of Understanding (MOU) with the Community Colleges that sets as a goal an increase in transfers to UC from 10,600 students to 14,500 students annually by 2005-06. In addition, there is always a small component (approximately 1,500 students) of transfers from other institutions, CSU among them.

Our assumptions about future numbers of transfer students are that we will honor the MOU, and in addition, continue to enroll the current number of non-Community College transfers. After 2005, we have assumed the total number of new transfers will continue to grow at the same annual increment as between 1996 and 2005. The possible effects of the MOU on the 60:40 ratio of upper-division to lower-division students expected by the Master Plan have not been calculated. Maintaining the 60:40 ratio will depend on individual campus admissions decisions.

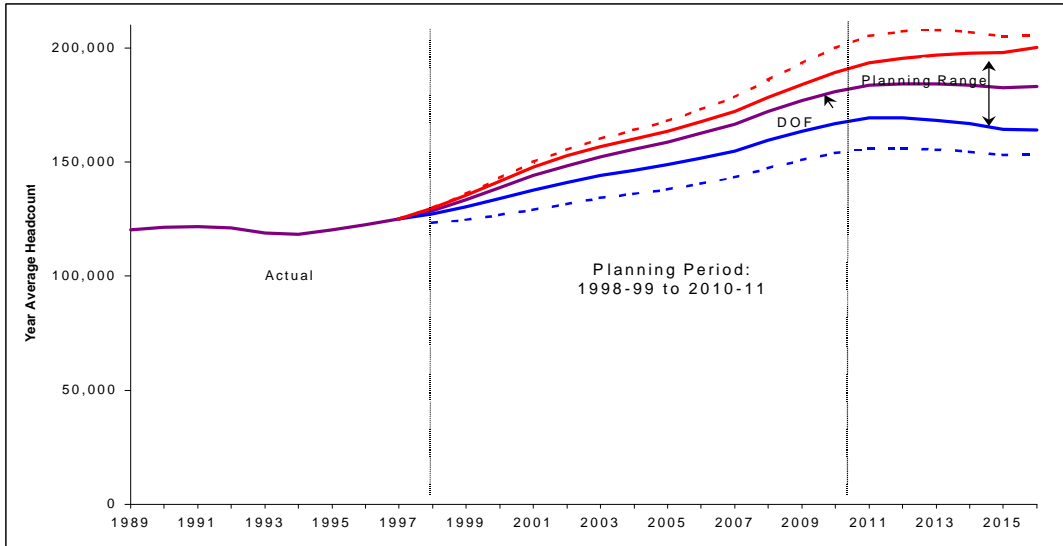
- The third component of our undergraduate projections is the estimated number of continuing students. Continuation rates are a function of retention (i.e., students making progress from one level to another, e.g., freshman to sophomore) and graduation rates. The demand model incorporates empirically estimated continuation rates for new freshmen and transfers, based on actual data from 1989-97. Our assumption for the model is that the rates identified in those years will remain stable.

Overall range of enrollment demand: Figures 15 and 16 show the results of adding the transfer student and continuing student estimates to the range of freshman demand displayed above, resulting in the maximum, minimum and reasonable planning ranges of potential undergraduate enrollment demand. The reasonable planning range represents annual growth ranging from 2.3 to 3.4 percent, with average annual increases of 3,300 to 5,200 undergraduates between 1998-99 and 2010-11. DOF projections of total enrollment are shown for reference.

**Figure 15 – Range of Total Undergraduate Demand
(Year-average headcount)**

| | 1997-98 actual | 1998-99 budgeted | 2005-06 estimated | 2010-11 estimated |
|---------------------------------------|-----------------------|-------------------------|--------------------------|--------------------------|
| Maximum | 125,489 | 126,850 | 168,000 | 200,000 |
| High Reasonable Planning Range | 125,489 | 126,850 | 163,400 | 189,100 |
| DOF | 125,489 | 126,850 | 158,800 | 180,700 |
| Low Reasonable Planning Range | 125,489 | 126,850 | 148,800 | 167,000 |
| Minimum | 125,489 | 126,850 | 138,000 | 153,800 |

Figure 16 – Projected UC Total Undergraduate Enrollment Demand



C. Factors that May Affect Future Demand

Summary of Major Points

UC-eligible students can choose from many colleges and universities.

Many personal factors can affect students' choices, including cost and socioeconomic factors and social expectations.

Institutional decisions may influence participation rates, including limited enrollment capacity at some UC campuses, changes in eligibility criteria, and expanded outreach efforts.

The greatest unknown in establishing a reasonable enrollment target within the range of estimated demand is in trying to anticipate future student enrollment behavior, that is, the proportion of eligible students that will choose to enroll at UC. Many factors affect students' decisions. We look at three: First, UC-eligible students have many choices of colleges and universities available to them. Second, factors such as cost, socioeconomic and demographic characteristics and societal expectations will influence individuals' choices of where to enroll. Finally, actions UC takes will also play a role in encouraging or discouraging future UC enrollment.

UC-eligible students can choose from many colleges and universities.

By definition, UC-eligible students are the best of the high school graduates in the State. Most colleges and universities would be pleased to number them among their student bodies. Indeed, many higher education institutions throughout the country actively recruit highly qualified California high school students, including students from underrepresented minority groups. Most UC-eligible high school graduates will enroll in college somewhere, usually directly after graduation from high school. Thus, their decision is not whether to attend college, but where to enroll.⁴⁷

Having many choices available to them, UC-eligible students are able to consider more criteria in their selection of the best college experience for themselves. They can choose in-state or out-of-state; small, large, or something in between; a liberal arts college, a comprehensive university or research university; a religious or other specifically oriented college that can offer certain academic programs or valued extracurricular activities. Prospective students may also take into consideration the potential "buying power" of their bachelor's degree in terms of acceptance to graduate or professional school, employment opportunities or social prestige.

