"*Return on Investment: Educational Choices and Demographic Change in California's Future"*

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Introduction

California is the world's fifth largest economy, however in the last four decades the Golden State has lost its luster among the nation's leaders in economic performance and wealth. Amongst the various elements that can affect the well-being of future Californians, the characteristic that state government policy has the most power to influence is education. California now ranks only slightly above average, and our findings reveal that investments in secondary and post-secondary education can reverse this downward trend.

Furthermore, California benefits from an opportune stage in its age distribution which favors educational investment. Projections[1] of California's population reveal an increase in overall population by over 50% by 2000 and 2040, influenced strongly by the growth of the Hispanic population. An important and quickly growing part of this growth is comprised of young adults entering the years in which post-secondary education is usually acquired (18-24.) Depending on assumptions about international migration patters, increases in the number of young Hispanics will account for between half and two-thirds of the growth, non-Hispanic Blacks for about 13-17%, and Asian/Pacific Islanders for about 9%. This "Tidal Wave II" boomlet presents both a challenge and an opportunity for the state of California.

In this paper, we consider the consequences of shifts in the educational distribution on outcomes beyond simple demographic characteristics. We ask the question: What is the relationship between education and measures of social and economic well-being for Californians. This analysis proceeds as follows:

First, we assess the impacts of changing educational outcomes using a simple summary method for describing what kinds of educational transitions make a difference for specific outcomes based on relationships and distributions in 2000. We also identify how some of the specific measures differ by education and ethnicity.

Then, we briefly describe how movement through the educational pipeline in California – from high school graduation to BA completion - is structured by age and ethnicity. We also look at the trends in these movements over time in California.

Next, we discuss the substantial effects of education on three differentiated classes of effects: personal benefits, collective benefits, and changes in revenues and expenditures to the state. We consider four scenarios for changes in public higher education which range from highly constrained to more expansive.

Methods

I will briefly describe the approach used in each of the three sections discussed. A more detailed description of the projection methodology can be found in the full report.[2]

Synthetic Outcome Approach

Educational attainment affects us at all stages in a life cycle. For children, most of these effects - poverty, crowding, disposable income - depend more upon their parents' education than their own. However, the educational opportunities afforded to children and the choices they make about their education become more important as those children transition into adulthood.

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[1] Our projections use four basic inputs: current size of the population, age-specific fertility rates, annual survival rates, and domestic and international rates of immigration and emigration. We differentiate these rates by conventional factors including: age, sex, race/ethnicity, as well as two less common sets of covariates: 1) educational attainment (adjusted for final- versus current- levels) and 2) nativity and period of entry.

[2] The latest version of the full report can be accessed at: http://ucdata.berkeley.edu:7101/

To capture the effects of one's own education rather than parental characteristics, we focus on outcomes for adults, particularly those aged 25 and over. We use these adults to construct a synthetic cohort[3] which allow us to estimate the differences in outcomes which emerge by education over the course of an individual's life.

Values for each of these outcomes are estimated using either logistic or ordinary least squares regression separately for seven ethnic/racial groups, using a standard set of covariates (and a reduced form where appropriate.) Specifically, we derive these synthetic estimates by estimating the mean value of the outcome for each year of age, and summing those values separately for men and women in each of our ethnic categories. The cumulative synthetic outcome S for each stratum defined by an educational category E, ethnicity R[4], and gender G reflects the average value of the outcome O at each year of age A summed across all ages from 25 to 64.

$$S_{ERG} = \sum_{A=25-64} mean(O_{AERG})$$

That synthetic outcome represents what the average Californian of that ethnicity, gender and education could expect to experience over their adult years if the relationship between that outcome and age remains consistent over time. If, for example, we are considering the impact of education on employment, we estimate the likelihood that an individual will be employed at each age, and sum across the relevant ages. The sum will reflect the number of years (out of the forty possible years between ages 25 and 64) that we expect that individual to be employed. If the outcome of interest is instead income, we sum the age-specific mean income for a stratum, and the result reflects the total income in constant dollars) that an individual in that stratum could expect to receive between the age of 25 and 64. Population and indicator data is based on the 2000 5% Public Use Microdata Sample (PUMS) for California.

Educational Pipeline

In order to get a picture of the conditional progression of students from high school to BA completion, we had to rely on a number of data sources. This includes data published by California Department of Finance, the California Postsecondary Education Commission (CPEC), the University of California Office of the President (UCOP) and reports on data from California State University (CSU) and the California Community College Chancellor's Office (CCCCO). The data from these sources are complex, differ in focus and coverage from one another, and are sometimes simply inconsistent. Yet, we believe that we have a relatively consistent picture of what is happening.

Population Projection

We use population projections to illustrate the effect of various education scenarios, on California's future population. The same characteristics that we used to differentiate the vital

[3] The concept of a synthetic cohort is a common one used in demographic analysis. A synthetic cohort applies the rates of a given time period over the entire projected lifetime of a group of people, as they age through life. Though it makes the assumption that rates will not change throughout time in the future, synthetic cohort analyses provide a useful way to assess the implications of the continuation of current conditions.

[4] For notational simplicity, we include distinctions based on nativity and years since entry under ethnicity.

rates for our projections- age, sex, race/ethnicity, nativity, and education – also have large influences on outcomes of well-being.

The population projects we present use a *cohort-component* method to estimate the size and composition of California's population over the course of the next 40 years. The basic cohort component method divides the population into different *cohorts* -- individuals who share the same year of birth and sex, and potentially other characteristics -- and applies a schedule of demographic transitions to derive the size of equivalently defined cohorts at some point in the future. The schedules of demographic transitions reflect the specific ages at which each *component* of demographic change -- mortality, fertility, and migration – changes California's population.

In simplest form, this method estimates the population P at time t for cohort i as:

$$P(i)_t = P(i)_{t-1} + B(i)_{t-1,t} - D(i)_{t-1,t} + M(i)_{t-1,t}$$

where for each cohort,

$P(i)_{t-1}$ = cohort population at time $t-1$;
$B(i)_{t-1,t}$ = additions to cohort via births, in the interval from time $t-1$ to time t;
$D(i)_{t-1,t}$ = deaths to cohort, in the interval from time $t-1$ to time t; and
$M(i)_{t-1,t}$ = net migration of cohort, in the interval from time $t-1$ to time t.

Since we have defined cohorts in terms of birth year and sex, the impact of the birth component $B(i)_{t-1,t}$ for existing cohorts is equal to zero: no-one can enter the cohort population after the year of birth by being born. That component exists only for new cohorts, and reflects how fertility changes affect the state both when they occur and from then on. We apply an age-specific fertility rate to the female population cohorts in the period $i-1$ to obtain future births ($B(i)_{t-1,t}$) for a number of difference demographic scenarios.

Our projections are for the state of California, and are detailed by race/ethnicity, nativity, and current educational attainment. We detail projections by nativity because natives and non-natives differ markedly in fertility and educational attainment, and because we wish to separate net migration into its international and domestic components for further modeling. Current and completed educational attainment are incorporated both as outcomes of interest, and also because education is strongly tied to fertility, patterns of migration to California, and social outcomes of analytic interest.

The basic projection used in this analysis proceeds with five main inputs. In particular, we:

1. Identify the size of the population by age, sex, race/ethnicity, nativity and period of entry, and current and future educational attainment in the base year (2000);
2. Estimate age-specific fertility rates by race/ethnicity, nativity and educational attainment;
3. Estimate annual survival rates, specific by race/ethnicity, age and sex, applicable to the population;
4. Estimate the domestic and international rates of immigration and emigration, specific by race/ethnicity, nativity and period of entry, age and education.
5. Estimate an educational transition matrix which reports the probability of attaining each of five educational levels (no diploma, high school graduate, some college, four-year

degree, advanced degree) for each category of parent's education (the same five categories), using the U.S. General Social Survey,

Discussion of Results

Synthetic Outcomes: Effects of education

In order to answer questions such as: What would happen if educational attainment for Latinos resembled that of Asians? What would happen to overall levels of earnings, employment, poverty, or asset accumulation if college going rates increased? What if the proportions of Blacks who drop out of college decreased?, we look at the relationship between those outcomes and education in 2000. To estimate these effects, we provide one method of summarizing how much outcomes differ by educational level, and how much changing outcomes for those specific transitions could affect overall outcomes for the population. Although part of the relationship between outcomes and education may reflect unmeasured factors tied to both outcomes and education, these estimates are a strong indicator of the size and direction of changes we could expect from shifts in educational distributions.[5] Furthermore, the relative impact of education appears to be increasing over time.

To organize our discussion of the consequences of the interaction between educational and demographic change, we differentiate three classes of effects: personal benefits, collective benefits, and -- considered from the perspective of the state – changes in revenues and expenditures.[6] (See: *Appendix 1: Measures of Three Categories of Benefits***,** for further detail the indicators used.)

In terms of personal benefits, we consider items that we expect individuals to benefit from directly: a good job, good wages, ownership of one's home and automobile, freedom from overcrowding in housing and poverty, and increased security in retirement. Non-financial

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[5] The most important critique of interpreting existing educational differentials in outcomes like earnings as an unbiased measure of the consequences of educational gains is that it ignores the effects of unobserved characteristics which are responsible for some of the variation in both earnings and education. The association we measure between education and outcomes does not control for many factors – things like ability, motivation, parental support, or an array of other possible characteristics -- which are related to both education and income. Moreover, since continuation of education is matter of choice as well as opportunity, we might expect that those who have continued their education are those who expect to benefit the most. Grubb and Lazerson (2004) suggest that "simple differentials among education groups…are slightly lower when other variables are considered, but between 70 and 90 percent of differences persist". Hence, it is possible that groups with low average levels of education also have lower levels of motivation or ability, and would benefit less from gains in education – in fact would be likely to benefit only about 70-90% as much. However, Grubb and Lazerson go on to note that "recently economists have concluded that the "ability bias" in estimating the effects of education may be offset by the bias caused by measuring educational attainment incorrectly".

