

Describe the time paths of college enrollment versus college completion. When and why do the paths differ? Which (if any) “college access” programs (grant programs, loan programs, savings programs, subsidized tuition, etc.) increase college completion as well as initial enrollment?

Going to college and finishing college:
Explaining different educational outcomes

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College enrollment rates and college completion rates have diverged markedly over the past three decades. Among individuals age 23 in 1970, 23 percent of high school graduates had completed a BA degree while about 51 percent had enrolled in college for some period since high school graduation. For the same age group in 1999, the share of high school graduates who had enrolled in college at some point rose substantially to 67 percent while the share receiving a BA degree rose only slightly to 24 percent of the cohort. The objective of this analysis is to document the changing dynamic between college enrollment and college completion and then to provide a framework for assessing the factors responsible for this shift. At issue is why we might expect some divergence between college enrollment and college completion. On the demand side, I present empirical evidence on compositional changes in the preparation of potential college students and changes in the labor market return for postsecondary investments that may have differential effects on enrollment and completion. In addition, I also examine adjustments on the supply side of the market including the level and distribution of higher education resources. Of particular interest is the extent to which changes in the distribution of students across institutions with different characteristics, as well as changes in the availability of educational resources within institutions, affect college completion. Finally, I consider the role of policy variables – such as portable financial aid and state appropriations – in affecting changes in enrollment and completion.

PRELIMINARY AND INCOMPLETE

More students are attending college than ever before. Yet, undergraduate attainment, measured by years of college or degree attainment, is increasingly diverging from enrollment. Among individuals age 23 in 1970, 23 percent of high school graduates had completed a BA degree while about 51 percent had enrolled in college for some period since high school graduation. For the same age group in 1999, the share of high school graduates who had enrolled in college at some point rose substantially to 67 percent while the share receiving a BA degree rose only slightly to 24 percent of the cohort.¹

That a college education is more important now than ever is certainly cliché, though it is born out by the overall increase in the college wage premium. The value of a college degree in the labor force has also increased, rising from a premium over a high school degree of about 40 percent in 1980 to over 65 percent two decades later. While this change in the structure of wages surely represents, in part, demand-side forces in the labor market, a critical question is whether barriers to collegiate attainment in the higher education market have limited the supply of college-educated workers. Reduced growth in the supply of college-educated workers may hamper long-term increases in productivity while also increasing the degree of inequality in earnings. In this regard, the “output” of the higher education market is a fundamental determinant of the structure of wages and the level of inequality in society. How the higher education market transforms student enrollment to collegiate attainment, including degrees conferred, is fundamental to understanding the determinants of the supply of college-educated workers.

¹ This analysis will concentrate on the link between college enrollment and BA degree attainment; this is not to suggest that attaining a BA degree is the only collegiate credential relevant in the labor market. Data from the Beginning Postsecondary Students Longitudinal Survey indicate that five years after initial enrollment at four year institutions, 2.9 percent of students received certificates, 4.2 percent of students received the Associate degree and 53.3 of students received the BA degree; among students beginning at community colleges, 13.8 percent of students received a vocational certificate, 18.6 received the Associate degree, and 6.1 percent of students received the BA degree within this time frame.

While changes in the structure of earnings have received considerable attention over the course of the last two decades, changes in the timing and level of collegiate achievement have not been as widely recognized (in part because they are more difficult to measure). Emphasis on vaguely defined notions of “collegiate access and affordability”² in public discourse has diverted attention from the monitoring of outcomes of higher education, such as courses completed and degrees awarded. These outcomes are measures of human capital acquired and, while necessarily somewhat inexact, they are indicators of the addition to the stock of skills available to the labor force. Degree and credit outcomes register that a student completed a certain path of study with proficiency, while enrollment measures indicate only transitory participation. That the economic return to a BA degree has risen more rapidly than the premium afforded to some college is but one reason to assess the determinants of degree attainment.

It is important to ask why many education analysts (including economists) focus on the measure of enrollment, which is an indicator of potential investment, rather than degrees or credits which measure human capital stock. One explanation is that enrollment is simply much easier to track than outcomes like credits awarded. To be sure, enrollment is an important measure of individual investment in post-secondary education, capturing the level of individual time committed to the enterprise. Yet, enrollment per se does not capture how individuals, along with colleges and universities, transform this commitment to measured outcomes like BA degrees or course credits. That there may be substantial increases over time in the relative enrollment among individuals from poor families or racial minorities need not imply a narrowing

² “Access” implicitly refers to the extent to which individuals with the same potential benefits from college but different family circumstances have different levels of enrollment (or, more broadly, attainment). Unfortunately, the widely-employed notion of “college access” in public policy circles lacks a clear empirical definition. The term implicitly refers to the principle of equal opportunity for college attendance and attainment without regard to family income, though presenters tend to focus on the measurement of enrollment by family income.

in the difference between these groups in collegiate attainment. It is these differences in attainment, not enrollment, that ultimately contribute to earnings inequality.

The objective of this analysis is to document the changing relationship between college enrollment and college completion, to assess the factors responsible for these shifts, and to consider the implications for economic and policy analysis. In doing so, this analysis sets a new direction for higher education research by documenting the gap between enrollment and completions and identifying the universe of possible explanations. The first section considers the measurement of college enrollment and college completion, focusing on the intersection of results from a range of different data sources. The second section proposes a framework for analysis, starting with the human capital investment framework and putting forward explanations for why individuals who begin college do not complete. In the third section, I provide empirical evidence distinguishing the explanatory role of these various factors. The concluding section summarizes the challenges for future research, as well as suggesting some implications for policy and data collection.

If there is one overriding conclusion to be drawn from this analysis, it is that the traditional focus of economists and policy analysts on the twin variables of “enrollment” and “access” is insufficient to insure the supply of college-educated workers needed to meet demand, to reduce income inequality, and to narrow intergenerational differences in education and earnings. Yet, modeling the process of collegiate attainment is difficult, inherently requiring more information about the nature of educational experiences than is commonly available in large micro data sets such as the Census and CPS. Several factors bear on explaining the increased divergence between college enrollment and college completion. First, the marginal student may be increasingly underprepared academically or come from relatively disadvantaged

family circumstances. Beyond demand side factors, expansion on the supply-side of the market has been dominated by growth of community colleges and institutions with relatively low resources per student; as such, these institutions are able to contribute less to college completion than are institutions with greater resources per student. Public policies, including federal programs such as Pell grants and direct state appropriations to higher education, are not well-targeted and often do not increase opportunities for academically well-prepared students to complete four-year programs.

SECTION I: THE RELATIONSHIP BETWEEN COLLEGE ENROLLMENT AND COLLEGIATE ATTAINMENT

The measurement of college enrollment, college participation and college completion is fundamental to this analysis, but the definition of these variables is often given too little attention. First, college enrollment is inherently a flow variable, representing the number of students participating at a given educational level at a single point in time. College enrollment can be measured from data tabulated by colleges and universities (in which case the age of the enrolled students is often unknown) or it can be tabulated through survey data including the Census, CPS or other sources capturing what an individual is doing at a specific point in time. Collegiate attainment is, on the other hand a stock variable, measuring the sum of education acquired by a given point in time. The metric for measuring collegiate attainment includes measures of credits, years completed, or degrees awarded and, implicitly, the defining feature of these variables is that they are non-revocable.³ The most general stock measure is college

³ Human capital or skills may depreciate, but measured educational attainment does not decrease for an individual with age. Implicitly, when using micro data collegiate attainment is always truncated at a given age, as an individual can always receive more education, but the level will never decrease.

participation indicating that an individual completed at least some college.⁴ A particularly important analytic question is the relationship between enrollment at one point in time and subsequent attainment. In this paper, college completion is used to denote the receipt of a four-year baccalaureate degree, though one might identify other types of completion in the undergraduate pipeline such as receiving the associate degree.

The overall expansion in higher education over the last half century has been dramatic. Total enrollment has increased more than ten-fold since the 1939-40 academic year, rising from about 1.4 million to more than 14 million students. Baccalaureate degree attainment has also increased, but at a more moderate pace, increasing from 186,500 to 1.2 million over this interval (Digest of Education Statistics, Table 171).

Focusing on undergraduate enrollment, the behavior of recent high school graduates (often regarded as the “traditional” market for higher education) is shown in Figure 1. The enrollment rate of this group surged in the late 1960s, for men partly in response to the Vietnam war, and then stagnated in the 1970s.⁵ Between the late 1960s and the mid-1970s, enrollment rates for men and women converged, with the relative decline in enrollment more muted for women than men over this interval. Since 1980, the rise in the enrollment rate of recent high school graduates has been consistent, and the enrollment rate is now near 65 percent relative to about 50 percent in 1980. A key question is how this change in enrollment has translated into a change in collegiate attainment.