A recent Office of the President analysis of College Board data to examine the attributes of SAT-test takers identified characteristics of students applying, and not applying to UC.

⁴⁷Further study is required to demonstrate the extent to which this statement is true, but there is no indication, even anecdotally, that significant numbers of the most able high school students are choosing to forego or even delay a college education.

Of those who applied to UC (90 percent of whom were eligible) 98 percent indicated their primary interest was in attending a four-year college. Of UC-eligible applicants and nonapplicants, between 70 and 80 percent expressed interest in attending a public university, and additionally, 54-56 percent were interested in attending a private, non-religious university. Only 5 percent of the UC-eligible applicants and 10 percent of the UC-eligible non-applicants were interested in a two-year college. Between 57 and 68 percent expressed interest in staying in California; non-applicants expressed more interest in leaving California for college. Independent colleges and universities in California that are considered to be comparable to UC in terms of selectivity and academic rigor (as identified by CPEC)⁴⁸ are all full-time, residential institutions, as are the major out-of-state competitors of UC for California undergraduates (e.g., Harvard, MIT, Yale, etc.).

College, for the UC-eligible student, is valued both for its academic functions and for its rite-of-passage function, taking the student from the relative dependency of the high school student to the independent adulthood of the college graduate. At this point, it does not appear that an “online” college will be an attractive option for UC-eligible students because these colleges lack the intense, transformational experiences of full-time, residential college life where some of the most important interactions are with other students in discussions and group study. (However, online education may prove to be a viable alternative method for educating some Tidal Wave II students, particularly if cost-conscious, convenient, quality educational programs become available. Such a development in the private sector could take some of the pressure off public institutions.)

Given the many choices available to UC-eligible students, it is nevertheless clear that Californians value the University of California’s undergraduate education. Referring back to Figure 11, we can infer the value students place on the particular kind of educational environment and experience that a research university provides, since approximately 60 percent of all eligible students enroll in UC.

It is our intention to continue studying this issue of student choice to improve our knowledge of which colleges UC-eligibles are attending and why they make these choices.

Many personal factors can affect students’ choices, including cost and socioeconomic factors, and social expectations.

Many factors influence the choices UC-eligible students make among the colleges available to them. It is not possible from the data available to draw definitive conclusions about how these many factors will affect future college-going students, particularly more than ten years from now, but we can note some of the important changes occurring in California and draw some speculative conclusions about their impact.

Cost. This is a complex topic that is so intertwined with other variables (cost of the

⁴⁸The 21 independent California colleges and universities considered by CPEC to be comparable to UC are California Institute of Technology, Claremont McKenna, Harvey Mudd College, Loyola Marymount University, Mills College, Occidental College, Pepperdine University, Pitzer College, Pomona College, St. Mary’s College of California, Santa Clara University, Scripps College, Stanford University, Thomas Aquinas College, University of the Pacific, University of Redlands, University of San Diego, University of San Francisco, University of Southern California, Westmont College, and Whittier College. They have a combined total enrollment of approximately 62,000 undergraduates, about 7.5 percent of whom are part-time students (IPEDS Fall Enrollment Surveys, Fall 1995).

competition, economic stability, family income, availability, and attractiveness of aid packages) that it is difficult to say how, over time, cost differences between UC and other institutions have affected students' choice of college. It is certainly a factor that is taken into consideration by families. We have noted in recent years that fee increases have been correlated with a slight and temporary negative effect on UC enrollments—but it is not obvious the degree to which reduced enrollments were related to higher fees, to the difficult economy, or to the desire for greater fee predictability than UC could provide.

Nevertheless, the public press and media, as well as the United States Congress, have been concerned that the cost of a college education is too high, and that many students in coming years will not be able to afford an education. If families agree that costs are too high, the consequences could be that some students will shift their choices from expensive private to less costly public institutions, such as UC, and that some otherwise UC-bound students will attend a community college or CSU campus if that choice is more affordable. A 1997 study examining how undergraduate education is financed in the United States found nationally that among college students from families with annual incomes above \$200,000, the proportion attending public universities increased from 31 percent in 1980 to 38 percent in 1994. We do not have comparable data available for UC, but the percentage of UC freshmen from families with incomes over \$100,000 has increased from 15 to 20 percent, matching exactly the trend and proportion of freshmen at other selected public universities. (The corresponding trends for other income groups are less clear.)⁴⁹

Socioeconomic factors. Several reports and accounts have been published in recent years attesting to disturbing social and economic trends affecting significant portions of California's population. California has very high rates of poverty, as compared to other states, combined with very low educational achievement, as measured by test scores, high school dropout rates, and college attendance rates. It is beyond the scope and intent of this paper to examine these varied problems, but it is not hard to conclude that have serious implications for the State's well-being. California's continued prosperity and well-being depend on a population that is well-educated and able to participate fully as productive citizens and workers.⁵⁰

It is not clear, however, the extent to which these important social and economic factors apply to UC-eligible students and therefore what impact they might have on their college choices (although it is clear that these conditions prevent many students from ever hoping to become UC-eligible). By definition, UC-eligibles are not low academic achievers, and they are less likely to be poor than the general population. However, to the extent that UC-eligibles share the characteristics of a significant part of our population—single-parent households, parents without a college (or high school) education, limited access to the educational opportunities that make applicants competitive, such as advanced placement courses and instructional technology—there could be more UC-eligible

⁴⁹Chronicle of Higher Education, September 19, 1997, citing McPherson and Schapiro, *The Student Aid Game*, Princeton Press, 1997.