In fact, other analysts suggest that the bias may run in the opposite direction. Card (2001) provides reviews of 11 recent analyses which use instrumental variable methods to separate the influence of educational gains from those associated with ability. Those analyses consistently suggest that true returns to schooling are higher - typically by about 20% - than would be estimated using typical OLS techniques. This would suggest that increasing the educational attainment of groups facing greater educational disadvantages could provide greater gains than we estimate here.

[6] Not all benefits are quantifiable from the data sources we rely on for this report. For most of these potential benefits, the data we use to estimate impacts is the 2000 5% Public Use Microdata Sample (PUMS) for California. This source is the largest and best *single* source of information with data on both the majority of outcomes we are interested in and the characteristics we incorporate in demographic analyses. In some cases (e.g. voter registration or voting), pooled samples of the CPS were used to estimate values for measures unavailable from the PUMS.

personal benefits would also include the enjoyment derived from satisfying curiosity or self-fulfillment and better health.

In terms of collective benefits, we could place such items as an educated population, high levels of citizenship and civic participation, lower levels of inequality, high levels of facility with a common language, increased proportions of the population registered and willing to vote, or the establishment of common values. These latter benefits are considered to be "externalities" -- consequences which are not experienced or taken into consideration by the individual student making choices about continuing his or her education.

Finally, in the state's eyes a central concern is its ability to fund its operations through tax revenues and, to the extent possible, minimize the costs of the programs it operates. We provide some limited estimates of some of the elements of those revenues and expenditures.

We will first use the case of earnings to illustrate the utility of this approach. Next we will present a much broader set of impacts.

The Case of Personal Income

Personal income is a key indicator of the potential for well-being. It reflects our ability to purchase goods for consumption, it is strongly tied to happiness, health and mortality, provides savings for our retirement, and opens up many possibilities for choices and lifestyles that are unavailable without it.[7]

Weighted to correspond to the ethnic composition of 25 year-olds in 2000, Table 1 indicates that cumulatively, the transitions from an incomplete secondary education to an advanced degree yield nearly a fivefold increase in earnings, corresponding to an increase in income (in 1999 dollars) from slightly over half a million dollars to more than 2 ½ million dollars. [8]

Insert Table 1: Proportional increases in lifetime earnings by educational attainment in California, 2000

The impact of educational on lifetime earnings varies by ethnicity/nativity. Focusing on that first row, Table 2 contrasts lifetime earnings by education relative to non-Hispanic whites a high school degree. Comparison of the values in adjacent columns shows the effect of increased education *within* an ancestry group, while comparison of values in adjacent rows shows the extent to which educational payoffs for the foreign-born and non-whites trails that of native non-Hispanic whites.

Insert Table 2: Relative lifetime earnings by educational attainment, ethnicity, and nativity in California, 2000

Both of these comparisons are important. The first comparison shows the huge difference in outcomes that can be expected for education, regardless of ethnicity. Failing to

[7] See *Social Inequality*, edited by Kathryn Neckerman (2004), for a review of the literatures that support our claims in this sentence.

[8] Information on all of the rows after the first is redundant, and can be derived from the ratios of adjacent columns. Thus, the first row summarizes all of the information in the table. For example, the transition from "HS diploma" to an "Advanced Degree" (2.82) is simply the ratio of the transition from "less than HS" to "Advanced Degree" (4.89) divided by the transition from "less than HS" to "HS Diploma" (1.74).

advance educationally imposes huge penalties within all of these groups. The comparisons relative to non-Hispanic whites reveals an equally important consideration: increasing educational attainment among educationally disadvantaged minorities to equal that of non-Hispanic whites may only partially compensate for changing demographic composition. Some of these differences in relative lifetime earnings no doubt reflect unmeasured factors like English proficiency or the country in which credentials were earned, but they also reflect barriers to converting human capital to income due to discrimination.

Synthetic cohort estimates emphasize the effects of currently prevailing associations between education and outcomes. As such, they may overstate or understate the very real effects that education will have on people's lives as they experience them in "real-time" over the next half-century. However, it could be argued that as more and more adults go to college and earn baccalaureates and advanced degrees, payoffs will decline as the supply increases. Yet, all available evidence suggests that future demands for educational credentials in the workplace are outstripping the supply[9], and trends from the last three decades imply *increasing,* not declining, differentiation by education[10].

This trend can be illustrated through a comparison of synthetic cohort estimates of work-life earnings[11] based on patterns prevailing in California in 1980, 1990 and 2000, which shows steady and substantial growth in the payoffs to education. Table 3 shows that in the twenty year period since 1980, earnings for those without a high school diploma fell relative to that of high school completers, declining from 81% of the earnings for high school completers to 68% in 2000. During the same period, earnings relative to high school graduates for adults with a BA grew from 164% to 213%. Declines in earnings of those who failed to complete high school are partially tied to shifts in the ethnic composition of non-completers, but declines are notable within each ethnic group, as well. Relative gains among those with a baccalaureate degree are large and consistent for all ethnic groups.

Insert Table 3: Work-life Earnings Relative to HS Graduate of Same Ethnicity, 1980, 1990, 2000

The extent to which these returns to differing levels of education will continue to diverge is open to question. We believe a simple linear extrapolation of increasing divergence is unwarranted, and there is some evidence that returns to education may be stabilizing since 2000. As a result, we do not project increasing gains over time for our later cost/benefits projections.

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[9] See Neumark (2005) *California's Economic Future and Infrastructure Challenges*. The summaries provided in Table 8 suggest potentially large shortfalls in skilled labor. He also notes that demand for skilled labor is likely to grow strongly in the remainder of the US, and "there are likely to be similar demand pressures elsewhere, and therefore that the state's economy is most likely going have to rely, in large part, on boosting educational levels among the California-born and California-educated population." Available at http://ppic.org/content/pubs/OP_605DNOP.pdf . Also see Hanak, Ellen and Mark Baldassare. 2005. *California 2025: Taking on the Future*. San Francisco: Public Policy Institute of California. Available at: http://www.ppic.org/main/publication.asp?i=489.

[10] See Betts (2000) for an earlier examination of diverging trends in earnings by education for Californians between 1969 and 1997.

[11] Worklife earnings differ from the lifetime earnings discussed previously in that they focus only on employed persons, and eliminate the impact of education on the likelihood that one will actually have a job. We also use slightly different educational categorizations, due to inconsistencies in the way that educational attainment was asked and coded in the three censuses.

This is a conservative approach, and it is quite possible that the resulting estimated benefits will be understated.[12]

Other Benefits

Using the same synthetic lifetime measures, the following tables identify impacts on a much broader range of outcomes, expressed for each educational category relative to outcomes for those with a high school education. Outcomes are presented for the total population, and we combine and weight the ethnicity-specific results in proportion to their share of the 25 year-old population in 2000. The resulting figures can be interpreted as the average effects of education that can be anticipated for twenty-five year-olds who were present in California in 2000.

Insert Table 4 Synthetic Benefits Associated with Education

Table 4 clearly shows the positive impacts of education on a broad spectrum of outcomes, ranging from labor force attachment, earnings, income, and asset ownership to crowding, poverty, welfare use and incarceration. Beginning with simple labor force attachment, we know that among working age adults about 70% are in the labor force (employed or looking for work). Labor force participation is lower (at about 57%) for those without a high school diploma, and increases steadily with education, such that 86% of those with an advanced degree are in the labor force. The benefits of education are even stronger if we look at, not just being in the labor force, but actually holding a job. Only 47% of the working age population with less than a high school degree is employed, while the fraction of those with an advanced degree who are employed is virtually identical to the fraction in the labor force - 86%.

By creating a synthetic cohort, we can assess the impact of education on the number of hours worked over the course of a lifetime. These ratios are similar to the figures for the simple employment dichotomy, but reflect an increase from the equivalent of 21 full time years worked between the ages of 25 and 64 for those with less than an HS degree, to 35 years for those with and advanced degree.

Education affects the *kind* of work one does, as well as the ease one has in finding work and the number of hours and years one works. Professional careers are heavily skewed toward those with advanced degrees, managerial work is dominated by those with a baccalaureate degree, and both those with BAs and advanced degrees are over-represented among the self-employed. In contrast, a high school diploma or some college are the most common levels of education found among routine white collar workers, and those with less than a high school degree are most dominant in less-skilled manual jobs and, to a lesser degree, in skilled manual occupations.

Although part of the payoff from education emerges simply from the greater likelihood that someone can find work, a more substantial boost comes from the difference in earning power among the employed. Those with less than a high school degree will earn just over a half-million dollars ($538,000) over the course of their working life. Simply earning a high school degree is likely to yield an increase to $934,000, while those with a BA will earn almost 2 million dollars ($1,915,000) in the same period, and those with an advanced degree will earn 2.6 million dollars. Earning a high school diploma results in an average of $10,000 more each year,

[12] If demand in the labor market is the key factor, we can expect differences to remain constant or increase, with recent work by Neumark (2005) indicating that demand in California for more highly skilled workers will remain strong through 2020.

going onto college gains an additional $8,000 per year, finishing college with a BA yields yet another $17,000 per year, and going on to earn an advanced degree nets an additional gain of $18,000, for a total annual gain of 54,000 (taxable) dollars over that of an individual who does not complete high school.

The relative benefits for total income are similar to those of earned income, but reflect increases from $770,000 to $3.6 million as education increases from less than high school to an advanced degree. The net average annual gain is slightly larger if one looks at total versus earned income, at $57,000 rather than $54,000, and is more likely to reflect additional income from investments rather than the fall-off in transfer payments.