⁴ The measure of ‘some college’ follows directly from the data available for the 1970 to 2000 period. Ideally, we would have more direct measures of attainment such as the fraction of the population receiving three years of college. A coding change in large surveys including the CPS and Census shifting the educational attainment question from years of attainment to specified degree attainment makes the comparison particularly difficult. The most ambiguous category in the new scheme is “Some college, no degree” which might include any level of attainment from dropping out in the first semester to completing three years at a four year institution.

⁵ Card and Lemieux (2001b) find that educational deferments effectively raised college enrollment and completion for men likely to be at risk of conscription during the Vietnam war. Card and Lemieux find that draft avoidance raised college attendance rates 4-6 percentage points for men in the late 1960s.

Collegiate attainment is a function of both initial enrollment rates and the transition of the cohort through the education pipeline. Collegiate attainment, measured for a cohort, is also inherently a truncated variable. A birth cohort measured at age 30 will have had more of an opportunity to acquire education than a birth cohort measured at age 23. Yet, the timing of educational attainment is also an economic variable, as individuals acquiring education at relatively young ages will have more years to accrue the returns to skills. By near tautology, increased college enrollment rates of recent high school graduates translate to increases in the fraction of a cohort attaining some college. At issue is whether students' initial enrollment leads to persistence and considerable credit attainment.

Figure 2 presents a snapshot of the educational attainment of young adults and shows the proportion completing college and the proportion with any collegiate participation at the age of 23 from 1968 to 2000. [The data are presented for birth cohorts from 1945 to 1977, which is analogous to the 1968 to 2000 years of observation.] While participation rises in much the same pattern visible in Figure 1, the change in the proportion with a college degree is far more muted. Overall, the average annual increase in the college participation rate is 1.1% while the increase in college completion is a more modest .7%. Beyond the aggregate picture, the data suggest three distinct regimes, with the latest period marking the most substantial divergence between enrollment rates and completion rates. First, for the early cohorts born between 1945 and 1952 (equivalently the children of the baby boom and the college students of the Vietnam era), college enrollment rates and college completion rates both increased sharply for cohorts measured at age 23, with college completion increasing by about 35 percent and college enrollment by about 37 percent over this interval. A reversal followed, with absolute declines in enrollment and completion between the 1952 and 1958 cohorts (those cohorts age 23 between 1975 and 1981),

and the relative decline in college completion (about 13 percent) was somewhat larger than the relative decline in enrollment rates (about 18 percent). Then, from the 1958 cohort on, college enrollment increased markedly, surpassing the 1952 local maximum by 10 percentage points by the time those born in the late 1970s reached the age of 23.

Thinking about the difference between enrollment rates and completion rates as a difference in levels conveys much of the same information and also illustrates the widening gap between enrollment rates and completion in recent birth cohorts. Among those born in 1957 and age 23 in 1980, the expected difference between enrollment and BA completion among high school graduates was about 27 percentage points; by 2000, the gap was 36 percentage points for the cohort age 23 (born in 1977). It follows that the college completion rate (the share of those with some college receiving a degree) decreased from nearly 40 percent to about 34 percent, with this trend shown in the bottom panel of Figure 2.⁶

Turning to the same trends in college participation and completion for demographic subgroups, Figure 3 shows the trends for men and women (Panel A) and blacks and whites (Panel B). Gains in college participation are marked for blacks, rising at an average annual rate of 2.5 percent, though these gains are not replicated in the completion measure. Men and women display about the same modest overall decline in completion rates, but for men this is against a backdrop of stagnant college participation while college participation has been rising over all for women. For each subgroup, completion rates decline over the entire interval, though the decent is strikingly larger for blacks than for those in other ethnic groups.

⁶ Define CG as the overall graduation rate (college graduates/population) and SC as the college participation rate (some college/population). The completion rate, or probability of graduation conditional on enrollment, is $CR=CG/SC$. It follows that the difference between the graduation rate and the participation rate is $SC-CG=SC(1-CR)$ and thus widens with either an increase in college attendance or a decrease in the completion rate.

It is quite possible that the observation of individuals at age 23 provides a truncated picture of completion; changes in time to degree and the age structure of enrollment may be a significant part of the story. To provide a firmer understanding of how these measures of collegiate attainment change over time, Figure 4 shows college completion and college enrollment over time for different age levels. What is striking is the divergence between the top panel, showing participation, and the bottom panel, showing completion. For the most part, students who will participate in the collegiate system have had at least some college by age 22, as the share recording some college for each birth cohort at this age is nearly identical to the share with some college for age 30. It is in the bottom panel showing college completion where we see substantial divergence by time and by age. While for all cohorts there are gains in BA completion by age, these differences become particularly pronounced after the 1955 birth cohort, where the share of 22 year olds with a BA degree actually declines while degree receipt increases at older ages, particularly over 25. That few of the students beyond age 22 are ‘new participants’ provides an indication that either the duration of enrollment required to receive a BA has increased or more students complete their degrees after a series of ‘spells’ of discontinuous study. Thus, for students receiving BA degrees between age 28 and 30, the total time to degree likely exceeds 10 years.⁷

In the interpretation of these dynamics in college participation and completion, a salient question is how and when students from different circumstances contribute to the widening of the gap between participation and completion, as well as by the expansion of time to

⁷ A significant concern is that measured changes in degree completion may capture “education inflation” rather than degree attainment. One reader suggested that respondents might feel more self-conscious about having not yet have completed by age 28 than at age 23. Tabulations from the NLSY help to address this question, as we can examine year-to-year changes in educational attainment for those not enrolled during the prior year. If recording errors were random, about the same share of people would report losing a year as the share reporting gaining a year. While about 0.004 of those age 30 reported a year less of education attainment, more than 0.03 reported an increase in attainment without a corresponding increase in enrollment.

baccalaureate. Figure 5 shows enrollment by age and race from decennial Census calculations. What is clear is that while black enrollment is slightly greater, on average, than enrollment of whites at older ages, there are large differences in the opposite direction in the 18-20 age range.

To bring these points together, Table 1 presents the average annual rates of change in college participation, BA completion, the ratio of BA completion to participation, and the absolute difference between participation and completion over the more than three decades between 1968 and 2000 for a range of ages and demographic classifications. Focusing first on the completion rate conditional on enrollment measured at age 23 produces the consistent result of a declining completion rate, with this decline somewhat larger for blacks than for other groups. The completion rate declined significantly, while the absolute difference between participation and completion rose appreciably.

This analysis demonstrates several related, yet distinct, changes in the pattern of collegiate participation and attainment. First, the rate at which college participation is transformed into degree completion (what we will call the completion rate) has decreased over time when outcomes for those in their early 20s are examined. This divergence is particularly large for black Americans. Second, when attainment is examined at somewhat older ages, there has been little overall change in the completion rate. Thus, increased enrollment and attainment among older students in recent years compensates for lower levels of completion among traditional-age college students, leading to an increase in the median time to degree among those receiving BA degrees.

A particular concern is how the trends in college completion are related to family circumstances. While race is one characteristic associated with the likelihood of disadvantage in youth that is observed in data like the CPS and Census, the absence of measures of parental

income (and education) in these sources results in an incomplete picture of the extent to which economic circumstances and high school achievement affect college enrollment and completion. Other longitudinal micro datasets such as High School and Beyond allow for tabulations of college going by family income and student achievement. Drawing on a range of secondary tabulations (notably Ellwood and Kane, 2001 and Carneiro, Heckman, and Manoli, 2002), Table 2 summarizes the relationship between college participation and student achievement at several points in time, representing cohorts graduating from high school in the early 1980s and 1992. While there is a persistent difference at nearly all levels of achievement by family income, what changes over the period of observation is a decided narrowing in enrollment differences among high achievement students and a widening of the difference among low achievement youth. This suggests that widely-reported aggregate trends showing a persistent difference in enrollment rates by family income miss a significant shift over time -- with a narrowing of the participation gap by family income among the best students.

The next question is how enrollment by family income corresponds to completion by family income. [Note that these calculations are particularly difficult owing to the need to observe educational outcomes for individuals in their 20s in relation to the income of parents of these young people when they were teenagers.] Looking at different cohorts from the Panel Study of Income Dynamics, with the row entries representing age 16, the overall share of students receiving a college degree from the low-income quartiles has not changed markedly over time, while the share of students receiving a college degree among high-income students has increased from 32 percent to 47 percent (Table 3). Carneiro, Heckman, and Manoli (2002) examine college completion by family income and student achievement in the NLSY and also find striking differences in completion rates, with these differences particularly large among high

achieving students. This finding of substantial differences in college completion rates among academically well-prepared students from different income groups suggests that short-run credit constraints may inhibit collegiate attainment. What Carneiro, Heckman, and Manoli (2002) emphasize is that differences in collegiate choice, as well as delays in initial enrollment, are likely to be margins along which credit constraints have consequences for high ability, low income youth.