⁵⁰Controller's Quarterly, "California's Education Gap, pp. 5-7, March, 1997; Nancy Bolton, "The Education of the Work Force," UCLA Anderson Forecast, June 1997, California-2.1 – 2.3; Nancy Bolton, "Education in California—Can Money Buy Happiness?," UCLA Anderson Forecast, June 1998, California-2.1 – 2.7; *Kids Count Databook*, "1997 State Profile for California," Annie E. Casey Foundation, Kids Count Data Online, 1997.

students who will choose alternative educational routes, such as enrollment in CSU and the community colleges, which may be more convenient and less-costly institutions for students not able to pursue the full-time, rigorous educational experience offered by UC.

Rising social expectations. One encouraging recent social trend is the rising academic expectation of high school students, both while in high school and after graduation. California has introduced more rigorous standards for high school graduation, and although not fully implemented, the message to students and their families is clear: we must do better by our children in the K-12 grades if we are going to continue to have a population able to compete in the economy and society of the future. In addition, there are increased pressures for students to acquire at least two, and often four, years of college education. Accordingly, recent studies have shown that more California high school students are taking the necessary coursework to prepare themselves for college.⁵¹ Indeed, a significant focus of UC's expanded efforts in outreach is to help improve student preparation even more.

However, while these pressures may swell the ranks of college attendees, with implications especially for the Community Colleges, and perhaps for CSU, they will have little impact on UC because the UC-eligible population has historically been choosing to attend college. It is possible that higher societal expectations about college achievement could increase their likelihood of attending graduate or professional schools.

Institutional decisions may influence participation rates, including limited enrollment capacity at some UC campuses, changes in eligibility criteria, and expanded outreach efforts.

Effects of limited enrollment capacity. It is also interesting to consider the possible effects on total UC enrollment as increasing numbers of applicants are denied admission to campuses that have reached their enrollment capacity. For example, some have surmised that an increasing proportion of unsuccessful applicants to Berkeley and UCLA, the two campuses that are at capacity, would chose to go outside the UC system. If this outcome were to occur, it could be argued that overall demand for UC enrollment might be reduced. However, there are now some data about the choices made by unsuccessful applicants to Berkeley and Los Angeles that indicate that the proportion leaving the system remained steady from 1993-97, even though there was over a 50 percent increase in the number of unsuccessful applicants to those two campuses.

An analysis of undergraduate application, admit and enrollment data from all campuses for the years 1993-1997 shows that there has been surprising consistency in student enrollment patterns, with each campus exhibiting a unique profile. That is, a stable proportion of students not admitted to a given campus have chosen to remain in the UC system by enrolling at another UC campus. Furthermore, for those who enroll at another UC campus, the proportions have also followed a stable pattern. For example, slightly under 50 percent of the students not admitted to Berkeley enroll somewhere in the UC

⁵¹California Postsecondary Education Commission, *California Higher Education Performance Indicators, 1996 Student Preparation Context*, Section III.E.2: "California Public High School Graduates Completing University Preparatory Curriculum By Major Geographic Region, 1990, 1993 and 1995"; Section III.F.1: "California's Public Twelfth Grade Men and Women Participating in Advanced Placement (AP) Examinations, 1986, 1990, 1993 to 1995."

system; around 10 percent enroll at Los Angeles, and stable percentages enroll at each of the other campuses.

There has not been the dampening of overall UC participation some have speculated would happen as Berkeley and UCLA turn away more and more applicants. It will be important to continue to observe the enrollment patterns of applicants not admitted by other campuses, but at this point it is difficult to predict the effects on overall participation that will occur as those campuses reach their capacities.

Changes in eligibility criteria. The 1996 CPEC study noted that in addition to students who met UC's eligibility criteria (11.1 percent of California's public high school graduates), there was a group of students who could have become eligible under the current rules simply by completing the SAT test requirements. The size of this "potentially eligible" population was estimated to be 9.4 percent of the California public high school graduates. The University's Board of Admissions and Relations with Schools (BOARS) has been reviewing all the eligibility criteria to make sure that requirements estimate the top 12.5 percent as accurately as possible. BOARS has proposed changes to the criteria for Regental action in March 1999 that are intended to yield the full 12.5 percent and to eliminate the category of potentially eligible students; it remains to be seen how the new criteria will affect demand.

Impacts of outreach. The University, joining others in the state, is engaged in vigorous efforts to assist in the improvement of K-12 education in California, to help increase eligibility performance of underrepresented groups, and to help increase UC's diversity. The task is daunting, and will take years to have substantial impact. Nevertheless, it is perhaps the single-most important collection of efforts the University has ever undertaken to make sure access to higher education, and to UC, is uniformly available to all segments of California's population. It is not yet known how much impact these efforts will have on UC enrollment demand, but the assumption is that some success will come early and then build over the years as more students are better-prepared and more likely to consider attending college.

In summary, while we can project with some certainty the potential size of the pool of students who will be eligible for UC in the future—barring unforeseen events that could change migration patterns significantly—we have a less firm grasp on the enrollment choices UC-eligible students are likely to make in the future about where they will attend college. That they will attend seems almost certain; whether they will choose UC at rates similar to those in the recent past remains to be seen.