An indication of the impact of education on transfer payments is reflected by the self-reported receipt of welfare and SSI income. The likelihood that someone will use these benefits nearly doubles if they haven't earned a high school diploma and, as education increases beyond high school, the likelihood of public assistance income continues to decrease sharply. Welfare use among those with a baccalaureate degree is a quarter of those with a high school diploma, and an eighth of the rate among those who failed to complete high school.

Taken together, earnings and other income relative to family needs translate into large differences in poverty by education. Among adults, 22% of those with less than a HS degree live in poverty; only one in ten adults with a high school degree is in poverty, and less than one in twenty of those with a BA or more is in poverty.

These advantages translate to ownership of assets, as well. For most Californians, their home is their largest single asset and also represents the bulk of their total savings for retirement. While the relative differences in home ownership are more similar in size to those seen in terms of employment or lifetime hours worked than to the huge differences in earnings or poverty, they are nonetheless substantial. Less than half of working age adults without a high school degree own their homes, versus two-thirds of those with some college, and three-quarters of those with an advanced degree. Even more dramatic are the differences in the value of the homes afforded by those with varying levels of education: homes owned by Californians with high school degrees in 2000 averaged $220,000 in value, while those owned by those lacking a diploma had a value 23% lower, and those owned by those with a BA had a value 60% higher. Although the explosion in Californian home values since 2000 has driven up values for all owners, the association of home values with education remains.

Educational Pipeline

Education clearly makes California more prosperous and vibrant, and historically California has had the best higher education system in the country. Yet California currently faces a significant challenge. Between 2000 and 2015, the cohort of Californian children known as "Tidal Wave II" will pass through their high school and college-age years. This cohort will not only be larger than earlier cohorts, it will differ in terms of ethnic composition, containing larger proportions of children from ethnic groups with traditionally lower levels of academic achievement.

<u>Progress in Public High Schools</u>

The substantial gains in post-secondary enrollments have relied upon equally substantial gains in K-12 education. In 1970, only 63% of the population age 25 and older had a high school diploma. By 2004, 81% of Californians held that credential. Those gains have been achieved despite considerable barriers raised by declining levels of funding (which on a per pupil basis fell

from about $400 above the national average in 1970 to $600 below the national average in 2000), and a considerably more diverse and challenging student population (due to language deficiencies and low socio-economic status among other factors.)

Despite these gains, California has steadily lost ground relative to others states. In 1970, the 63% of the population 25 and older with a high school degree placed California well above the 55% national average. By 1990, the national average matched that of California, and by 2004 the 85% national average exceeded the 81% rate in California.[13] (In terms of rank, California fell from 23rd in 1989 to 45th in 2004 in the proportion of the population 25 and older with a high school degree.)

Officially, California reports a graduation rate of 86.9% for its public high schools. Unfortunately, that relatively high rate reflects a methodology which underestimates the number of dropouts, inflating the apparent level of success.[14] Much recent attention has been focused on the extent to which "official" graduation rates systematically overstate success, and alternative methodologies suggested for measuring academic progression.

Table 5 contrasts the graduation rates by ethnicity and in total using three methods: the method adopted by the California Department of Education, the Cumulative Promotion Index (CPI)[15], and an approach using data from the decennial census[16]. Several facts clearly emerge from these calculations. First, rates of on-time graduation in California are much lower than official reports would suggest, and hover around levels that raise serious concerns about our abilities to produce an educated workforce. Second, these concerns are particularly intense with respect to Hispanics and Blacks, while graduation rates among Asians are fairly high. All three methods suggest increases in graduation rates during the prior decade, with the CPI and the official graduation rate suggesting large gains, particularly among Hispanics, while the census based methods shows more moderate increases with no improvement for Hispanics.

Insert Table 5: Secondary Educational Progression 2000-2002

Figure 1 show trends in the ratio of diplomas to 18 year-olds by ethnicity since 1985. These figures show similar positive trends in Californian's graduation rates, with particularly strong growth since the late 1980's. Overall, the ratio of public high school graduates to 18 year-olds

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[13] In terms of levels of higher education among adults 25-64, California shows the same pattern of substantial absolute gains

[14] Johanna Wald and Dan Losen, 2005. "Confronting the Graduation Rate Crisis in California." Civil Rights Project Research Report, Harvard University.

[15] The CPI is based on a synthetic cohort created from grade-specific enrollment rates in adjacent years x and x+1. It is defined as:

$$CPI(years(x,x+1)) = \left[\frac{E(10,x+1}{E(9,x)}\right] * \left[\frac{E(11,x+1}{E(10,x)}\right] * \left[\frac{E(12,x+1}{E(11,x)}\right] * \left[\frac{Grad(x)}{E(12,x)}\right]$$

The Cumulative Promotion Index (CPI), has the particular advantage that it can be calculated for relatively small areas, uses administrative data which is already collected and disseminated and can be estimated using a shorter time frame (two years) than students actually take to complete high school, but it too has weaknesses. Most notably, it is biased by changes in net migration and retention in grade.

[16] This approach limits the sample to adults who were and are present in California as 14, 15 or 16 year olds, and to determine the proportion who identify themselves as having entered high school without completing it as of five years later. Those young adults were presumably present in California as high school students, and have had the opportunity to graduate by their current age as 19, 20 and 21 year-olds. (A similar approach could use data from the annual Current Population Surveys, although they use a five year migration window only twice per decade, and have much smaller sample sizes.)

has climbed from 52% in 1985 to 65% in 2003[17]. These longer trends underscore the points we extracted from the CPI-based calculations: worrisome rates of graduation, large ethnic variation in success, and a marked upward trend in rates over time. Overall, these ratios point to the substantial growth in college readiness in the last two decades, with particularly dramatic increases for Hispanics. (Ratios have increased about 15-20% for most groups, but 80% for Hispanics).

Insert Figure 1: Public High School Graduates per 18-year old California resident, by ethnicity, 1985-2004

In recent years, however, much attention has focused on the extent to which graduating students find themselves academically unprepared for college[18]. While not a perfect representation of college preparedness, the ratio of public high school students who graduated having completed the set of coursework required for admission to UCs and CSUs (the A-G requirements) to the 18 year-old population shows the same patterns of wide ethnic differentiation and strong growth in the levels of college preparedness among the population of college age.

Overall, California clearly faces strong obstacles to providing a successful high school education to its students, and it is less successful in providing that education to Blacks and Hispanics. These difficulties are apparent in simply generating high school graduates, and are exacerbated with respect to preparing students who are ready to enter a four year college (i.e. those who have completed the "A-G" subject requirements). At the same time, large gains have been made in preparing students since the mid-1980's, and those gains have been particularly notable for the Hispanic students who are comprising a steadily larger fraction of our population.

Insert Figure 2: Public High School A-G Graduates per 18 year-old California resident, by ethnicity, 1985-2004

Progress in Postsecondary Schools

The Master Plan for higher education in California created a tiered post-secondary system. The following chart provides an overview of flows through that system, based on data published by the California Postsecondary Education Commission (CPEC), the University of California Office of the President (UCOP) and reports on data from California State University (CSU) and the California Community College Chancellor's Office (CCCCO). The data from these sources are complex, differ in focus and coverage from one another, and are sometimes simply inconsistent. The various systems also have diverse educational goals. For the UC and CSU system, that goal is fairly simple to define: the system is successful to the extent that it is able to enroll students, either directly as freshmen or indirectly via transfer from the community

[17] Figures based on California Department of Finance detailed population estimates and counts of public high school graduates from the California Basic Educational Data System (CBEDS). The numerator for this statistic exclude graduations from private schools (which comprise about 10% of graduations in California) and includes all 18-year-olds in the denominator (and thus include many young adults who never entered high school in California, particularly among groups with high rates of immigration). Finally, the population estimates we use (provided by the Department of Finance), like all survey based-estimates, can be subject to mis-estimation. There appears to be some seaming evident in the DOF figures at the juncture of 1999 and 2000, when there is a sharp single-year increase in the estimates of Hispanics and declines in the estimates of non-Hispanic Whites.

[18] See, for example, the LAO brief of April 20, 2005 on "Are Entering Freshmen Prepared For College-Level Work?".

colleges, and can enable them to earn a baccalaureate degree. Conversely, preparation for BA completion is only a small fraction of the mission of the California Community College (CCC) system, which also provides remedial education, ESL instruction, vocational training, academic Associate's degrees, and a broad gamut of coursework which directly improves its' student's skills and lives, even if it does not result in a credential. For the purposes of this analysis, we focus on the role of the CCCs in preparing students to enter a four year institution and eventually earn a baccalaureate. We do not attempt to model or estimate transitions into professional or graduate schools.[19]

Insert Figure 3: Conditional Progression through the Public Educational Pipeline

The population we start with - public high school graduates - is approximately 15% non-Hispanic Asians, 7% non-Hispanic Blacks, 33% Hispanics, 1% Native Americans and 44% non-Hispanic whites. (Figures for American Indians omitted for readability). All the remaining percentages in the chart are calculated with reference to the number of public high school graduates of that ethnicity. Although it is tempting to interpret the remaining rates as the overall progression of California high school graduates, it is important to recognize that California has a robust system of private education in addition to its public education system and that students pass between the public and private systems. Nonetheless, 90% of high school graduates do emerge from the public school system, and over 90% of college-going students from California attend college in-state[20]. Similarly large fractions of post-secondary enrollments (85%) are in public institutions[21]. As a result, despite some caveats, these rates of entry, progression, and graduation provide a strong sense of the extent to which public education successfully prepares the youth of California for the workplace and their future.