What is more, college selection has become considerably less stratified by family circumstances among the most academically able high school graduates. In testifying on the extent to which college costs presented a fundamental barrier to collegiate attainment, Hoxby (2000) compared college choices among the high school classes graduating in 1972 and 1992 by income and ability quintile. In 1992, very high ability students from the bottom of the income distribution were no less likely to attend high-cost schools than were very high ability students the highest income group. Over the two decades of observation, financial circumstances become less important as a factor determining to the distribution of students across schools at the top of the achievement distribution; the share of students who were from the poorest families but in the top and fourth ability quintiles attending the most expensive schools increased by 14 percentage points and 12 percentage points, respectively.⁸

At the bottom of the achievement distribution, the story is somewhat different: more low ability, high-income youth are going to college than ever before. The increased college attendance among low-ability, high income students is particularly striking: the share of students attending college in the bottom two ability quintiles with family income over \$50,000 increases

⁸ Further evidence to this point is the substantial increase in the level of test scores at the most selective institutions over time as measured by the comparison of test scores for students entering in 1976 and 1989 shown by Bowen and Bok (1998). Moreover, this analysis shows increases in the level of economic and racial diversity among students enrolling at these institutions.

between 16 and 18 percentage points over this two decade interval. While low ability, high income students are less concentrated at the selective institutions than in 1972, it is nevertheless the case that this is the point in the achievement distribution where differences are the largest. Thus, it is plainly too simplistic to make sweeping statements about “collegiate access” changing by family income.⁹ High achieving students from low-income families have more opportunities than ever before to attend college and to attend some of the most selective (and expensive) institutions in the country. Low-achieving, low-income students are, however, more limited in their college enrollment, but such outcomes are more likely to result from barriers at the elementary and secondary levels than the limitations of the higher education market.

The interpretation of this descriptive picture and the inferences that should be drawn depends heavily on how this data fit in a broader picture of the labor market and the education market. That more people than ever are going to college but college completion rates are falling (or stagnant at older ages) is not, in itself, cause for concern -- if this pattern corresponds to objectives. Yet, given the evidence of substantial increases in the return to degree attainment matched with only modest changes in the returns to sub-baccalaureate attainment, there is at least a *prima facie* case for investigating the determinants of college degree completion.

⁹ For example, the report “Access Denied” (2001) makes the broad claim that “the current generation of low income young Americans today face diminished educational and economic opportunity as a result of lack of access to a college education.” Similarly, an editorial in the *New York Times* makes the sweeping statement, “The dearth of student aid for lower-income families is discouraging the neediest from applying to college at all and driving them toward low-paying jobs that keep them at the very margins of society. These are ominous developments at a time when a college diploma has become the ticket for admission into the new economy and a basic requirement for a middle-class life. The most alarming figures show that the college attendance gap between high-income and low-income Americans has widened and that about a quarter of high-achieving low-income students fail to go to college at all.”

SECTION II: EXPLAINING COLLEGE COMPLETION

Explanations for college attrition must explain why a person who begins college does not complete. The basic human capital investment problem suggests a number of potential explanations. First, the economic returns to additional time spent in college may fall over the investment horizon, as such it would be optimal for some individuals to terminate their schooling at the end of two-years rather than pursuing four years of study. A second, and related, type of explanation is that costs of persistence in college rise with duration of study. These cost increases may take a number of different forms, including the non-pecuniary costs of the increased difficulty of study of upper division courses relative to lower division courses, greater direct expense of upper division courses, or capital market costs associated with the exhaustion of borrowing capacity. Thus, costs reflect both differences in individual circumstances and variation in supply-side factors among colleges and universities. A third type of explanation focuses on uncertainty about the costs and benefits of collegiate investments, with initial participation providing information about the costs and returns to education that was not available a priori. Finally, a fourth consideration is that individuals may make systematic mistakes in their college enrollment choices, with some individuals enrolling with little ultimate chance of completion.

In the section that follows, I begin with the consideration of the basic human capital investment problem and, particularly, the extent to which increasing costs or decreasing benefits are likely to be substantial explanations for college attrition. Then, I turn to the set of explanations for college attrition that rely on the revelation and utilization of information in college enrollment, choice and persistence. The contribution of this section is to present the full range of potential determinants of the observed pattern of collegiate attainment. Changes in the

structure of wages, reflecting the benefits to college, cannot possibly explain the observed pattern in attainment, as the increased return to college degrees pushes toward more attainment rather than less. To this end, variation in the costs of education may play an important role in generating the divergence between college participation and completion. Beyond explanations based on the solution to the human capital problem under perfect certainty, risk and the extent to which individuals use all available information in their education investment decisions may fundamentally affect collegiate attainment.

Human Capital Investment Problem: Costs and Benefits of Persistence

In general, attending college bears many similarities to other investment decisions like buying a car or a piece of machinery at a firm. Potential students weigh the benefits from collegiate choices with the costs. Benefits include higher earnings over the remaining working years, and whatever consumption utility (or disutility!) is associated with the educational experience. Costs include the direct costs of college and foregone earnings. While tuition costs receive most of the attention in the popular press, it is the foregone earnings that typically form the largest share of college costs. Typically – and in very general form – economists model the college choice as individuals (i) choosing among the range of collegiate options (both school quality (*j*) and attainment(*s*)) to maximize lifetime utility, with a numeraire reflecting the option of no college.¹⁰ Individuals are likely to differ in a number of dimensions including the perceived returns from particular collegiate options and the available set of choices. The choice set varies with both institutional admissions decisions and factors potentially unrelated to economic returns such as distance to a college or state of residence.

¹⁰ Explicit specifications of this model of college attendance and choice are available in a number of studies including Manski and Wise (1983) and Long (2001), as the formal structural approach to this question has received increased attention in the literature.

Assuming full information about earnings and the nature of the college experience, individuals must choose the length of the program and the college or university to attend to maximize utility. To simplify, one way to proceed is to frame the question as a financial investment decision, with individuals choosing the length of enrollment (s) and the particular college program (j) in order to maximize the lifetime value of earnings:

$$\text{Choose } s, j \text{ to maximize } \sum_{t=s+1}^T \frac{Y_{sji}}{(1+r)^t} - \sum_{t=1}^s \frac{F_j}{(1+r)^t} - \sum_{t=1}^T \frac{Y_{0i}}{(1+r)^t}$$

where Y_{sji} is the annual earnings for individual i attending institution j for s years, Y_{0i} is the annual expected earnings with no further education, and F is the level of direct college costs.¹¹ Implicitly, this specification assumes no limitations in credit markets with individuals able to borrow and lend at the market rate r . Thus, for individuals enrolling in college, the program choice has passed a cost-benefit test such that:

$$\sum_{t=s+1}^T \frac{Y_{sji} - Y_{0i}}{(1+r)^t} - \sum_{t=1}^s \frac{F_j - Y_{0i}}{(1+r)^t} > 0$$

where the first term reflects the benefits to college attendance and the second term captures the costs in terms of both direct expenditures such as tuition and forgone earnings.

Taken at face value, this simple formulation leads to a number of important predictions. First, individuals who make collegiate investments will invest in the initial periods rather than in later years. Early investment provides more years over which to accrue the benefits.¹² Second,

¹¹ Discrete time discounting, payments at the end of each period, and the assumption of fixed annual payments are assumed for expositional simplicity. Adding appropriate timing of payments (tuition at the start of the period) and growth of earnings of the life-cycle does not change the substantive implications.

¹² To illustrate, four years of college attendance initially is preferred to four-year college after a hiatus of four-years so long as: $\sum_{t=5}^T \frac{Y_C}{(1+r)^t} - \sum_{t=1}^4 \frac{F}{(1+r)^t} > \sum_{t=1}^4 \frac{Y_H}{(1+r)^t} + \sum_{t=9}^T \frac{Y_C}{(1+r)^t} - \sum_{t=5}^8 \frac{F}{(1+r)^t}$. It can be shown that this inequality holds so long as $(\frac{Y_C + F}{Y_H + F})^{1/4} - 1 > r$ which must be the case because even with an infinite period

individuals choosing to invest in college will generally choose immediate and continuous enrollment to a split of time between college attendance and employment at the non-collegiate wage.¹³ Increasingly, these predictions are violated by the data as there is increasing evidence of discontinuous spells of enrollment and extended time to degree. Important missing pieces from this analysis include the role of uncertainty in assessments of costs and benefits and the potential presence of credit constraints.