D. Implications for UC's Undergraduate Enrollment Proposal

Summary of Major Points

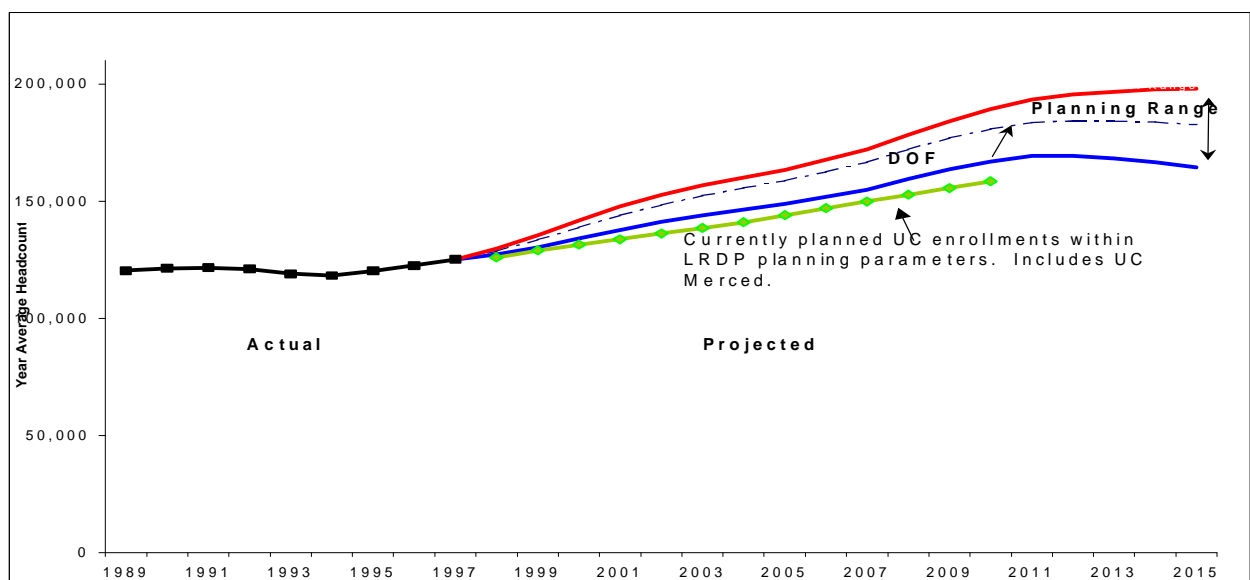
The level of undergraduate enrollments the University can accommodate is well below projected demand.

The level of undergraduate enrollments the University can accommodate is well below projected demand.

UC is committed to enrolling, somewhere in the UC system, all eligible high school graduates who choose to attend. Undergraduate enrollment of 158,400 students can be accommodated at our existing campuses within LRDP planning parameters, and at UC Merced, by the year 2010, assuming graduate enrollments of approximately 18.3 percent. Given the 1998 estimates of high school graduates, this level falls well below even our most conservative levels of demand within the planning period of 1998-2010.

Figure 17 shows the projected undergraduate enrollments UC is able to accommodate under current LRDP planning commitments for existing campuses and plans for UC Merced. Planning within these commitments assumes that each existing campus would reach the level planned for in the LRDPs by 2010; four will be at capacity several years before (Berkeley and UCLA are already at capacity; Davis and Santa Barbara are projected to reach capacity in 2005-06). Irvine, Riverside, San Diego and Santa Cruz would be adding 500-600 undergraduates annually (plus additional graduate students) until they reach their LRDP enrollment levels in 2010.

Figure 17 – Currently Planned Undergraduate Enrollments within LRDP Planning Parameters Compared to Projections of UC Undergraduate Enrollment Demand



UC Merced enrollments are also included in Figure 17, growing to about 4,700 undergraduates between 2005-06 and 2010-11. UCM's proposed enrollment growth was determined by examining the growth experiences of campuses entering the UC system in the 1960s (Irvine, San Diego and Santa Cruz), and by estimating the potential for increased participation of high school graduates from the Central Valley.⁵²

The gap between the currently planned enrollments and the most conservative level of projected demand is about 7,400 undergraduate students in 2010. Compared to DOF's projection of undergraduate enrollment, the shortfall could be as many as 22,000 undergraduates in 2010.

⁵² *UC Merced: The Research University Enters the Twenty-First Century*. Needs Study for UC Merced prepared for the California Postsecondary Education Commission by the University of California Office of the President, November 1, 1998.
February 1999

E. Tasks Related to Undergraduate Enrollment

Summary of Major Points

- 1. Continue efforts to help students graduate in a timely manner.***
- 2. Continue efforts to increase the number of transfer students and to ease their transition to UC.***
- 3. Continue analytical work to understand and estimate undergraduate demand.***

Undergraduate growth, combined with the graduate growth discussed in the previous section of this report, presents some significant planning challenges for the University. These challenges, and options for meeting them, are the subject of Section IV. There are, however, some tasks specific to undergraduate growth which are addressed in this section.

1. Continue efforts to help students graduate in a timely manner.

University of California undergraduates have a very good record in terms of the time it takes them to graduate, and this record has improved consistently over the last several years for students entering as freshmen and as transfer students. Studies have shown that when UC students take longer than the normal 12 quarters (or four years) it is usually due to personal reasons, such as changing majors or occasionally taking lighter-than-normal courseloads. Institutional barriers, such as unavailability of classes necessary for timely progress to a degree, are not usually the cause of students taking extra time to graduate.

One objective in ensuring that students make efficient progress toward their degree is to make room for other students. Campuses will continue to monitor course availability and assess whether there are other institutional barriers that impede student progress.