For our purposes, we are interested in identifying the effects of a changing age and ethnic composition on eventual educational distributions, and subsequently on statewide outcomes such as income, poverty, employment, taxes, and political participation. This requires that we be able to express these rates relative to some population we identify in population projections. Tables 4.2 and 4.3 express the expected distribution relative to the 18 year old population. Based on preceding analyses, we expect public high school graduates to average about two-thirds that of the 18 year-old population, and expect about slightly less than half of eighteen year-olds to go to college in the next year[22]. The bulk of those college-goers (about a third of 18 year-olds) will attend a CCC and 13% will enter a UC or CSU. Although data to appropriately estimate transfer

[19] Data on movement into graduate school is simply not available in any systematic and representative form.

[20] Figure from the National Center for Education Statistics, Digest of Education Statistics (2003), table 207. In Fall 2000, out of 161,235 Californians who graduated from high school in the previous year and enrolled in degree-granting institutions, 91% (146,279) pursued their higher education in-state. Only 9% (14,956) of high school graduates enrolled out-of-state. California received about 13,000 students from other states. Among the fifteen most populated states in the country, California and North Carolina tied for first (91%) in terms of college attendees pursuing their education in their home state.

[21] The bulk of these enrollments are in the CCC system. If we consider only four-year institutions, about 70% of college enrollments are in public institutions.

[22] To estimate college going rates, we divided the counts of Fall semester first-time freshmen age 19 and younger at UC and CSU, and divide them by the 18 year-old population. For the CCCs, we estimate the same rate, but adjust it to include first-time enrollments in the following Spring semester, as well. The rate of adjustment is based on the ratio of first-time students age 19 and younger in the Spring semester to the same counts in the Fall. That ratio draws on CCC Datamart counts, and is averaged over a 3 year period. For our calculations, we estimate rates for the last 3 years, and average the resulting rates.

rates are scarce, we anticipate that about 14% of eighteen year-olds will eventually transfer to a UC or CSU after initially entering a CCC[23]. Finally, we expect that slightly more than one in five eighteen year-old Californians will eventually earn a baccalaureate degree at a CSU or UC.[24]

Given the large discrepancies in ethnic progression rates we identified in public high schools, it should come as little surprise that similar ethnic-specific barriers manifest themselves in college. We expect nearly 80% of Asians to go to college, more than a quarter directly to UCs, and anticipate that 43% of Asians will eventually earn a BA at a public state university. In contrast, our estimates indicate that fewer than one third of Hispanic eighteen year-olds will go on to college (most of whom will enter a CCC), only 15% will eventually reach a public four-year institution, and less than one in ten will earn a BA there. Black eighteen year-olds do much better at entering college, nearly equaling the average rate, but suffer from low transfer rates from the CCCs and high attrition rates if they do eventually enter a UC or CSU. As a result, the likelihood that they will eventually earn a BA is virtually identical to that of Hispanics. Rates for non-Hispanic whites parallel the overall rates remarkably closely, falling between the extraordinary accomplishments of Asians and the less successful records for Blacks and Hispanics.

Cost-Benefit Analysis

Costs

Increasing education offers obvious advantages in terms of employment, earnings, poverty, quality of life, civic participation and equality. Balanced against these advantages are costs as well. The direct costs of education are borne principally by students and their families, who pay fees, foot the expenses necessary to live and attend school, and face opportunity costs in the form of foregone earnings and lost time while attending college. Costs are also borne by the universities themselves through endowments and fundraising to support these educational programs. We make no attempt to estimate these costs, although they are real constraints on the decisions made by individuals to enroll and by universities to support those decisions. More centrally to our analyses, costs are also borne by the state to provide necessary infrastructure.

We start by creating estimates of how much it costs the state in order to provide post-secondary education to students. We create this estimate by applying a *cost per enrollment year* to a projection of the *years per enrollment* to establish a *cumulative cost per entrant*.

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[23] This transfer includes both entrants who enter with the intent to transfer and those who do not. Per Patrick Perry, "transfer rates for students who show transfer intent is around 40% statewide". For the purposes of tracing transitions into the CCC and through the CCC into the four years systems, the 14% figure is the figure consistent with our inflow estimates.

Fall term transfer counts considerably underreport the number of transfers annually between the Community College system and the four-year institutions. The full year transfer counts we use are only available for the last two years. Unlike the direct enrollment rates, we divide the full years transfers by the number of eighteen-year olds from 3 years prior. More problematic is that, while we can largely regard direct enrollments in the UCs and CSUs as drawn from recent high school graduates, the CCCs draw on a much broader age spectrum for their student body. Nonetheless, age distribution of the transfer ready are quite skewed toward the younger ages, and we don't believe that transfer rates are biased greatly by defining them relative to the lagged eighteen year-old population. (Other analyses have suggested that slightly over half of transfers are to students age 21 and younger, and about 80% are of students aged 24 and younger.)

[24] Cohort-based graduation rates and retention rates are provided for a period of six years after entry for CSU. At that point, nearly 1 in 10 (and 1 in 7 for Hispanics) have neither earned a BA or dropped out. We assume that 75% of continuing students at that point will continue on to earn a BA.

In order to calculate the state's burden in educating future generations, we estimate future costs by applying system-specific costs per enrollment to predicted levels of enrollment in each system. There are a number of choices in estimating costs. In budgeting for enrollment growth, the state currently allocates expenditures for increases using marginal cost estimates. We calculate the costs we use for subsequent modeling based on historic average costs per student (in terms of dollars from State General Funds per full-time equivalent student (FTE[25]) in each of the three systems), and do not include student fees, state contributions for financial aid, or funds for capital construction.[26] In addition, we use information on identify how long individuals are in school, where they attend, and how successful they are. Both UC and CSU provide summary figures tracking cohorts of entering freshmen and transfer students, identifying the fraction in each subsequent year who earn a BA or who remain enrolled without graduating. We use those figures to identify, by ethnicity and success in earning a degree, the number of years they are enrolled before leaving the system[27].

Benefits

In order to calculate the benefits of increased educational outcomes, savings are calculated from three sources: changes in tax receipts, changes in spending for poverty-related support programs, and shifts in costs of incarceration. For our purposes, we are interested only in changes in the balance of the state's general fund, and do not consider saving to either local or federal governments.

Changes in tax receipts are calculated as a fixed percentage of total personal income. We apply this rate to the change in total income we calculate to derive gains (or losses) in state tax receipts. Costs of incarceration are fixed at the discounted rate of $25,000 per year of incarceration.[28] We do not estimate the broader costs of crime, which would include financial

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[25] An undergraduate FTE is 15 semester or quarter units or, on an annual basis, 30 semester or 45 quarter units. A graduate FTE in the semester system is student enrollment in 24 semester units or 36 graduate credit units per academic year. (from: http://www.cpec.ca.gov/completereports/2003reports/03-08/appendixb.pdf)

[26] Marginal costs are immediately lower than average costs because they exclude or discount items which are not sensitive to the size of the student population (such as existing common facilities or infrastructure). In contrast, average costs apportion the entirety of state funds equally among students. Marginal cost estimates may be more appropriate when growth in enrollments is relatively low or when the expected cost structure of educating new students is similar to that of existing students, but may not provide a better estimate of true long-run costs of increased enrollments. When the educational demands of new students differ from those of existing students, in the presence of changes of technology, when new enrollments cannot fully share existing discounted resources, or when growth is large enough that discounted items in marginal cost estimates must be expanded, average costs may be more appropriate. If new enrollments are consistently funded at marginal rates, and the average cost structure for existing enrollments remains fixed, use of a marginal cost approach to project expenditures will result in a steady decline in average costs as enrollments increase. If this is the best way to "cost out" long term enrollment growth, historic average costs should drop significantly over time. Separate analyses show despite substantial growth in each of the state's higher education systems over the last three decades, little or no secular trend is apparent.

[27] UC and CSU tracks entering cohorts of first-time full-time freshmen and full-and-part-time transfer students entering as sophomores or above (upper division in UC). Data concerning persistence and graduation at selected intervals are published in the UC Information Digest and at the Consortium for Student Retention Data Exchange (CSRDE) web site. The published data do not fully describe year-to-year rates. We make the assumption that, in the CSU system, 75% of students still enrolled at 6 years will graduate with a mean number of years til graduation of 6.5. For UC, we assume that the fraction of students discontinuing after their second year can be represented as the fraction of students still enrolled after 2 years who have not graduated by the end of their sixth year (or for transfer students, the end of their fourth year). Standard life table methods are applied to calculate years in each system for entrants.

[28] The California Department of Corrections places the average cost of housing an inmate at $30,929 per year.

costs to victims, property damage and loss, costs of policing, and costs of courts, as well as non-monetary effects such as feelings of safety and security or reduced public trust.[29] Costs of poverty-related programs are estimated by applying a fixed value per changes in years in poverty. This approach allows us to focus on the underlying rationale for programs of support without having to calculate costs on a program-by-program basis and allocate state shares of those programs costs.[30] We estimate a cost to the state general fund of $3,000 per person year of poverty, based on *state* expenditures for MediCal, CalWORKs, and state supplements to SSI reported in the state budget, divided by Census Bureau estimates of the number of persons in poverty.

The estimation of costs for social support programs and incarceration are intentionally broad, and are not adjusted for life-cycle effects or marginal impacts. Both incarceration and social supports exhibit a strong association with age: social supports are typically focused on the dependent young and the elderly, while incarceration rates are highest for young adults. We assume that demand for social supports by the young is reflected in the education of their parents, and demand by the elderly is reflected in the earnings and accumulation of working age adults. Incarceration of adults 18-24 is not captured in our costs, but would likely increase the positive the impact of education.

Four scenarios

In order to assess the net benefit of investing in educational improvement in California, we consider four scenarios for public higher education, ranging from highly constrained to more expansive, which explore the effects of changes in rates of high school graduation, college-going, and college completion. Because education is so highly tied to important outcomes such as per capita income, poverty, and tax revenues, we can use these scenarios to project the future economic, social, and fiscal well-being of the state.