Benefits: Labor market incentives

Collegiate attainment is fundamentally a derived demand: the wage opportunities defined above are determined by the state of production technology, the demand for goods and services, and the existing supply of labor of different skill levels. The market sets fundamental incentives for college completion through wages. Increases in the labor market return to college investments are, perhaps, the most significant change over the course of the last two decades in the incentives for college investment. As long-run returns to collegiate attainment rise, so too should college enrollment and completion.¹⁴ Yet, while there is no puzzle in enrollment behavior, which has risen markedly since the 1980s, the absence of sustained increases in college

over which to recoup returns, the individual attends college only when $\sum_{t=5}^{\infty} \frac{Y_C}{(1+r)^t} - \sum_{t=1}^4 \frac{F}{(1+r)^t} > \sum_{t=1}^{\infty} \frac{Y_H}{(1+r)^t}$,

which holds only when $(\frac{Y_C + F}{Y_H + F})^{1/4} - 1 > r$. [The solution is a simple application of perpetuities.]

¹³ A simple demonstration is provided by the comparison of full-time attendance for four years to part-time attendance and employment for eight years: $\frac{1}{2} \sum_{t=1}^8 \frac{Y_H}{(1+r)^t} + \sum_{t=9}^T \frac{Y_C}{(1+r)^t} - \frac{1}{2} \sum_{t=1}^8 \frac{F}{(1+r)^t}$. It can be shown that

full time attendance is preferred so long as $(\frac{2Y_C + F}{Y_H + F})^{1/4} - 1 > r$, which will again hold whenever any college has a positive net present value.

¹⁴ One might also consider the role of short-term changes in economic conditions and the structure of wages as a potential explanation for the observed trends. Yet, it appears that much of the variation we observe in both enrollment and completion is low frequency, rather than high frequency, implying that this is not a viable explanation. In periods of high unemployment, the opportunity cost of college enrollment is low (in the absence of credit constraints) thus producing a countercyclical pattern in enrollment, which may not be mirrored in degree completion. See Betts and McFarland (1995) and Card and Lemieux (2001).

completion presents more of a conundrum. That the return to a college degree has risen more than the return to “some college” as shown in Figure 6 would lead to the hypothesis that college completion should have increased markedly over the last decade. Yet, the expected changes run absolutely counter to the observed difference between enrollment and completion. Thought of most simply in terms of the Mincer return to education specification, increasing returns necessarily widens the relative wage gap between sub-baccalaureate attainment and baccalaureate attainment, in addition to the well-known change in the high school wage gap. Put differently, in a linear specification, the population with ‘some college’ would need to be increasing its attainment if relative wages between some college and college completion were to hold constant in a regime of increasing returns to education.¹⁵

Yet, there is widespread evidence that employers continue to reward degree attainment, beyond seat time in the classroom, as measured by sheepskin effects in a number of empirical studies including Jaeger and Page (1996). While Kane and Rouse (1995) argue that there is little difference in the return to a college credit by type of institution for students at the margin between attending community colleges and four-year institutions, they also find some significant degree effects for women at the associate degree level (generally 2-year college degrees, including nursing) and men at the BA level. Jaeger and Page (1996) find that returns to years of schooling are small relative to the degree effects associated with BA-level degrees. The presence of degree effects underscores the significance of the gap between college enrollment and college attainment because the ‘loss’ associated with non-completion is much greater than if

¹⁵ Kane and Rouse (1995) present information (Table 4) suggesting that the average income of those with “some college” relative to a college degree stayed nearly constant between 1970 and 1990 at about .8. Estimates using decennial Census data suggest that the benefits of “some college” relative to a high school degree are much smaller. For men age 30, calculating the return to BA-level completion and “some college” for men with log hourly wages as the dependent and controls for part-time status and race, suggest that the percentage increment associated with college completion relative to a high school degree is 40 percent in 1980 and 67 percent in 1990, while the return to “some college” relative to high school completion is 14 percent in 1980 and 22 percent in 1990; these calculations point to a some college/BA ratio of about .33 in both years.

only “seat time” in college produced higher earnings.¹⁶ What is clear is that changes in the structure of wages over the last two decades forecast an increased completion rate, rather than the stagnant or widening observed relationship between initial college participation and degree completion.

Costs: Individual Constraints

The basic human capital model assumes that individuals are able to borrow at a market rate (r) in order to finance college. The violation of this assumption owing to the reluctance of banks to make loans that they are unable to collateralize will lead to an underinvestment in education at the collegiate level. Inability to borrow to finance education “up front” may explain why individuals may work before enrolling in college or pursue studies on a part-time basis. Moreover, even with some capital provided through government-sponsored student loan programs, students may exhaust borrowing capacity relatively quickly, forcing the termination or postponement of continued college study. Credit constraints are likely to be particularly significant for students from economically disadvantaged backgrounds. Providing clear identification of credit constraints in an empirical context is no easy task as economic disadvantage, including the inability of parents to contribute to the financing of college, is likely to be correlated with other factors determining collegiate outcomes, some of which may be difficult for researchers to observe.¹⁷ [In this regard, the differences observed in Tables 2 and 3

¹⁶ At issue is whether the failure to obtain degrees or complete a course of study reflects individual characteristics such as academic preparedness, market failures such as credit constraints, or supply constraints that affect attainment. The empirical observation of these effects does little to help us separate among these explanations. Moreover, the observation of these effects does not distinguish between additions to human capital and signaling explanations for the return to education, as courses taken – in addition to individual effort expended – may differ markedly between individuals with observationally similar credits or time in the education pipeline.

¹⁷ Two of the strongest pieces of evidence that potential college students would be better off with more access to credit markets are provided by examinations of federal loan programs. First, Kane (1999, Figure 4-1) demonstrates a high degree of stacking in the distribution of student loans, with many students apparently constrained at the lower division limit of \$2625 and the upper division limit of \$4,000. In addition, Dynarski (2002) finds significant changes in attendance behavior with the removal of home equity from the needs analysis formula in

are *not* proof of credit constraints.] Using data from the NLSY, Cameron and Taber (2000) explore a number of different estimation strategies and fail to find evidence that borrowing constraints affect collegiate attainment. In a very different type of study, Stinebrickner (2001) examines the collegiate progression at Berea College, a school where all students receive full-tuition scholarships, and finds that completion rates are persistently lower among the most economically disadvantaged, even when observable student characteristics such as test scores are held constant. Such results are striking, though ultimately leaving some puzzles unresolved, as one explanation is that credit constraints persist because student financial needs extending beyond direct college costs, while an alternative explanation is that there are other factors correlated with family income affecting outcomes. Over time, changes in the level or distribution of family income may affect the proportion of potential college students likely to face credit constraints. How state and federal policy interact with individual economic circumstances to determine the capacity of an individual to finance higher education is an important empirical question, with considerable implication for understanding the observed pattern of collegiate attainment.

Beyond the pecuniary costs of college and the capacity of individuals to finance these investments, cognitive and non-cognitive skills affect the costs and returns to collegiate investments.¹⁸ Poor secondary performance plausibly explains some college attrition as students who have difficulty skills with such as algebra or written expression may find the costs associated with upper-level courses in which these skills are a prerequisite prohibitive.

Variations across local areas or over time in the effectiveness of elementary and secondary

the early 1990s. Still, these observations do not demonstrate that increasing access to credit would increase collegiate attainment and completion.

¹⁸ In this chapter, individual cognitive and non-cognitive skills are considered as part of the cost of collegiate attainment. Quite plainly, such characteristics affect both the costs and the returns to marginal investments in education. For a model illustrating individual heterogeneity in costs and returns, see Card (2000).

schooling could explain some of the observed changes in the level and timing of college completion. Moreover, failure to complete traditional high school degree programs may be an important indicator that individuals lack the task commitment and other non-cognitive skills necessary to complete college. As such, changes in high school dropout rates and GED receipt may be a significant indicator of the potential for college completion. Because education is fundamentally iterative (unlike other investments such as home ownership or owning a bond), costs in at the collegiate level are related to outcomes in prior periods.

Costs: Variation on the Supply-side of the Higher Education Market

Variation in the price and quantity of potential collegiate options generated by exogenous changes in policy on the supply side of the market is one factor that may lead to differences across states or changes over time in college completion. It perhaps goes without saying that the education market is distinguished from the automobile industry by the institutional organization of the providers. Most (though not all) colleges and universities are either public institutions or private non-profit institutions and face objective functions more complicated than the profit maximization model in the traditional theory of the firm framework.¹⁹ One implication of the mixed-market structure in higher education is that it is likely inappropriate to assume perfect elasticity in supply, and how institutions adjust to demand shocks is, itself, an important question for economic analysis. In addition, political control of public institutions, combined with significant subsidies from private and public sources, introduce considerable potential variation in tuition levels and the capacity of colleges and universities.

¹⁹ Because the objective functions of private, nonprofit institutions are not transparent, they may respond to other considerations such as the quest for prestige (Ehrenberg, 2000) and quality maximization. Economic theory, as well as historical accident, offers some explanation for the institutional structure in higher education. First, as argued by Hansmann (1980), the nature of the educational product (difficult to observe) necessarily leads to a principal-agent problem with for-profit provision. Second, the complementarity between teaching and other aspects of the academic enterprise like research, gives non-profits some advantage in the market. Finally, the presence of highly-subsidized public institutions makes it difficult for for-profits to enter the market.