2. Continue efforts to increase the number of transfer students and to ease their transition to UC.

The University is committed to increasing the number of transfer students entering UC from the Community Colleges. A Memorandum of Understanding with the Community Colleges sets as a goal an increase in transfers to UC from 10,600 students to 14,500 students annually by 2005-06.

The University is participating in intersegmental efforts to improve transfer rates. The Community Colleges will be held accountable for increasing the number of transfer-ready students. The Intersegmental Committee of the Academic Senates (ICAS) is exploring ways of helping potential transfer students become better prepared for their major, addressing issues related to lower-division courses leading to engineering, math and chemistry majors. Their work is intended to serve as a model for other disciplines, as well. There are also administrative efforts to improve financial aid planning information for transfers and potential transfers, which will help remove the obstacle of cost for many students who have been reluctant to consider transferring to UC.

3. Continue analytical work to understand and estimate undergraduate demand.

One of the lessons learned in developing the 1995 enrollment projections was the importance of reviewing regularly the assumptions underlying enrollment demand. It remains part of UC's commitment to do so. Among studies that are proposed or under way:

- Determine where UC-eligible students enroll if they do not enroll at UC. This study builds on previous studies by including those students who do not apply to UC. The purpose is to identify the differences (if any) between UC and non-UC students, and to understand why students chose to enroll outside the UC system.
- Improve demand estimation methods by including county and regional data.
- Continue the current study of inter-campus application, admission and enrollment dynamics, with the intent of tying such behavior to participation rates and to predictions of future enrollment behavior.
- Gather more information on expected workforce demand for high-end university graduates (i.e., UC graduates).
- Continue to study the changing demographics and socioeconomic factors that may affect UC eligibility and UC enrollment. Some factors to include are parental income, parental education, race and ethnicity, and regional population trends.

There is a crystal-ball aspect to undergraduate enrollment planning that makes it difficult for any set of planners to project enrollments accurately beyond a few years at most. Thus frequent review of the forces underlying undergraduate demand is both necessary and helpful in making appropriate mid-course adjustments to the preparations we are making for the future.

IV. OPTIONS FOR ACCOMMODATING INCREASED ENROLLMENTS

Summary of Major Points

Updated planning assumptions show that current campus plans are insufficient to accommodate projected enrollments. Therefore the University is exploring options for increasing capacity.

Some increase in capacity can be gained by changing where and when some students attend classes.

Year-round operation could significantly increase capacity, at least for some student groups.

Significant increases in capacity can occur through re-evaluation of LRDP enrollment capacity limits.

It appears that existing campuses and UC Merced can close the demand gap.

The University's options for expanding undergraduate enrollment capacity will not include substituting undergraduate enrollments for graduate enrollments or admitting students from anything less than the top 12.5 percent.

Updated planning assumptions show that current campus plans are insufficient to accommodate projected enrollments. Therefore the University is exploring options for increasing capacity.

As the previous section describing escalating undergraduate demand shows, the enrollments being planned for each campus within current LRDP constraints appear to be too low. In order to respond to the demographic pressures to enroll an increasing number of undergraduates and to meet the State's need for more workers with advanced degrees, the University is revising its planning assumptions about the number of students it might be expected to accommodate beyond the LRDP targets for existing campuses and the initial enrollments at UC Merced. The revised planning framework assumes:

- The level of undergraduate enrollments currently projected by DOF. As Figure 17 shows, this level is about midway between the University's high and low estimates of possible undergraduate demand.
- At least the number of transfer students agreed to in the Memorandum of Understanding.
- Graduate student enrollments at 18.3 percent of the total general campus FTE enrollment, which is approximately the level it was before the budget cuts in the early 1990s, but which is still below the percentage at public and private comparison universities.

Figure 18 summarizes the headcount and FTE undergraduate and graduate enrollments that result from these planning assumptions and compares them to the University's current planning levels within LRDP commitments. The gap between what is currently possible on existing campuses and UC Merced and what is being projected is over 23,000 FTE students (27,500 headcount).

Figure 18 – Summary of Potential UC Enrollments

| | Headcount | | | FTE | | |
|-------------------------|-----------|---------|----------|---------|---------|----------|
| | 1998-99 | 2010-11 | Increase | 1998-99 | 2010-11 | Increase |
| Undergrad | 126,900 | 180,700 | 53,800 | 120,800 | 171,700 | 50,900 |
| Graduate | 26,700 | 39,700 | 13,000 | 26,200 | 37,700 | 11,500 |
| Total | 153,600 | 220,400 | 66,800 | 147,000 | 209,400 | 62,400 |
| Current Plan, incl. UCM | | 192,900 | | | 186,100 | |
| Gap in 2010 | | 27,500 | | | 23,300 | |

The first response to the possibility of not meeting future student demand ought to be one of caution. These projections are still far enough into the future that several intervening years of demographic shifts could dramatically change the pattern we now think we see for the future. Nevertheless, since it can take years to accomplish major changes, we have begun to explore some possible options, should the demand that we are currently projecting materialize.

Implementing any or all of the proposed options will have far-reaching implications for campus financial and physical resources, for the structure of academic programs, for student life, administrative systems, and community relations, to name a few major areas. Start-up and conversion costs associated with some options could be very high and must be carefully balanced against the potential gains. Most importantly, options that are selected for implementation must be feasible in the local campus environment; one solution will not fit all campus situations.

The options being considered by campuses include educating more students off-campus, considering changes to the academic calendar and instructional schedule and increasing LRDP enrollment levels at one or more existing campuses. What follows is an initial assessment of these options and their likelihood of contributing to increased systemwide capacity.