Fixed Capacity Scenario – In this scenario, the state's capacity for serving higher education students does not increase over time as the young population grows—it remains the same as in 2003. This would depart from historic trends in which capacity has increased, but it might occur due to budgetary stringencies.

Current Conditions Scenario – In this scenario, current ethnicity-specific rates of high school graduation, college-going, and college completion proceed at the same rate in the future as they do currently. This is our "baseline" scenario which models the continuation of existing conditions.

Increased College Going Scenario – In this scenario, high school completions and entry to college gradually trend upwards over the next two decades at reasonable levels from current rates.

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[29] The proportion of total costs of crime attributable to incarceration varies from crime to crime, but Moretti (2004) places the range between about 4% (for arson) and 36% (for burglary). It is unclear what proportion of additional costs would be costs to the state, but they would be likely to be significant.

[30] A program by program analysis could be undertaken using a survey that asks detailed questions about sources of income[30] (such as the SIPP). However, welfare related costs tend to be substantially under-reported, non-cash assistance values require imputation, and separation of state costs from federal costs is difficult. Moreover, the extent to which programs evolve over time suggests that a focus on core rationales for assistance, rather than on specific programs, could be more robust and is certainly more transparent.

Improved Completion Scenario -- Finally, in this scenario, we assume both "increased college going" and greater efficiencies in getting students who enter public colleges to complete their programs.

These scenarios are not intended to be an exhaustive compilation of the many possible changes in participation and success in the California's public education system. However, they do highlight key issues which confront us in the near future: changing demographics, tight constraints on expansion, potential gains in demand from success early in the pipeline, and the efficiency and effectiveness of the state's postsecondary institutions. Any approach to confronting the future of higher education in California will have to consider those issues.

Comparison of Scenarios

The "current conditions" scenario is used as a baseline, and results in the remaining three scenarios presented relative to that reference scenario. That scenario, shown in Table 6, illustrates the impacts of the changing demographic composition of 18 year olds on educational distributions, income, measures of dependence, educational costs, and savings. Table 7 contrasts, for 18 year-olds in 2005, 2010, 2015, and 2020, how cumulative lifetime costs and savings under the alternative scenarios would differ from those resulting from the Current Conditions scenario. Table 8 parcels out the benefits, costs, and savings that accrue during each of the four decades of life between age 25 and 64 for the alternative scenarios, again contrasting results relative to the reference model, for the cohort of 18 year-olds in 2015.

Insert Table 6: Selected Lifetime Impacts of Changes in the Demographic Composition of 18 year-old cohorts in California, Current Conditions Scenario

Insert Table 7: Impacts on State Receipts and Expenditures Under Alternate Educational Scenarios, 2005-2020

Insert Table 8: Impacts on State Revenues and Expenditures By Stage in Life under Alternate Scenarios, Cohort of 2015

Current Conditions: In the "current conditions" scenario, eventual education distributions are completely determined by trends in ethnicity and nativity and all changes in costs and outcomes reflect shifts in ethnic composition. Table 6 shows the declining state resources resulting from demographic shifts in the state under these assumptions. Relative to 2000, the fraction of 18 year-olds who will fail to complete high school increases steadily through 2020, with matching declines at higher levels of educational achievement. These declines, in combination with differences in the returns that education brings to different ethnic/nativity groups, result in an average lifetime loss of nearly $25,000 in income by 2020 (a decline of 1.8% from 2000), largely resulting from loss of earnings. The number of years these cohorts can expect to live in poverty before age 65 increases slightly, creeping up by about half a month for the 2020 cohort, and by about a month and a half if we consider years under 200% of the federal poverty threshold. Similar trends are noted with respect to participation in cash assistance programs, with small changes in incarceration.

However, lower levels of educational achievement also create less demand for higher education, and average educational costs consequently decline: state support for secondary education drops by $150 by 2020, community college support declines by about $200 in the same period, and average UC/CSU support declines by nearly $400. Overall, the average educational expenditures required by the typical 18 year-old will decline by $750 for the 2020 cohort from that needed for the 2000 cohort. Despite these savings, the net cost to the state will far outweigh the savings. The declines in average income will cost the state nearly $2,000 in foregone taxes, the moderate increases in poverty will add an additional $100 in support payments and services, and incarceration costs will add more than $1,200 to the state's bill. Overall, the lifetime costs to the state are anticipated to increase by $3,200 per 18 year-old in 2020, and net costs will increase by $2,500 (after deducting the savings from reduced educational support).

Fixed Capacity: The losses and gains entailed under the current conditions scenario are bracketed above and below by the remaining three scenarios. Unlike the first scenario, in which changes are driven exclusively by shifts in the demographic composition of eighteen year-olds, the remaining scenarios explicitly incorporate the impacts on changing success in the educational pipeline. In the "fixed capacity" scenario, we estimate the original fixed rate model, compare the counts from the expected educational distribution to those from our 2000 estimate, and transfer any excess from the post-secondary categories into the high school only category. This treats the number of post-secondary educational slots as fixed, with any pegs which cannot fit in the slots moved to high school graduate category[31]. We apportion the available slots by ethnicity and nativity in the same proportion as estimated for each cohort from the fixed rate model.

The "fixed capacity" scenario is displayed in the first column for each of the cohorts from 2005 through 2020. Because it manipulates only the categories of high school completers, no differences emerge in the percentage with incomplete secondary education, relative to the model with fixed rates. The substantial absolute declines in college attendance, ranging in size from 6% to 10%, are matched by increases in the proportion that have only a high school diploma. The size of the lifetime income losses varies from $40,000 to $70,000, and lifetime years in poverty increase by an average of 6 weeks, with corresponding increases in cash assistance and incarceration. Per 18 year-old, the state can anticipate shaving more than $1,600 off its support for education on average, primarily from the four-year colleges. However, it will pay heavily for these savings, totting up costs between $4,000 and $7,000 in lost tax receipts, increased costs for incarceration, and subsidies for the poor. The state's net lifetime losses average between $3,000 and $5,000, and these losses cost the state more than 2 dollars over this cohorts' lifetime for every dollar it saved in curtailed educational support.

[31] In short, we assume that students are turned away from the state's public community colleges and universities, and terminate their educations after completion of high school. Some students would undoubtedly move out-of-state in those circumstances, or apply to the private post-secondary system. There are a number of reasons to believe that these alternatives would not meet the frustrated demand. First, much of that demand is quite localized, and potential students would be unwilling or unable to make the greater effort associated with longer travel or relocation. Capacity at other institutions is also competitive, and the addition of demand would be likely to increase competition and decrease acceptance rates. As well, many employment contacts and opportunities are acquired in the postsecondary setting, and expecting students to leave the state for educational opportunity but return for employment may be quite optimistic.

Increased College-going: If instead of limiting access, we allowed for reasonable increases in high school completion and college-going rates, a very different picture emerges. In the "increased college-going" scenario, changes to educational progression rates are gradually achieved over a fifteen year period, so later cohorts tend to benefit more. Even in the fairly early years, however, the advantages in term of educational distributions, income, and dependence are obvious. By 2005, the absolute percentage expected to lack a high school degree declines by two points, average lifetime income climbs by $16,000, and individuals can anticipate six fewer weeks lived in poverty. Participation in cash assistance programs and incarceration will decline, and political participation will rise. The cost will be modest - about $500 per person - and will reap about $1,500 in net lifetime savings for the state.

Both educational cost and benefits increase steadily in later years. By 2020, the fraction of the cohort with less than a high school diploma would drop 7.2 percentage points, the percentage with baccalaureates or more would increase by 2.2 percentage points, and lifetime income would total $70,000 more than under the current conditions scenario. Individuals will trim nearly half a year lived in poverty, on average, and registration and voting will increase by nearly a full percent. The state will pay nearly $2,000 per person to achieve these benefits, but it will, in turn, gain more than $5,000 in additional taxes and save nearly $4,000 in decreased supports for poverty-related programs. On net, the state will gain $7,000 per person over the life of this cohort, returning nearly four-for-one on its initial investment in their human capital.

Improved Completion: The final scenario considers the potential impact of halving the rate at which students terminate their four year college careers prior to earning their baccalaureate. Currently, nearly one-third of students who enter a four year public university in California leave without a degree. These rates are particularly low for Black students, among whom only one-half graduate. Like the third scenario, this increased completion scenario is phased in gradually and achieves its greatest gains in later years. Initially, lifetime income increases by $25,000, with attendant declines in poverty and public dependence, at a savings of around $800 per cohort member. The state gains $2,900 in additional taxes and reduced outlay, and nets about $2,000 per person. By the year 2020, when gains are fully realized, the proportion of the cohort with baccalaureate degrees would climb 7 percentage points, and average lifetime income gains would top $100,000. The gains would provide the state with an additional $8,000 in tax revenues which, in combination with the $4,000 in reduced expenditures for poverty and prisons, offsets the additional $3,000 in educational costs several times over.

Lifetime Distribution of Costs and Benefits

The gains and costs related to education are unevenly distributed over a lifetime. As with any investment, costs tend to be front-loaded, while benefits accrue over time[32]. In Table 8, we

[32] Effects for the synthetic cohort are based on differences found among those age 25-64. The lower age boundary is set at 25, since most of the educational transitions we are concerned with are completed by that age. This does not mean that education does not have a strong impact on adults before the age of 25. In fact, strong differences emerge in rates of incarceration, poverty and welfare use. However, for this age group it is not possible to distinguish impacts on those who have completed their education from those who are still in the process of pursuing it. (For example, the poverty rate for 19 year-olds who have only a high school degree at that age will reflect poverty among those who will never go to college, those who will attend some college, those who will finish their BA, and those who earn advanced degrees.) We expect that these relationships would persist, and probably more strongly, if we could distinguish final educational destinations in these age groups

pick one cohort - the cohort of 18 year-olds in 2015 - and track their anticipated costs and gains in each of the four decades of their life between 25 and 64. As with Table 7, the gains and losses are calculated with reference to the current conditions model, and each of the other three scenarios are considered in turn.