In an empirical context, variation across states or over time in college tuition or the supply of different types of college options will lead to variation in the costs of persistence. Similarly changes in program parameters for state and federal financial aid programs yield variation in college costs which would be expected to affect persistence in college; the empirical importance of these factors are discussed in Part III. Increases in college price, particularly the difference between the tuition charged by two-year and four-year institutions, might have an adverse impact on persistence, though direct college charges are small relative to opportunity costs. *Ceteris paribus*, increases in net college costs decrease attainment (weakening the link between enrollment and completion), while reduction in net cost increases attainment.²⁰ It is particularly important to focus on “net price” rather than sticker price in evaluating how college costs affect enrollment and completion, as work by Hoxby (2000) and others demonstrates that changes in net price over the last two decades have been appreciably less than changes in the “sticker” price of college.

Similarly, decreases in the quality of offerings or reductions in relative capacity at upper-level institutions would adversely affect persistence. It is well documented that institutional resources (some of which are very difficult to measure) affect both the economic benefits to college attainment as well as the likelihood of completion. Just as we would expect individuals with relatively strong elementary and secondary options to complete more years of education (Card and Krueger, 1996), so too will individuals attending relatively high quality education options complete more years of education. The important question in explaining variation in

²⁰ In considering the effects of public subsidies on collegiate participation and attainment, the characteristics of students at the margin will have a large effect on outcomes, particularly if the college preparedness of students receiving aid differs markedly from that of those likely to attend college without aid. Moreover, as the student at the enrollment margin changes in college preparedness, so too does the likelihood of college completion, that is, $d BA / d Aid$ may well decrease as students further down the achievement distribution choose to enroll in college.

college persistence is whether there are substantial differences in the quality of offerings by colleges and universities between states or over time. Changes in state policies, as well as overall changes in market structure, may lead to changes in college quality between institutions, as well as within institutions, which would affect the return to collegiate attainment and observed persistence. One hypothesis, which is addressed in the next section is whether political shifts at the state level affect the relative support for community colleges relative to four-year institutions.

At one margin, a reduction in state support to higher education would be expected to reduce college quality at public institutions and, in turn, attainment of students choosing to attend these schools. In the other direction, increases in endowment income or private contributions lead to increases in resources (at constant tuition revenues) and, hence, collegiate attainment. The unusual character of higher education in which students are both customers and inputs to the production process (Rothschild and White, 1995) implies that increased sorting of students among institutions necessarily increases quality at the most selective institutions while reducing quality at the least selective institutions.²¹

Uncertainty, Information and College Persistence

Economists typically develop models of collegiate investment under the assumption that all of the parameters of the college investment problem are known to potential students at the time of college choice and that individuals do not make systematic mistakes in their assessment of the investment problem. Information available to potential college students and the ex ante uncertainty associated with different choices may have a substantial impact on the college investment problem and may explain behavior not well-described in the traditional human capital

²¹ To this point, Bowen and Bok (1998) find that at a sample of the most selective colleges and universities completion rates narrow, not widen, between the 1976 and 1989 cohorts, with first-school graduation rates rising from 77 to 85 percent.

investment problem. Two types of information problems may contribute to the gap between enrollment and college completion:

- i. Individuals face considerable uncertainty about both the costs and the benefits to college investments.
- ii. Individuals make systematic mistakes by enrolling or persisting in college when it is perfectly predictable, given available information, that the costs of college completion will outweigh the benefits.

I address each of these explanations in turn. Note that the first explanation is an economic argument involving uncertainty, while the second is inherently not an economic argument but a psychological argument.

Option Value

Collegiate attainment is really an investment under uncertainty.²² As individuals consider college options they must form expectations about the true costs and returns, as well as assessing the likely variation in their forecasts of these variables. Variation in costs derives from uncertainty about one's own ability, the ability of classmates, and the characteristics of the college experience (the quality of faculty and so forth). Variation in the returns comes from uncertainty about future demand and supply conditions in the labor market. Taken together, these sources of variation imply that college is a risky investment, particularly since it can not be bought and sold and the risk cannot be separated from its owner through diversification.²³

²² Notably, the traditional human capital model as formulated by Becker and Mincer does not account for this uncertainty and a more realistic formulation would present collegiate attainment as a sequential choice under uncertainty. Both Manski (1989) and Altonji (1993) present such models.

²³ Levhari and Weiss (1974) present a model of the effect of risk on human capital investment. They make the further point that, under the circumstance where the variance in return increases with education, the average return (across individuals) will exceed the private marginal return providing a rationale for a transfer of resources to human capital investment. In short, society is able to diversify the risk where individuals cannot.

One of the gains from college enrollment may be additional information about individual aptitude and individual preferences for college work. Thus, while some individuals would not invest in college *ex poste*, the *ex ante* return is positive. In this regard, initial college attendance has an option value. Altonji (1993) provides a formal model of this decision process, with new information on individual ability and college characteristics affecting persistence from enrollment to college completion. An interesting question is whether one strategy individuals use to reduce the risk associated with collegiate investments is to combine school and work. Such a strategy would allow the accrual of both education and work experience, while coming at the cost of somewhat longer time to completion in the collegiate program.

It is also likely that the variance in potential costs of college may vary systematically with individual characteristics, as potential students from the most advantaged backgrounds may have better information about different types of college options because they have more opportunities for campus visits and other types of information gathering. Research in progress by Kane and Avery studying the Project COACH intervention in financial aid guidance and college application at a number of schools in Boston is likely to shed considerable light on the role of information available to high school students as they consider college options.²⁴ Public policies that reduce the uncertainty in college investments may have significant returns,²⁵ yet, it is inherently impossible to eliminate all of the uncertainty associated with investments in education.

²⁴ . In another example, Avery and Zeckhauser (2002) note that the early decision process may favor those from relatively affluent educational settings who are well-informed about the “rules of the game”, while others are effectively “informationally disadvantaged” in their college selection, which would ultimately affect college choice and persistence.

²⁵ In addition to programs that serve to increase the information set and, in turn, the quality of collegiate matches, income contingent loan programs are a widely discussed approach to reducing the uncertainty associated with earnings outcomes (see Kane, 1999, for a full discussion).

Systematic Mistakes: Psychological explanations

Youth predictions about success in college may be inconsistent with actual academic prospects and, as such, they may make mistakes in enrolling in college when it is predictable that the likelihood of a positive return is very poor. Placed in the context of recent analysis at the intersection of economics and psychology, one might consider this to be “belief perseverance” or “overconfidence bias,” capturing the reluctance of individuals to abandon college aspirations after receiving poor academic marks at the secondary level.

Much of the exploration of these psychological explanations for college attrition has fallen to sociologists, with one of the earliest assessments attributable to Burton Clark (writing in the 1960s) who hypothesized that open access institutions like community colleges may serve a function of “cooling out” and thus have very high attrition rates. Rosenbaum (2001) suggests that one explanation for high college attrition is the mismatch between expectations formed in high schools which encourage a “college for all” norm, while failing to provide clear guidance on the academic requirements for degree completion. The “college for all” norm is not just a coined phrase but an empirical observation as 95 percent of high school seniors in the class of 1992 planned to attend college, despite the fact that nearly half of the 12th grade students’ math and verbal skills were below the ninth grade level. Rosenbaum’s assessment of degree attainment a decade after high school for the 1982 cohort shows that aspirations are insufficient to guarantee degree attainment. Among those with BA aspirations, about 66 percent of those with As in high school had received a BA degree while only 16.1 percent of those with Cs in high school had achieved the BA degree. At a more general level, Rosenbaum finds that those with low high school grades are the most likely to enter college and complete 0 credit hours, with nearly 13 percent of C students with BA aspirations ending up with this outcome.

That empirical economists may do significantly better than some college students in assessing collegiate prospects should not be interpreted as a triumph of the profession; rather, this observation suggests a need to look more closely at the individual decision making process. Rabin (1998) and Kahneman and Tversky (1974) provide general discussions of how the process of choice observed by psychologists may violate the assumptions of economics. The question for collegiate attainment is whether experiments that change the way individuals employ available information in the college choice process will change the return to education and the observed enrollment and persistence decisions.

SECTION III: EMPIRICAL EVIDENCE ON THE DIVERGENCE

Understanding why college completion has not increased over time depends on the determinants of college going, college choice, and college persistence. On one side of the market, changes in the characteristics of individuals – both financial and academic – affect collegiate attainment. On the other side of the higher education market, the structure of the production functions for colleges and universities and the level and form of state support for higher education affect the price, quality, and availability of undergraduate options and, in turn, affect the observed level of educational attainment.