Some increase in capacity can be gained by changing where and when some students attend classes.

Increasing the potential for the number of students at off-campus locations. Campuses will be able to increase their on-campus capacity by enrolling more students in already-existing off-campus programs. For example, more students may be able to participate in the Education Abroad Program (EAP) and the University's program in Washington, D.C. (UCDC). Currently about 1,800 students enroll in EAP programs, with participation

ranging from about 50 to 350 students per campus. UCDC currently enrolls about 150 students in the Fall and Spring quarters, with fewer enrolled in the Winter quarter.

One campus (Santa Cruz) is in the planning process for creating an off-campus center and other campuses may consider doing the same. Off-campus centers are usually designed either to serve the needs of a working population, or to take advantage of proximity to related industries. While their greatest value may be in graduate education, they may also provide a way to reach more transfer students who have completed their lower-division courses at a community college, but who are unable to attend classes at the main campus location. The off-campus center alternative allows additional students access to UC without having to increase LRDP enrollment limits.

UC currently has one such program, the Off-Campus Studies (OCS) department at UCSB. Designed for working professionals who wish to pursue a degree but cannot do so on a full-time basis because of employment or family responsibilities, the Ventura-based department provides such individuals with the opportunity to earn either a bachelors or masters degree on a part-time basis. The program serves about 100 upper-division transfer or re-entry students and about a dozen graduate students.

While no firm planning has been completed, initial campus estimates indicate that enrollments in both existing and new off-campus programs could increase by over 5,000 students.

Increasing use of technology. While there will be considerable growth in the use of technology to improve instruction and to streamline certain administrative activities related to instruction, at this time it does not appear that incorporating “distance learning” techniques will replace on-campus enrollment for the students interested in the type of educational experiences UC offers. However, the California Virtual University, for example, could offer courses that would enable some on-campus students to progress more rapidly. This continues to be an open subject with many developments we have not yet anticipated. Estimated access potential is still unknown, but is likely to be small for some years to come.

Expanding the instructional day or week. Campuses do not currently estimate any significant increase in capacity by teaching evening or weekend classes. Many are already using these times to teach bottleneck courses, such as introductory laboratory science classes required by several majors, or for University Extension classes.

Expanding the use of traditional Summer Session. Each general campus currently has a Summer Session program that consists of sessions running from three to ten weeks. About 90 percent of the registrants are undergraduates, and about 75 percent of these are UC students. On average, each registrant takes about six units (a normal quarter load is 15 units). Summer Session is not funded by the State; students pay for the cost of the program. UC students enrolled in Summer Session are estimated to be about 5,000 FTE.

Students enroll in Summer Session for a number of reasons. They may be catching up with courses they were not able to complete earlier, repeating courses in which they hope to obtain better grades, or trying to accelerate their progress to their degree.

Several campuses are developing incentives to overcome some of the impediments to fuller participation in Summer Session. For example, students may have their fees waived if Summer Session attendance allows them to complete one or two remaining courses required for graduation. Another incentive program allows departments to keep a portion of the fees their courses generate, with popular courses generating more income. Campuses estimate, again without benefit of in-depth analysis or planning, that an additional 2,000 students could be enrolled in Summer Session.

Year-round operation, supported by State-funding, could significantly increase capacity, at least for some student groups.

A more significant proposal is one that would use the summer months more fully, perhaps even offering a full quarter (or semester) for at least some students. The University has already proposed to use the summer—with State funding—to increase programs for teacher credential students. There may be students in other programs for whom a summer quarter—funded by the State—would make academic sense. In addition, students who wanted to make more rapid progress toward their degrees by attending year-round could do so.

It is important to note that this option is not without costs: the additional faculty appointed as a result of increased enrollments will require not only operating budget support but also office and research space. There could be increases in staff because, for example, work now completed during the summer for one entering class (e.g., financial aid processing, orientation, and advising) would be required year-round. Furthermore, summers at each campus are largely devoted to important outreach activities involving youth who are on their own summer vacations. Conferences, camps and Summer Session provide income to the campus and to many departments. Important questions related to the availability of financial aid, maintenance schedules (many classrooms and housing facilities are not available during parts of the summer due to maintenance), and the sequencing of courses required by the major will have to be resolved. There are also community impacts to be considered, particularly for campuses located in or near towns with substantial levels of summer tourism.

Estimates of potential increases in capacity are probably significant, but are yet to be determined given individual campus circumstances. Given the experience of other universities, it is probably realistic to expect that summer enrollments could be up to 40 percent of Fall enrollments.

Significant increases in capacity can occur through re-evaluation of LRDP enrollment capacity limits.

Over ten years have passed since most campuses created their current LRDPs. Because of continuing enrollment pressures and other campus and community changes, campuses now must consider again the appropriateness of their LRDPs. Any efforts to change LRDPs significantly will require resources, time and community involvement. However, as a rough estimate, it does appear reasonable to think that existing campuses have the physical potential to enroll about 10,000 to 12,000 students above their current LRDP targets by 2010, if necessary.

It appears that existing campuses and UC Merced can close the demand gap.

Initial estimates indicate, as shown in Figure 19, that by increasing off-campus enrollments, expanding the use of traditional Summer Session, and modifying LRDP enrollment targets, existing campuses may be able to enroll an additional 17,000 to 19,000 students by 2010. A state-funded summer program could well increase this capacity sufficiently to meet the need to enroll about 27,500 headcount students above the current planning level. These estimates will have to be carefully examined as campuses move toward more definitive solutions for their own individual contexts. In addition, some campuses, including UC Merced, may be able to expand further after 2010. Therefore, it appears at this time, that the University should concentrate its energies on growth alternatives for its existing campuses and UC Merced. If however, these efforts fall short of the need, or if the numbers continue to rise substantially after 2010, it may be necessary to consider other options, including adding an eleventh campus.