Between the ages of 25 and 34, the cohort experiencing the conditions created in the fixed capacity scenario lose about $7,000 in income, or about $700 per year, nearly all of it in lower earnings. They will spend about 10 days more in poverty, participate slightly more in cash assistance programs, and will spend an additional week in jail.[33] Because educational costs are front-loaded, they will enter their 25th year having already saved the state over $1,200, but the state will net only $277 by the end of their 34th year, due to lower tax receipts and higher outlays. In their next decade of life, the loss of an additional $11,000 in income, coupled with smaller increases in poverty and incarceration, costs the state $1,000 and push its net position into the red. Income losses increase steadily over the next two decades of life, but poverty and incarceration play an increasingly small role. Nonetheless, the state loses an additional $2,000, split evenly between the decades, for its decision to curtail educational capacity.

Under the conditions of the increased college-going scenario, the state also garners a net gain for the cohort by time they turn 35, but this time due to increased returns rather than foregone investments. The cohort earns nearly $9,000 more, lives one month less in poverty and two weeks less in jail, and returns $1,800 to the state coffers for the $1,400 the state initially invested. By the end of the next decade, they average another $13,000 in income, and they return to the state $1,900 in additional savings. The remaining two decades see continued gains for themselves and the state, based on increases in terms of gains in income rather than reductions in dependency, but still netting the state an additional $3,000 during the period.

For the improved completion scenario, the relatively high costs of education at the beginning are balanced evenly by increased gains in early ages. With nearly $14,000 in additional income, and reductions of $1,200 in reduced need for support, this cohort returns the state's investment by the end of their 34th year. The higher returns continue to accumulate, with this cohort averaging an extra $20,000 in income in each of the subsequent decades. The tax revenues generated by this income, and the declines in state expenditures, yields the state $2,600, $2,300 and $2,000 respectively in the remaining three decades before retirement.

Because education and labor market activity are competing alternatives, it is possible that education and income could actually have a negative relationship for this age group. Eventual college graduates could focus on pursuing their studies, while those who end their educations at high school are busy earning wages. To gauge some of these possible effects, we estimated income by age and education for each of our ethnic categories, but classified individuals currently enrolled in school as having an educational attainment one level higher than their current educational level. Hence, only non-enrolled persons with a particular educational level will be classified in that category, excluding possible lower earnings on the parts of students still in school. These analyses still show total income among those having some college experience equaling or exceeding that of high school graduates for all ethnic categories by age 25, and substantially exceeding that of those who fail to complete high school. Any opportunity costs on the parts of these students (and postponed tax revenues on the part of the state) appear to largely evaporate by age 25. Relative to those with some college, moderate declines in income among those placed in the BA and advanced degree categories exist, but total cumulative income by age 25 differs by less than 10% between these educational categories.

[33] These are averages. The population would experience substantial variation around each of these outcomes. Very few will, in fact, spend just 10 days in poverty or exactly one week in jail. The vast majority will experience no days of poverty and no time in jail. But those who do fall below the poverty line or land in jail will spend so much time there that the whole cohort will average 10 days more of poverty and seven of jail time.

Conclusion

The state devotes a substantial portion of its budget to supporting education in California. That support is not wasted: the net costs of neglecting education are very substantial, and the net benefits this investment brings to the state are very great. Laudable though it may be, California's investment in higher education is insufficient. If things stay as they are now, that is, if future students progress through their educational careers at the same rates as their ethnic counterparts did in 2000, the state will suffer a net loss, and that loss will increase as years pass. With no other changes, the state will forgo revenues from the increased earnings that education encourages, and pay more to support a population in a situation of increased poverty and incarceration. If, rather than maintaining the per-person level of educational support and access, the state were to limit capacity, the situation would become even more dire, costing the state an average of two dollars in the long run for every dollar it failed to spend in the short run.

However, based on existing trends in educational demand, we expect that high school graduation rates and college going rates will increase, and demands on state support for education will climb commensurately. California will have to invest in community colleges and universities in the short run, but both the state and its residents will benefit handsomely from this additional support in the long run. Our calculations suggest net savings to the state will exceed the additional cost by three-fold or four-fold, while its population will enjoy lower levels of poverty, crime, and dependency, and higher levels of average income and political participation. The state can also do more; eliminating ethnic disparities in enrollment and graduation would make a rosy scenario rosier. Raising black and Hispanic BA rates to those of Asians could serve to increase tax revenues further, primarily through increased tax revenues.

The payback for these investments is not immediate, but it is surprisingly quick: for most of the scenarios discussed, the state shows a positive balance 10 years after enrollment expands. Regardless of the specific educational investments the state chooses to make, one thing is clear: expenditures on post-secondary education are investments. They require an outlay when people are young but reap returns as they age. Investments in higher education pay off three ways: they enhance the lives of residents directly, pay back their initial costs quickly, and continue to return dividends for many years. The result is a more prosperous, higher quality of life, and a still "golden" California.

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Appendix 1: Measures of Three Categories of Benefits

Personal

Measure	**Operationalization**
Labor Force Participation	Dichotomy
Unemployment	Dichotomy (if in Labor Force)
Hours worked	(in Last Year)
Occupation	Seven broad categories
Earnings	In Last Year
Total Income	In Last Year
Poverty: 100%	Dichotomy
Home Ownership	Dichotomy
Home Value	(if Home Owner)
Auto Ownership	Dichotomy
Crowding	Dichotomy (> 1.5 person/room)

Collective

Measure	**Operationalization**
Citizenship	Dichotomy
Voter Registration	Dichotomy
Voter Turnout	Dichotomy
Educational Attainment	Categories
Facility with English	Dichotomy

State

Measure	**Operationalization**
Welfare Receipt	Dichotomy
SSI Receipt	Dichotomy
Poverty	As proxy for demand for Transfer Programs
Incarceration	As proxy for costs of incarceration

Tables/Figures (in order of reference)

Table 1: Proportional increases in lifetime earnings by educational attainment in California, 2000

Total Population	**Proportional increase in Lifetime Earnings**				
	if educational attainment increased to:				
From current education of:	**Less than HS**	**HS Diploma**	**Some College**	**BA**	**Advanced Degree**
Less than HS	1.00	1.74	2.31	3.56	4.89
HS Diploma		1.00	1.33	2.05	2.82
Some College			1.00	1.54	2.12
BA				1.00	1.38
Advanced Degree					1.00

Table 2: Relative lifetime earnings by educational attainment, ethnicity, and nativity in California, 2000

	Relative Lifetime Earnings				
	if educational attainment increased to:				
Earnings relative to NH White with a HS Diploma	**Less than HS**	**HS Diploma**	**Some College**	**BA**	**Advanced Degree**
NH White: Native	0.65	**1.00**	1.29	2.02	2.66
NH Black: All	0.42	0.72	0.99	1.54	2.09
Asian/PI : Native	0.60	0.95	1.25	1.79	2.59
Hispanic: Native	0.51	0.86	1.15	1.68	2.13
NH White: Immig	0.64	0.92	1.19	1.83	2.55
Asian/PI : Immig	0.46	0.71	0.98	1.40	2.35
Hispanic: Immig	0.48	0.71	0.94	1.27	1.51

Table 3: Work-life Earnings Relative to HS Graduate of Same Ethnicity, 1980, 1990 and 2000

Work-life Earnings Relative to a HS Graduate of Same Ethnicity (Synthetic Cohort of Employed Persons)				
		Less than HS	**Some College**	**BA or More**
All Ethnicities	1980	0.81	1.17	1.64
	1990	0.78	1.23	1.88
	2000	0.68	1.26	2.13
Non-Hispanic White	1980	0.90	1.16	1.63
	1990	0.91	1.19	1.83
	2000	0.79	1.20	2.03
Non-Hispanic Black	1980	0.86	1.14	1.60
	1990	0.78	1.21	1.80
	2000	0.82	1.19	1.90
Asian/Pacific Islander	1980	0.77	1.17	1.59
	1990	0.72	1.29	1.86
	2000	0.75	1.31	2.18
Hispanic	1980	0.77	1.17	1.52
	1990	0.72	1.26	1.79
	2000	0.73	1.27	1.90

Table 4: Synthetic Benefits Associated with Education

Outcomes relative to HS Graduate	Less than HS	HS Graduate	Some College	BA	Advanced Degree
Years in Labor Force	0.80	1.00	1.12	1.19	1.25
Years Employed	0.75	1.00	1.14	1.23	1.30
Occupation					
Professional	0.39	1.00	2.11	4.32	6.98
Managerial	0.32	1.00	1.51	2.56	1.89
Self-Employed	0.67	1.00	1.56	3.08	2.72
Routine White Collar	0.48	1.00	1.04	0.66	0.27
Skilled Manual	1.14	1.00	0.61	0.23	0.10
Less Skilled Manual	1.89	1.00	0.60	0.23	0.09
Earnings	0.57	1.00	1.33	2.05	2.81
Income	0.59	1.00	1.32	2.02	2.78
Poverty : < 100%	2.13	1.00	0.64	0.38	0.38
Poverty : < 200%	2.00	1.00	0.66	0.38	0.34
Auto Ownership	0.93	1.00	1.03	1.04	1.05
Home Ownership	0.76	1.00	1.08	1.14	1.14
Value of Owned Home	0.78	1.00	1.18	1.60	1.87
Crowding : > 1.5 Persons/room	3.45	1.00	0.59	0.41	0.34
Welfare Use	1.85	1.00	0.61	0.22	0.19
SSI Use	1.85	1.00	0.61	0.26	0.19
Incarceration	1.14	1.00	0.50	0.13	0.09
Citizenship*	0.63	1.00	1.16	1.20	1.11
English Fluency*	0.52	1.00	1.07	1.07	1.08