The study of the determinants of college persistence is complicated by the usual identification problems in applied work. The observation of decreased completion among those age 23 or increased time to degree does not resolve the question of whether changes in student demand, such as decreased family financial resources, or changes in the offerings of colleges and universities account for the outcome. The clear statistical identification of the impact of competing explanations is a difficult challenge that is largely unresolved in the empirical

analysis that follows. Rather, the following section presents empirical evidence that addresses the plausibility of competing explanations for the widening of the gap between participation and completion. I begin with the assessment of underlying changes in demographics, family circumstances and student achievement that may affect attainment at the collegiate level and BA attainment. Then, I turn to the institutional and policy variables that are likely to affect college completion.

A. Demand side

Parental resources

The widely discussed changes in the structure of earnings have significant intergenerational effects, leading to increased inequality in parental income and thus the capacity to finance college. The top panel of Figure 7 illustrates real family income in families with 15 to 17 year olds by quartile and shows the widely-known result that after 1980 there has been a substantial divergence between the top and bottom quartiles. Because the primary source of this divergence is the increased return to education, potential students in the top quartile of the income distribution are increasingly likely to come from a family with a college-educated parent. The bottom panel of Figure 7 shows maternal educational attainment by income quartile over time. Among those teens in the top quartile of the income distribution in 1980, about one-fifth had a mother with a college degree. By the year 2000, this share had doubled to about 40 percent, while the change in the collegiate attainment of those in the bottom quartiles was much more modest. What is striking is the concentration in the rise in parental education in the top quartile of the income distribution. Thus, young people of college age in the top of the income distribution in the 1990s are better off than those in the same relative position in the income distribution in the 1970s for two reasons: their parents have more real financial resources and

they are more likely to benefit from a college-educated parent. College participation and college completion are expected to rise with family income; at issue is the expected relative change in these outcomes.

What matters for this analysis is how changes in parental education and the level and distribution of parental income affect the link between college enrollment and college completion. One way to address this question is to estimate the change in college completion under the assumption of a known cross-sectional relationship between collegiate outcomes and parental characteristics.²⁶ Taken as descriptive parameters, cross-sectional expressions show the very powerful relationship between maternal education and expected collegiate outcomes. The effects of parental income are also significant, but somewhat less robust, likely reflecting the presence of more measurement error in the reporting of income than education and the high correlation between parental education and income. Focusing on cross-sectional estimates from the National Longitudinal Survey of Youth, collegiate degree attainment by the respondent's mother corresponds with a 14 percentage point increase in the probability that the respondent will attain a BA and a 6 percentage point increase in the likelihood of college participation by age 28.²⁷ Thus, the dramatic increase in maternal education among potential college students from 6.4 percent of mothers of those in their teens in 1970 to 21.2 percent of mothers of teens in 2000 would have led to a narrowing in the difference between college participation and college completion for those entering college in the last three decades. Thus, changes in other factors –

²⁶ This approach assumes constant parameters over time in the relationship between parental characteristics and collegiate outcomes, correct specification of the cross-sectional regression equation, and the absence of general equilibrium adjustments associated with changes in college going.

²⁷ All coefficients are statistically significant; other included covariates include dummy variables for maternal education at the some college and high school degree levels, race and sex. Estimates with the inclusion of respondent's AFQT score produce effects of maternal college education of .06 and .14 on college participation and college completion, respectively.

at the level of the individual college student or in the market for college education – must swamp the expected increase in college completion associated with the rise in maternal education.

Student Achievement

While parental educational attainment has risen over the last two decades, student achievement has not followed suit. Judging by standardized test scores, there has been a modest decrease over time in the college preparedness of high school students. For example, average NAEP math scores for 17 year olds have decreased by about 10 points since 1970. With a 9 percentage point increase in the college participation rate, this change implies that the student at the margin of college enrollment has declined about a quarter of a standard deviation in test performance, as illustrated in Figure 8.²⁸ Combined with increasing rates of college-going, the implication is that the marginal college student may be less prepared to complete the college curriculum than students attending college in prior decades.

What is more, there are other potential changes in college preparedness to consider, including the observation that more and more college students are entering with a GED rather than a traditional diploma. Although high school graduation is often thought of as an important part of the educational pipeline through which students advance, a regular high school degree need not be a pre-requisite for college enrollment, particularly at community colleges or other open access institutions. Many institutions accept the GED as a substitute for a high school diploma and a number of institutions allow older students to enroll without an equivalency certificate. Beginning with the reauthorization of the Higher Education Act in 1976, a high school degree was not required to receive federal financial aid under the Title IV programs, but

²⁸ Plainly, these calculations are oversimplified as they assume that college-going is perfectly correlated with test scores. Nevertheless, the calculations are illustrative, providing an upper bound on the extent to which achievement changes affect college completion. We can back out the effect of achievement on college persistence necessary for changes in test scores to accord with observed levels of college completion.

only an "ability to benefit" from postsecondary training. The potential increase in the proportion of college students without a high school degree may adversely affect the attainment prospects of entering college students, as this group is implicitly less select. While there is a long literature debating the returns to a high school degree, it seems plausible that whatever characteristics of persistence are associated with high school completion may also affect college persistence -- even if these "skills" are somewhat different than measured cognitive achievement. Figure 9 shows the increase in GEDs awarded in the population, as well as the decrease in the share of recent cohorts receiving traditional high school diplomas. Moreover, the rise in the share of test-takers who are 19 years of age from about 33 percent in 1975 to about 42 percent in the year 2000, suggests that an increasing number of young people may be substituting the GED for traditional high school completion.

It is well established that GED recipients are considerably more likely than other high school dropouts to enroll in college (see, for example, Murnane et al. (1997)). GED recipients are less likely to persist in the higher education pipeline than traditional high school graduates. On average, GEDs complete fewer years of postsecondary education than high school graduates. An analysis by Garet et. al. (1996) shows that almost three-fourths of GED recipients enrolling in a higher education program completed 1 year or less of college and the results shown in the tables presented in Cameron and Heckman (1997) are broadly similar. Thus, an increase in GED recipients in the collegiate pipeline implies an increase in the concentration of students who are least likely to persist in higher education.

Why student achievement – measured by cognitive and non-cognitive outcomes --has decreased at the high school level is the subject of a large literature, with explanations including the changing demographic characteristics of the population and decreased efficiency and

inequality in elementary and secondary schools. Certainly, these changes move in the direction of explaining the gap between college participation and college completion as well as the increased time to degree.

“Non-traditional” College Students

Beyond parental economic circumstances and academic preparedness defined in terms of cognitive and noncognitive skills, employment and family circumstances of students may have a significant effect on the level of collegiate attainment and persistence to degrees. As has been discussed in the first section, the age of enrolled students has increased appreciably over the last three decades and the median undergraduate is no longer a student in his late teens but a student in her twenties. With increased age comes a different set of responsibilities, including children and employment.²⁹

College enrollment among women with children has increased dramatically over the last two decades and the presence of young children may limit attainment in several ways – reducing the time available to study and limiting course and institutional options, for example.³⁰ Table 4 shows the enrollment rate among women with and without children in Census years. While women with children have always been appreciably less likely to enroll in college than those without children in their late teens and early twenties, the share of women with children in these age ranges enrolled in college has approximately doubled over each decennial census interval. The bottom panel of Table 4 shows the year of college enrollment for these women. While about

²⁹ In discussing the relationship between non-traditional collegiate attributes and outcomes, the ambiguity of the causal arrows needs to be acknowledged. In particular, the changes in achievement and the demographic characteristics of potential college students may contribute to higher levels of participation among older, non-traditional students. At the same time, changes in federal and state policies may lead to institutional adjustments that favor the expansion of programs aimed to non-traditional students. To this end, an important further research agenda is the explanation of the rise of non-traditional student enrollment.

³⁰ Causation seems nearly impossible to identify here. One hypothesis is that people who have children in their late teens or early 20s may lack some of the unobservable attributes contributing to college success, while another explanation is that children have a negative effect on educational attainment.

1/3 of the women without children are in their first year of college, about one half of the women with children are in their first year of college. This relatively limited level of education suggests that women with children may be particularly likely to have interrupted spells of college participation, and to end up with modest levels of college attainment and low levels of college completion.

More generally, recent policy reports highlight the rise in the number of non-traditional students and raise questions about the collegiate trajectories of the increasing share of non-traditional students.³¹ Empirically, there is no question that non-traditional students are less likely than traditional students to attain a degree within five years of initial enrollment. Yet, it is far from clear that this gap is caused by the conditions of non-traditional enrollment (type of programs available, jobs and family constraints) rather than individual characteristics that determine non-traditional status. Perhaps more importantly, many “non-traditional” students started their collegiate experience in their late teens or early 20s and thus an important policy question concerns the factors that led to the interruption of initial college enrollment.