Figure 19
Estimates of Additional Undergraduate Enrollments
That Could be Accommodated on Existing UC Campuses
Headcount (FTE not estimated)

| Option | Estimated Headcount |
|--|----------------------------|
| Increased off-campus enrollments | 5,000 |
| Expanded instructional day and week; expanded Summer Session | 2,000 |
| State-funded Summer program (year-round operation) | To be determined |
| Increased LRDP enrollments | 10,000-12,000 |
| Total Estimate | More than 17,000 - 19,000 |

The University's options for expanding undergraduate enrollment capacity will not include substituting undergraduate enrollments for graduate enrollments or admitting students from anything less than the top 12.5 percent.

Those who have focused primarily on the challenge of accommodating the anticipated "Tidal Wave II" undergraduate enrollments have also suggested two additional solutions that the University considers neither feasible nor prudent: reducing graduate enrollments in order to meet the burgeoning undergraduate enrollments, and reducing the eligibility pool for freshmen below 12.5 percent.

The State and nation need the graduate students UC produces, and will need more of them. Graduate education is essential to provide the trained researchers and professionals on which our economy depends, and undergraduate education can only reflect the forefront research and creative thinking characteristic of a research university when graduate students in appropriate numbers play their part in the process. It should also be

obvious that as the numbers of undergraduates continue to grow, student demand for graduate degrees will also increase.

The University also will continue to honor the Master Plan's promise that any student in the top 12.5 percent of California's public high school graduates who wishes to attend be able to enroll somewhere within the UC system.

V. FINANCIAL ISSUES

Summary of major points

The University is working with the Governor to reach agreement on a new compact to provide resources that will maintain academic quality and accommodate enrollment growth.

The greatest challenge to accommodating growth will be the funding of the capital program.

The current outlook for continued strong federal support is uncertain.

A successful graduate program requires ongoing support from many sources.

Enrollment growth requires corresponding financial support, both operating and capital resources, in order to maintain academic quality. While there are many funding sources that support the University's activities, it is State funding that provides the platform that enables the faculty and administration to acquire additional funding. The current outlook for the State-funded operating budget is promising, given a healthy State economy and commitments of support for higher education from the Governor and Legislature; the outlook for obtaining adequate funding for capital projects, however, is less certain.

The University also relies on federal funding to support faculty research and to assist students with various types of financial aid. Enrollment planning at both the graduate and undergraduate levels must be sensitive to changes in the federal funding environment.

Finally, as discussed earlier, we again note the importance of expanding the funding sources for graduate student financial support programs.

A. Sufficient Operating Budget Support

The University is working with the Governor to reach agreement on a new compact to provide resources that will maintain academic quality and accommodate enrollment growth.

The University is now in the final year of a four-year compact for higher education. This framework has returned stability to the University's State-funded budget following cuts of the early 1990s. Recognizing that this compact of mutual commitment and accountability has worked well for UC, students and the State, the University and the Governor are working to develop a new four-year compact. The agreement will address the resources needed to maintain quality and accommodate a growing number of students as well as the identification of specific goals that would allow the State to measure its investment.

It will be essential to maintain adequate administrative support as enrollments grow. There were significant cuts in staff employee positions during the years of the budget crisis many of which have not been refilled. From housing issues and campus police, to grant administration, physical plant services and academic advising, it will be important to provide for support of the staff in their administration of the University, their participation in the process of enrollment, timely matriculation and commencement of students, and their assistance and coordination of faculty instruction and research.

B. Adequate Funding for New Capital Projects, Repairs, and Renovations

The greatest challenge to accommodating growth will be the funding of the capital program.

Most recent analyses conclude that the greatest challenge in accommodating projected enrollment growth in California's public higher education segments will be in providing the necessary facilities. The University relies on State revenue bonds and general obligation bonds, and non-State sources for its capital program. Revenue bonds are approved by the Legislature, with the debt paid through the University's operating budget. General obligation bonds must be approved by two-thirds of the voters, with the debt carried by the State. In November 1998, California voters passed Proposition 1A, a \$9.2 billion, four-year facilities bond act to be shared by K-12, the Community Colleges, CSU and UC. Higher education's portion is \$2.5 billion, shared equally among the three segments, providing UC with \$210 million per year for each of the four years. The bond addresses UC's top priorities: earthquake and life safety, more space for enrollment growth, including funds for the initial development of UC Merced, and modernization of existing facilities and infrastructure.

However, the State government remains concerned that debt beyond a certain limit would not be fiscally prudent. Consequently, it does not appear today that the needs of K-12, higher education, prisons and other competing State priorities can all be met by relying on State bonds.

An analysis of the space needs in 2010, assuming enrollments levels that reach LRDP targets at each existing campus, and assuming the completion of capital projects funded for construction in the 1999-2004 capital program, shows a shortfall of over 2 million assignable square feet (asf) of instruction and research (I&R) space.⁵³ This shortfall means that the system has about 85 percent of the space that CPEC space planning guidelines estimate to be needed for I&R. Another 1.7 million asf would be required if enrollments reach the enrollment level projected by DOF⁵⁴.