* Figures for Citizenship and English Fluency are restricted to foreign-born population

Table 5: Secondary Educational Progression, 2000-2002

		Proportion Advancing				
		to 10th	to 11th	to 12th	Graduate	Completion Rate
CDE	**NH White**	.99	.99	.98	.97	.93
	NH Black	.95	.95	.95	.94	.81
	NH API	.99	.99	.99	.98	.94
	Hispanic	.97	.97	.96	.95	.86
	Total	*.98*	*.98*	*.97*	*.96*	*.89*
CPI[1]	**NH White**	.97	.95	.93	.91	.79
	NH Black	.91	.90	.90	.83	.60
	NH API	1.00	.99	.96	.93	.88
	Hispanic	.91	.89	.87	.86	.60
	Total	*.94*	*.93*	*.91*	*.89*	*.71*
Census	**NH White**	.99	.98	.95	.95	.88
	NH Black	.99	.97	.90	.89	.75
	NH API	.99	.99	.98	.96	.91
	Hispanic	.96	.94	.90	.88	.65
	Total	*.98*	*.96*	*.92*	*.92*	*.79*

[1] Counts by grade-specific enrollments by ethnicity were determined from school level figures from Section B of the School Information Form (SIF) available from California's Basic Educational Data System (CBEDS), and aggregated to the state level. Recently, the Harvard Civil Rights Project (HCRP) used this approach to estimate ethnicity-specific graduation rates in California. Although our total estimates are identical, their ethnicity-specific estimates differ slightly from our own. These differences arise because the HCRP builds statewide rates from the district-level up, top-codes individual grade promotion rates at the district level, and limits their universe to large stable districts. We topcode only at the state level and make no restriction on our enrollment universe.

Figure 1: Public High School Graduates per 18 year-old California resident, by ethnicity, 1985-2004

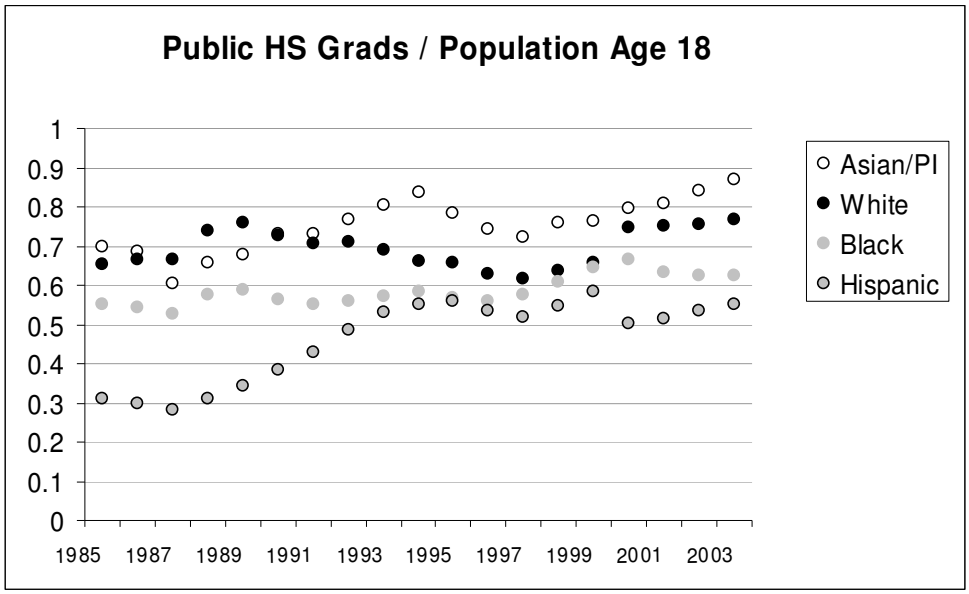

Figure 2: Public High School A-G Graduates per 18 year-old California resident, by ethnicity, 1985-2004

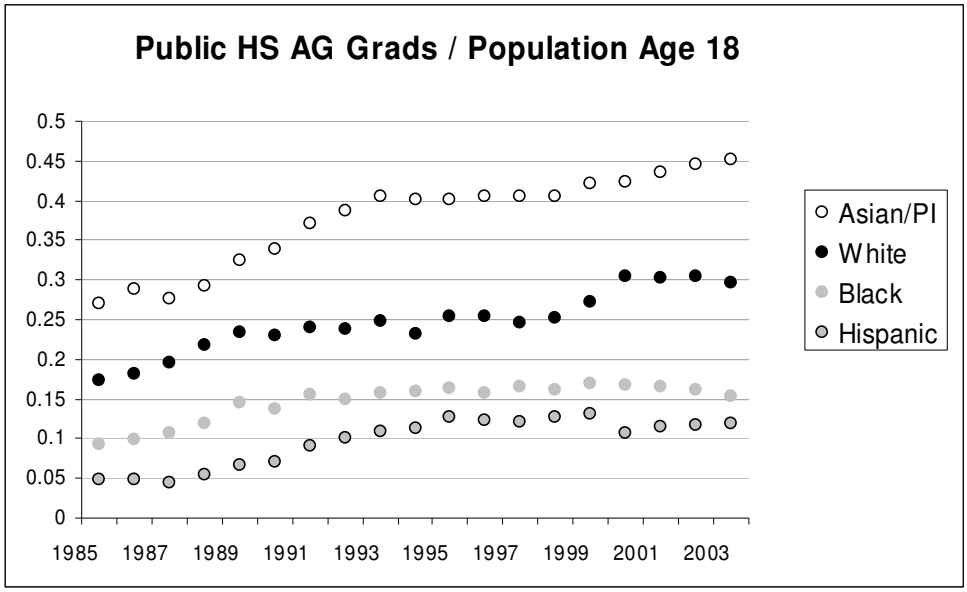

Figure 3: Conditional Progression through the Public Educational Pipeline

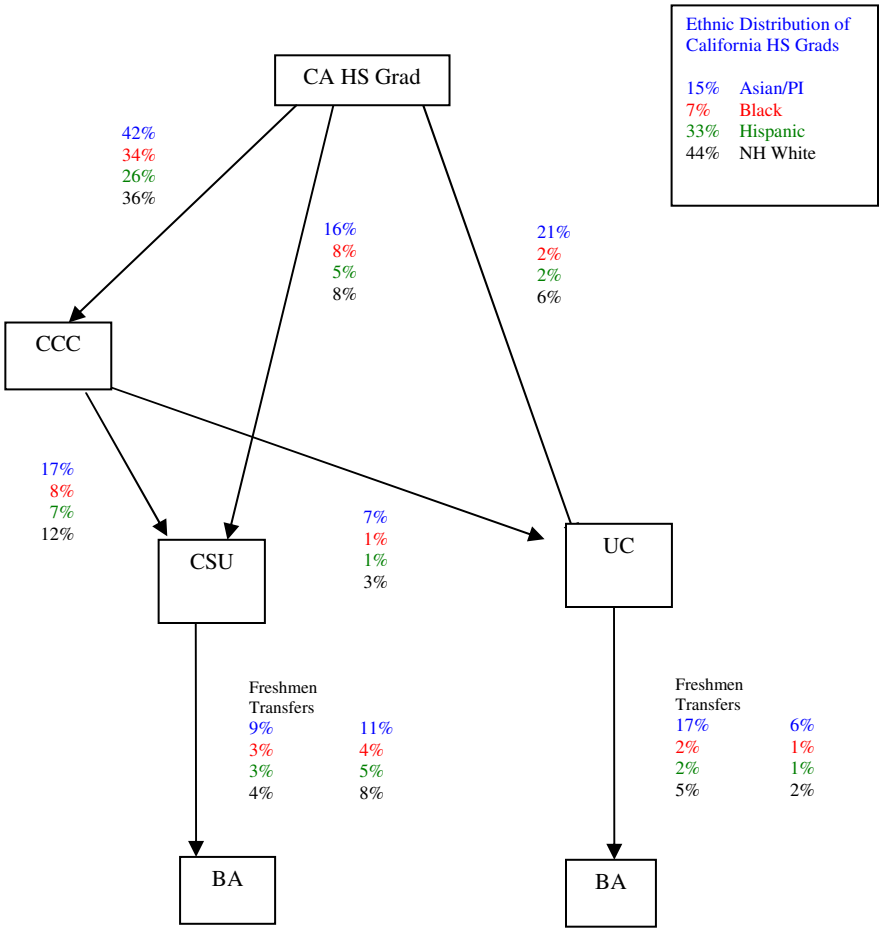

Table 6: Selected Lifetime Impacts of Changes in the Demographic Composition of 18 year-old cohorts in California, Current Conditions Scenario