B. Supply Determinants and Public Policy

Market structure: Changes in institutional shares

The market for higher education is stratified by type of institution, with very large difference in both resources and program offerings across institutions. Over time, different sectors of the market have grown disproportionately. Key empirical questions concern how colleges and universities respond to changes in demand as well as whether changes in levels of public support necessarily favor expansion at certain types of institutions, either at the bottom or

³¹ A recent report released by the Department of Education (Condition of Education, 2002) notes that nearly 73 percent of undergraduates in 1999-2000 were in some respect non-traditional, defined in terms of characteristics like the presence of dependents, the absence of a high school diploma, no parental financial support, and full-time employment.

top of the distribution.³² Considering changes in the distribution of enrollment and degrees across types of institutions provides an empirical starting point (Table 5 and illustrated in Figure 10). In 1967, about 1/5 of all undergraduates were enrolled at community colleges, about 51 percent were at public 4-year institutions and the remainder were at private institutions, with selective private liberal arts colleges and research universities accounting for the relatively modest share of 7 percent. A major shift occurred between 1967 and 1977, with both an increase in the level of undergraduate enrollment and a shift in the distribution of enrollment away from four-year institutions toward community colleges -- the two-year share rose from 21 percent to 34 percent. While these results are clearly interesting in a descriptive sense, they do not resolve the question of whether the change in the distribution of individuals across institutions reflects changes in the type of collegiate experiences demanded by students or shocks to the supply side of the market.

Not surprisingly, shifts in undergraduate enrollment across institutions are likely to affect BA output since persistence and the likelihood of degree completion differ across these institution types. [Completion rates for the class of 1972 are shown in the bottom of Table 5 by the classification of the first institution.] Between 1967 and 1977, the ratio of full-time equivalent undergraduate enrollment to BA degrees increased from about 8 to 8.5. A quite plausible explanation for this slowdown in the increase in degrees awarded to successive birth cohorts is that most enrollment growth occurred at open-access institutions, thereby limiting degree attainment.³³ In effect, “soft capacity constraints” limited college degrees awarded in this

³² Research by Bound and Turner (2002) demonstrates that the elasticity of college completion with respect to demand shocks is considerably less than 1. At issue is how price, quantity, and the quality of offerings adjust to changes in demand in the higher education market where colleges and universities respond to somewhat different incentives than for-profit institutions.

³³ Bound and Turner (2002) provide empirical evidence to this point. Estimates of the elasticity of BA degrees (and enrollment) with respect to cohort size by type of institution show essentially no response among

period as research universities and liberal arts colleges responded to increased demand by increasing their selectivity, leading to further stratification among institutions in the higher education market. However, such changes in the distribution of students across institutions do not persist into the 1980s and 1990s, indicating that between institution supply adjustments are unlikely to be the dominant explanation for stagnant rates of increase in collegiate attainment over the last two decades.

Across states, there is considerable variation in the mix of different types of colleges and universities. A salient question is how these structural differences, as well as changes in the distribution of resources across institutions, affect degree completion within states. As a starting point, Figure 11 shows these differences in the distribution of enrollment and completion at the state level. There is the expected positive relationship between enrollment and completion, largely reflecting broad differences across states in socio-economic conditions as well as in educational institutions. However, states above the average line in the graph have relatively high transitions from college participation to completion, while those below the line have somewhat lower completion rates. In the cross-section, these data provide some indication that the structure of state higher education systems (in dimensions like the concentration of community colleges) affects completion rates, though other differences across states may also contribute to this dispersion.

At a descriptive level, changing the allocation of students across institutions of different characteristics will also lead to changes in degree completion. Table 6 presents regression results with the change in the share of the cohort age 23 with a college degree relative to the share of the population with some college as the outcome measure of interest. Shifting

flagship public institutions and selective private universities (elasticities close to zero), while there is an elasticity of degrees awarded of about .71 at non-flagship public four-year colleges and universities.

enrollment away from public research universities or private institutions (particularly the selective research and liberal arts institutions) to relatively open-access institutions – either at the two-year or four-year level – has a negative effect on completion rates. The movement of enrollment shares from four-year to two-year institutions may be explained by two quite different mechanisms. One explanation is that student demand shifts in response to changes in achievement or changes in the capacity to finance college. An explanation with quite different policy implications is that states or other institutions funding higher education engage in a policy shift (distinct from changes in student demand) which leads to an adjustments in the relative subsidies provided to different types of institutions.

Over time, increased geographical integration in the marketplace has plainly led to a greater and greater concentration of the most able students at a relatively small number of institutions (Hoxby, 1998). This stratification, in turn, raises quality at some institutions while reducing peer quality at other institutions. To be sure, institutional resources combined with peer quality are likely to have a real behavioral effect on college completion. Yet, because more able students also attend the most selective schools it is inherently difficult to disentangle the effects on outcomes of student characteristics versus institutional characteristics. To frame this point more concretely, Table 7 shows the graduation rates from NCAA division I schools by Carnegie classification. Private institutions and institutions organized as research universities generally have much higher completion rates than public institutions or ‘comprehensive’ institutions, which are generally less selective. There are some distinctive examples at the bottom and top of the quality distribution. Among the institutions with six-year completion rates less than 20 percent are Chicago State University, Texas Southern University, and McNeese State University (LA). At the other extreme, institutions with completion rates over 90 percent include the

University of Virginia, Georgetown University, and Northwestern University. Of some note, the former group of schools enrolls more entering undergraduates than the latter group. Still, institutional completion rates are not the final predictors of individual completion as many individuals complete college as transfer students.³⁴

State Higher Education Policy

States have a long-standing tradition of funding higher education and producing higher education through public colleges and universities. The nature of the political process leads to both considerable variation over time and states in the determination of levels of support and tuition prices. State level politics may be a particularly important factor in the determination of the location, type and number of institutions, as well as the relative support for research institutions relative to comprehensive colleges or community colleges. To the extent that shifts in state support are driven by politics (say, the desire to reward the governor's alma mater or a move to reward a legislative leader with the opening of a community college in his home district) rather than student demand, shifts in state appropriations will operate like supply shocks. Shifts toward institutions with relatively low completion rates will likely lead to a reduction in the link between participation and completion.³⁵

One hypothesis to consider is that, in the last several decades, the political process has favored community colleges relative to four-year institutions. One explanation is that community colleges may advertise stronger direct links to local economic development than universities by providing job training for local employers. In addition, because community colleges are open to all local residents and are relatively widely dispersed across counties (while

³⁴ As an example, Bowen and Bok (1998) document that for college students at 28 selective colleges, the first school graduation rate for white students was 86 percent while the overall graduation rate was 94 percent and for black students the first school graduation rate was 75 percent and the overall graduation rate 79 percent.

³⁵ Unaddressed in this discussion is the extent to which institutions adjust enrollment or quality of offerings to changes in the level of state appropriations.

universities generally have much more limited locations), state legislators may receive much greater political rewards (in terms of re-election prospects) for increasing community college funding than increasing appropriations for the state flagship university, which may be hundreds of miles away and practically out of reach for many constituents. As an empirical matter, a regression of the share of state appropriations to higher education directed to four-year institutions on a time trend and state fixed effects for 1973 to 1996 shows a decidedly negative trend [-.002 (.0001), see Table 8]. For those states in which this trend is most pronounced, we would expect to see relative declines in the link between college enrollment and college completion. Our measures of state-specific completion rates are limited to crude indicators -- either the ratio of BA degrees conferred to enrollment using the institutional data or the ratio of college completion to college participation for young people in the census.³⁶ Still, regression results that use variation across states in the change in the share of state appropriations as the key explanatory variable present a clear result [Table 8]. Increasing (decreasing) the share of state appropriations to four-year institutions has a strong positive (negative) effect on completion, with a 5 percentage point decrease in the share of appropriations directed to four year institutions associated with a 1.7 percentage point decrease in college completion measured using outcomes from the Census. Still, additional evidence on the exogeneity of state appropriations (demonstrating that shares are not adjusting to changes in local demand conditions) is necessary before claiming a causal relationship.

In addition to the level of appropriations for public institutions, a second significant state political variable is the level of tuition charged by public institutions. To this end, changes in tuition may be considered a source of variation determining both enrollment and completion.

³⁶ Note that these measures are fundamentally different. The institutional measure of degrees award relative to enrollment is that ratio of two flows, while the Census measure captures the age-specific stock of collegiate attainment.

Using within-state variation over time and enrollment of recent high school graduates measured in the October CPS, Kane (1995) finds large enrollment effects associated with relatively low-tuition, particularly for low-income students and for those attending two-year colleges. Yet, low-tuition strategies come at a substantial cost, as below-market tuition is essentially an across-the-board subsidy to all students, including those who would continue to enroll at higher tuition levels.