These estimates do not include libraries or other academic or institutional support, housing or student facilities. Nor do they include the capital costs for opening UC Merced. Finally, in addition to needs for new facilities, campuses must continue their programs of renovating existing facilities and infrastructure to meet developing program needs, to meet life safety requirements, and to restore an aging physical plant.

⁵³ Assumes completion of all projects proposed for Construction funding in the 1999-2004 Capital Program.

⁵⁴ Assumes an average of 75 asf per additional student, at 23,300 students.

Securing adequate capital funding, as well as finding ways to use the physical plant more efficiently continue to be the most significant challenges facing the University's proposed enrollment growth in the coming decade.

C. Continued Strong Federal Support

The current outlook for continued strong federal support is uncertain.

While the State funds the largest and most important portion of the University's instructional budget, core funding for faculty salaries, the federal government also provides significant support to the University. UC faculty pursue and attract the additional research funding—most of it federal—that sustains our success as a research university. Also, as noted earlier, the federal government is the single largest source of support for graduate students.

Another long-term unknown in our enrollment planning is the extent to which federal support will grow. While the dire predictions made during the budget-balancing debates of recent years have diminished, the federal picture continues to be uncertain even with a projected budget surplus. If discretionary funding caps are removed, funding prospects for higher education could improve. Since UC campuses do so well in attracting federal funds, this topic will continue to be an important element of our planning.

D. Multi-source Funding for Graduate Student Support

A successful graduate program requires ongoing support from many sources.

We have already addressed this important topic, noting that a strong and successful graduate program must have continued financial support for students from many sources. Campuses are identifying where their strengths lie in acquiring support for graduate students, where they have opportunities for improving support, and where there may still be unmet needs.

The University's continued quality and success require adequate resources as well as continued commitment to use those resources as efficiently and productively as possible in the pursuit of its mission.

VI. HEADCOUNT AND FTE CAMPUS ENROLLMENTS WITHIN LRDP PLANNING PARAMETERS

**Figure 18 – General Campus Year-Average Enrollments,
1998-99, 2005-06 and 2010-11**

| | <u>Headcount</u> | | | <u>Budgeted FTE</u> | | |
|----------------------|------------------|----------------|----------------|---------------------|----------------|----------------|
| | <u>1998-99</u> | <u>2005-06</u> | <u>2010-11</u> | <u>1998-99</u> | <u>2005-06</u> | <u>2010-11</u> |
| Berkeley | 28,970 | 28,700 | 28,700 | 27,800 | 27,800 | 27,800 |
| Undergrad | 21,270 | 21,000 | | 20,290 | 20,290 | |
| Grad | 7,700 | 7,700 | | 7,510 | 7,510 | |
| Davis | 21,790 | 25,000 | 25,000 | 20,300 | 23,400 | 23,400 |
| Undergrad | 18,670 | 21,200 | | 17,210 | 19,630 | |
| Grad | 3,120 | 3,800 | | 3,090 | 3,770 | |
| Irvine | 16,090 | 20,670 | 25,000 | 15,700 | 20,300 | 24,600 |
| Undergrad | 14,010 | 17,600 | | 13,700 | 17,330 | |
| Grad | 2,080 | 3,070 | | 2,000 | 2,970 | |
| Los Angeles | 30,630 | 31,000 | 31,000 | 28,500 | 28,900 | 28,900 |
| Undergrad | 23,590 | 23,860 | | 21,570 | 21,880 | |
| Grad | 7,040 | 7,140 | | 6,930 | 7,020 | |
| Merced | | 1,040 | 5,200 | | 1,000 | 5,000 |
| Undergrad | | 935 | | | 900 | |
| Grad | | 105 | | | 100 | |
| Riverside | 10,000 | 14,510 | 18,000 | 9,550 | 13,800 | 17,400 |
| Undergrad | 8,680 | 12,530 | | 8,250 | 11,850 | |
| Grad | 1,320 | 1,980 | | 1,300 | 1,950 | |
| San Diego | 17,140 | 21,650 | 25,000 | 16,850 | 21,300 | 24,600 |
| Undergrad | 14,920 | 18,350 | | 14,650 | 18,030 | |
| Grad | 2,220 | 3,300 | | 2,200 | 3,270 | |
| Santa Barbara | 18,500 | 20,000 | 20,000 | 17,880 | 19,400 | 19,400 |
| Undergrad | 16,260 | 17,000 | | 15,700 | 16,500 | |
| Grad | 2,240 | 3,000 | | 2,180 | 2,900 | |
| Santa Cruz | 10,460 | 13,450 | 15,000 | 10,420 | 13,400 | 15,000 |
| Undergrad | 9,450 | 11,870 | | 9,445 | 11,870 | |
| Grad | 1,010 | 1,580 | | 975 | 1,530 | |
| UC Total | 153,580 | 176,020 | 192,900 | 147,000 | 169,300 | 186,100 |
| Undergrad | 126,850 | 144,345 | 158,400 | 120,815 | 138,280 | 152,275 |
| Grad | 26,730 | 31,675 | 34,500 | 26,185 | 31,020 | 33,825 |

Individual campus graduate and undergraduate enrollments after 2005-06 have not been determined.

Budgeted FTE enrollments are based on 1998-99 conversion ratios and are subject to change as conversion ratios change.

APPENDIX 1

MAKING DISCOVERY WORK

APPENDIX 2

***WORKFORCE PROJECTIONS AND JOB MARKET TRENDS FOR GRADUATE
AND PROFESSIONAL DEGREE RECIPIENTS***

APPENDIX 3

UNDERGRADUATE ENROLLMENT DEMAND PROJECTION METHODS