Outcomes Relative to 2000 : Current Conditions Scenario	2005	2010	2015	2020
Education	*Absolute Change in Educational Distribution at 25*			
< HS	0.1%	1.3%	1.8%	2.1%
HS Only	0.2%	0.0%	-0.3%	-0.4%
CCC Only	0.0%	-0.1%	-0.3%	-0.5%
4 Year College	-0.1%	-0.3%	-0.3%	-0.4%
BA +	-0.2%	-0.9%	-0.9%	-0.9%
Income	*Change in Average Lifetime (25-64) Dollars (2004 $)*			
Total	$7,150	-$9,299	-$22,829	-$24,860
Earnings	$5,418	-$9,614	-$19,914	-$20,851
Dependence				
	Change in Years in Poverty			
Poverty 100%	-0.02	0.04	0.07	0.04
Poverty 200%	-0.05	0.03	0.16	0.12
	Change in Years of Participation			
Welfare	-0.01	0.05	0.04	0.03
SSI	0.00	0.04	0.01	-0.01
Incarceration	*Lifetime years in Institution*			
Corrections	0.00	0.05	0.06	0.06
Educational Costs				
	Change in State $ per person			
UC/CSU	-$132	-$459	-$406	-$381
CCC	-$29	-$118	-$150	-$208
High School	-$4	-$89	-$125	-$153
Total Cost	-$164	-$665	-$681	-$743
Change in State $				
	Change in State $ per person			
Change in Tax Receipts / Person	$536	-$697	-$1,712	-$1,865
Change in Dependency Payments	-$58	$124	$219	$113
Change in Incarceration $	$3	$925	$1,211	$1,274
	$592	-$1,746	-$1,934	-$3,252
Net State Savings	$756	-$1,080	-$1,252	-$2,509

Table 7 **Impacts on State Receipts and Expenditures Under Alternate Educational Scenarios, 2005-2020**

Outcomes Relative to Scenario 1 (Current Conditions)	2005 Cohort			2010 Cohort			2015 Cohort			2020 Cohort		
	Fixed Capacity	Increased College-Going	Improved Completion	Fixed Capacity	Increased College-Going	Improved Completion	Fixed Capacity	Increased College-Going	Improved Completion	Fixed Capacity	Increased College-Going	Improved Completion
Education												
Change in Educational Distribution of Cohort												
< HS	0.0%	-1.7%	-1.7%	0.0%	-3.5%	-3.5%	0.0%	-5.3%	-5.3%	0.0%	-7.2%	-7.2%
HS Only	7.8%	0.1%	0.1%	10.6%	0.3%	0.3%	6.2%	0.5%	0.5%	8.1%	0.7%	0.7%
CCC Only	-3.3%	0.7%	0.7%	-4.6%	1.5%	1.5%	-2.7%	2.3%	2.4%	-3.5%	3.2%	3.2%
4 Year College	-1.5%	0.3%	-0.9%	-2.0%	0.6%	-1.8%	-1.2%	0.9%	-2.8%	-1.5%	1.2%	-3.7%
BA +	-3.0%	0.5%	1.8%	-4.0%	1.1%	3.5%	-2.3%	1.6%	5.2%	-3.1%	2.2%	7.0%
Income												
Change in Average Worklife Dollars (2004 $)												
Total	-$53,692	$16,436	$25,845	-$72,173	$34,063	$52,479	-$41,928	$51,334	$78,545	-$54,845	$69,564	$105,648
Earnings	-$48,056	$15,293	$23,887	-$64,621	$31,736	$48,559	-$37,592	$47,863	$72,748	-$49,161	$64,855	$97,807
Dependence												
Change in Years in Poverty												
Poverty 100%	0.14	-0.11	-0.12	0.19	-0.22	-0.25	0.11	-0.34	-0.37	0.14	-0.46	-0.50
Poverty 200%	0.34	-0.20	-0.23	0.46	-0.41	-0.48	0.27	-0.63	-0.73	0.35	-0.86	-0.99
Change in Years of Participation												
Welfare	0.05	-0.03	-0.04	0.07	-0.07	-0.08	0.04	-0.11	-0.12	0.05	-0.14	-0.16
SSI	0.05	-0.04	-0.04	0.06	-0.08	-0.08	0.04	-0.11	-0.13	0.04	-0.15	-0.17
Incarceration												
Change in institutionalized years												
Corrections	0.04	-0.03	-0.03	0.05	-0.06	-0.07	0.03	-0.09	-0.10	0.04	-0.12	-0.14
State General Fund Expenditures for Education												
Change in State costs per cohort member												
UC/CSU $	-$1,365	$229	$525	-$1,809	$460	$1,036	-$1,069	$695	$1,561	-$1,406	$935	$2,085
CCC$	$0	$229	$229	$0	$223	$223	$0	$419	$419	$0	$614	$613
High School $	$0	$79	$79	$0	$168	$168	$0	$259	$259	$0	$354	$353
Total Cost	**-$1,365**	**$537**	**$833**	**-$1,809**	**$851**	**$1,427**	**-$1,069**	**$1,373**	**$2,239**	**-$1,406**	**$1,903**	**$3,052**
Change in State Tax Receipts and Selected Expenditures												
Change in State costs per cohort member												
Change in Tax Receipts	-$4,027	$1,233	$1,938	-$5,413	$2,555	$3,936	-$3,145	$3,850	$5,891	-$4,113	$5,217	$7,924
Change in Dependency Payments	$428	-$318	-$353	$577	-$667	-$736	$338	-$1,014	-$1,116	$434	-$1,370	-$1,503
Change in Incarceration Expenditures	$737	-$571	-$640	$1,020	-$1,200	-$1,343	$597	-$1,839	-$2,052	$765	-$2,494	-$2,772
Total Savings	**-$5,192**	**$2,121**	**$2,932**	**-$7,010**	**$4,421**	**$6,014**	**-$4,079**	**$6,703**	**$9,059**	**-$5,312**	**$9,082**	**$12,198**
Net State Savings	**-$3,826**	**$1,584**	**$2,099**	**-$5,201**	**$3,570**	**$4,588**	**-$3,009**	**$5,329**	**$6,820**	**-$3,906**	**$7,179**	**$9,147**
Savings / Investment	2.80	2.95	2.52	2.87	4.20	3.22	2.81	3.88	3.05	2.78	3.77	3.00

Table 8 **Impacts on State Revenues and Expenditures By Stage in Life under Alternate Scenarios, Cohort of 2015**

Outcomes Relative to Scenario 1 (Current Conditions)	Ages 25-34			Ages 35-44			Ages 45-54			Ages 55-64		
	Fixed Capacity	Increased College-Going	Improved Completion	Fixed Capacity	Increased College-Going	Improved Completion	Fixed Capacity	Increased College-Going	Improved Completion	Fixed Capacity	Increased College-Going	Improved Completion
Education												
Absolute Change in Educational Distribution at 25												
< HS	0.0%	-5.3%	-5.3%	0.0%	-5.3%	-5.3%	0.0%	-5.3%	-5.3%	0.0%	-5.3%	-5.3%
HS Only	6.2%	0.5%	0.5%	6.2%	0.5%	0.5%	6.2%	0.5%	0.5%	6.2%	0.5%	0.5%
CCC Only	-2.7%	2.3%	2.4%	-2.7%	2.3%	2.4%	-2.7%	2.3%	2.4%	-2.7%	2.3%	2.4%
4 Year College	-1.2%	0.9%	-2.8%	-1.2%	0.9%	-2.8%	-1.2%	0.9%	-2.8%	-1.2%	0.9%	-2.8%
BA +	-2.3%	1.6%	5.2%	-2.3%	1.6%	5.2%	-2.3%	1.6%	5.2%	-2.3%	1.6%	5.2%
Income												
Change in Average Lifetime (25-64) Dollars (2004 $)												
Total	-$7,054	$8,841	$13,852	-$10,853	$13,143	$20,729	-$11,896	$14,726	$21,631	-$12,125	$14,624	$22,332
Earnings	-$6,963	$8,990	$13,835	-$10,308	$13,013	$20,265	-$11,156	$14,305	$20,756	-$9,165	$11,554	$17,892
Dependence												
Change in Years in Poverty												
Poverty 100%	0.03	-0.09	-0.11	0.03	-0.09	-0.10	0.03	-0.08	-0.09	0.02	-0.07	-0.08
Poverty 200%	0.08	-0.16	-0.19	0.08	-0.17	-0.20	0.07	-0.16	-0.18	0.05	-0.15	-0.17
Change in Years of Participation												
Welfare	0.02	-0.04	-0.04	0.01	-0.04	-0.04	0.01	-0.02	-0.03	0.00	-0.01	-0.01
SSI	0.01	-0.02	-0.02	0.01	-0.02	-0.03	0.01	-0.03	-0.04	0.01	-0.04	-0.05
Incarceration												
Lifetime years in Institution												
Corrections	0.02	-0.04	-0.05	0.01	-0.03	-0.04	0.00	-0.02	-0.02	0.00	0.00	0.00
Educational Costs												
Change in State $ per person												
UC/CSU	-$1,069	$695	$1,561	$0	$0	$0	$0	$0	$0	$0	$0	$0
CCC	-$216	$419	$419	$0	$0	$0	$0	$0	$0	$0	$0	$0
High School	$0	$259	$259	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Cost	**-$1,285**	**$1,373**	**$2,239**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Change in State $												
Change in State $ per person												
Change in Tax Receipts / Person	-$529	$663	$1,039	-$814	$986	$1,555	-$892	$1,104	$1,622	-$909	$1,097	$1,675
Change in Dependency Payments	$96	-$282	-$316	$99	-$273	-$300	$86	-$250	-$271	$55	-$210	-$229
Change in Incarceration $	$383	-$830	-$901	$133	-$642	-$728	$68	-$321	-$358	$12	-$46	-$65
Total Savings	**-$1,009**	**$1,775**	**$2,256**	**-$1,047**	**$1,900**	**$2,583**	**-$1,046**	**$1,675**	**$2,251**	**-$977**	**$1,352**	**$1,969**
Net State Savings	$277	$402	$17	-$1,047	$1,900	$2,583	-$1,046	$1,675	$2,251	-$977	$1,352	$1,969
Cumulative Savings	$277	$402	$17	-$770	$2,302	$2,600	-$1,816	$3,977	$4,851	-$2,793	$5,329	$6,820
Savings / Investment	-0.22	0.29	0.01	0.60	1.68	1.16	1.41	2.90	2.17	2.17	3.88	3.05

Figure 4: Net Cumulative State Gains and Losses by Age
(for each Scenario relative to "current conditions" model)