Whether low-tuition policies have any affect on collegiate attainment is critical to determining whether public calls for continued reductions in tuition are sound policy recommendations.³⁷ In most cases, the level of tuition may have little effect on the completion rate beyond effects associated with changes in initial enrollment. Tuition is only a fraction of total college costs, with forgone earnings of persistence in college likely to exceed direct college costs. About 43 percent of all students attend institutions with tuition costs less than \$4,000 per year. Estimates in Table 9 use within-state variation over time in regressions of enrollment and BA completion on tuition (producing coefficients in elasticity form). What is unambiguously clear from these specifications is that the behavioral effect is entirely concentrated at the initial enrollment margin as the BA degree elasticity is no larger than the enrollment elasticity; beyond changes in enrollment, increasing – or decreasing – tuition at public institutions has no effect on degree attainment. [It is probably easiest to explain this in specifications with enrollment included as an explanatory variable.] One explanation is that the demand for a BA may be quite

³⁷ A significant trend in higher education finance in the last five years has been real declines in tuition costs in several major state systems (e.g., California, Michigan, New York). Governors and state legislators have found that low-tuition policies are particularly popular among their constituencies, and several governors instituted tuition rollbacks for in-state students. For example, in-state students in the 1998-99 academic year at the University of Virginia paid \$4,866 in tuition and required fees, followed by a rollback to \$4,130 in academic year 1999-2000. California and Texas also reduced nominal tuition in the late 1990s. While reductions in state budgets have put upward pressure on tuition for 2002-2003 in many states, these increases come with reduced state appropriations and generally reduced resources per student. Efforts to freeze tuition at public colleges and universities are politically popular because they provide tangible near-term relief in an area of intense voter interest. Yet, without higher tuition, institutions of higher education may be forced to reduce quality or capacity.

inelastic among those students who are not at the enrollment margin. Second, state-subsidized tuitions change the price of public institutions relative to private institutions and, to the extent that the latter is more likely to affect college completion, this shift in college type will affect completion rates. Finally, the introduction of additional students through the enrollment effect may have adverse effects on completion rates.

Federal Policy

A final dimension to consider is the effects of federal policy on student enrollment and completion.³⁸ The primary instruments for federal policy designed to increase collegiate attainment over the last three decades have been the programs under Title IV of the Higher Education Act, notably Pell Grants and Stafford student loans. More recently, beginning with the Tax Reform Act of 1997, tuition tax credits are another mechanism provided through the federal government to reduce college costs (the details of these programs are discussed elsewhere in this volume). A third type of aid funded at the federal level is the specially-directed aid aimed at specific populations to achieve objectives other than meeting financial need. These programs include G.I benefits and the Social Security Student Benefit Program.

Focusing first on Title IV, the primary programs are the Pell grant program and the Stafford Student Loan program. Both programs are means-tested and eligibility is determined through the evaluation of a FAFSA form that records student and parental assets and incomes. Applying a non-linear benefit reduction formula yields an expected family contribution, and the difference between allowable college costs and expected family contribution is the aid

³⁸ For the most part, the federal role in financing higher education has historically been much more modest and considerably more targeted than the state role. Still, at particular times in history, federal support for institutions of higher education, including the Morrill legislation chartering many public institutions, has been decisive in determining the level and distribution of higher education services. Federal research funding no doubt has a significant effect on enrollment and completion in graduate programs, even though these resources are allocated largely at the institutional level (the Javits and NSF programs are exceptions).

eligibility.³⁹ Title IV financial aid is remarkable in the breadth of the programs covered and the range of potential students eligible to benefit. While early federal higher education programs such as NDEA focused on selected degree programs, the only academic criteria for Title IV eligibility is “ability to benefit” from a post-secondary program, and the aid may be used at a range of post-secondary institutions, including non-degree granting institutions and proprietary institutions.⁴⁰ The Title IV financial aid programs are often described as the cornerstone of federal higher education policy; in academic year 2000-01, Pell grant aid totaled 7.9 billion in expenditures while loan programs provided over 26 billion in capital, with about 12.6 billion of the amount provided through the subsidized Stafford loan program.

Despite the rhetoric (and almost sentimental attachment) surrounding the Title IV programs as the key dimensions of federal policy aimed at eliminating credit constraints, empirical evidence on the behavioral effects of these programs is mixed. Focusing first on the enrollment effects for traditional college-age students (defined as students who are recent high school graduates and still depend on their parents for financial support), evaluations focusing on the change in enrollment for the eligible population with program introduction relative to a control group (a difference-in-differences strategy) consistently yield no evidence that the

³⁹ In essence, a tax rate is applied to a measure of available resources, both income and assets, with fixed adjustments for family size and number of members of the family in college to determine the student’s “ability to pay.” If this amount is less than allowable college costs, the student is aid eligible.

⁴⁰ The inaugural Higher Education Act passed in 1965 separated academic and vocational training in determining program eligibility. Most of the programs funded under the 1965 Higher Education Act were campus-based (providing resources to institutions rather than portable aid to students). According to Gladieux (1995), Title IV of the Higher Education Act was the first explicit federal commitment to equalizing college opportunities for needy students, which was to be achieved through means-tested grant aid as well as student support programs (Upward Bound, Talent Search and the programs now known as TRIO). The primary means-tested aid vehicle was the Student Educational Opportunity Grants (SEOG); award of aid under this program was administered by colleges and universities which were required to “make ‘vigorous’ efforts to identify and recruit students with ‘exceptional financial need.’” (See Gladieux (1995) for additional history). Under the 1972 reauthorization of the Higher Education Act, Congress substituted the word “postsecondary education” for “higher education”, intending to broaden the range of options beyond traditional baccalaureate programs. In this regard, the Basic Educational Opportunity Grants (known now as the Pell grants) included two- and four-year colleges and proprietary schools from the inception. Thus, in 1972, federal financial aid changed the choice set of students to include a wider range of short-term, non-baccalaureate degree and vocational programs under Title IV.

program changed enrollment (Hansen, 1983; Kane, 1994).⁴¹ What is more, evidence presented by Manski (1993) yields the proposition that the margin of impact is on initial enrollment rather than attainment, as low-income youth graduating from high school between 1972 and 1980 (after the introduction of the program) show no relative gain in college completion. Why the Pell grant program has such modest effects for traditional college-age students has been the subject of much speculation (but few rigorous empirical tests). One explanation is that the complexity of the program and the difficulty in determining benefit eligibility may impose a high cost, inhibiting many potential students at the margin from applying. Another explanation is that factors beyond financial constraints, including academic achievement, are the factors limiting college enrollment and college attainment for the marginal low-income student. Why the Pell grant program does not affect attainment is also a serious question for analysts with few ready answers. One hypothesis is that because many very low income students receive the maximum Pell grant while attending a low cost institution like a community college, the Pell grant is a blunt instrument for encouraging better college choice because it does not reduce the marginal cost of attending a relatively high quality institution.

While the Pell grant program has not had a discernable effect on the collegiate attainment of traditional students, the effects on college participation for non-traditional students have been marked.⁴² As Kane (1999) notes, the financial aid system was not designed with non-traditional

⁴¹ In one of the initial assessments of the program using time series data, Lee Hansen examined the relative enrollment rates of more and less affluent students before and after the introduction of the Pell program. Hansen's review of the evidence "suggests that expansion of federal financial aid programs and their targeting toward youth from lower-income and lower-status families did not alter to any appreciable degree the composition of postsecondary students or the college enrollment expectations of high school seniors over the 1970s." (Hansen, 1984)

⁴² Under Title IV of the Higher Education Act, federal financial aid policy makes a statutory distinction between "dependent" and "independent" students in the determination of program eligibility. Eligibility for independent students rests only on the financial position of the applicant and his or her spouse, relative to direct college costs and other demands on resources including the number of children in the family. To be eligible for aid

students in mind. As a result, there is a somewhat greater likelihood that Title IV aid to older students will not meet the full needs of students with potentially high returns to college investments, while potentially leading to the proliferation of student enrollment in areas without high returns. Kane argues that the “backward looking” nature of needs assessment may particularly disadvantage students returning to college to switch careers or as a result of job loss.

Eligibility for students claiming independent status has become more restrictive since the inception of the program. The 1986 amendments to the Higher Education Act required students to be at least 24 years old, married, or with children to qualify for aid as an independent student. Despite restrictions that potentially limit independent student eligibility, the share of Pell grant recipients who are independent has risen steadily over the last three decades from about 30 percent in 1975 to over 60 percent in the early 1990s [Figure 12]. Research by Seftor and Turner (2002) finds that the introduction of the Pell program, as well as changes in program eligibility, have a significant effect on the college enrollment decisions with college cost elasticities of about $-.26$ for men and $-.67$ for women. What is less clear from this analysis is how college enrollment of these older students translates to collegiate attainment and increased earnings.

Overall, a review of changes in the determination of eligibility for Title IV aid, particularly the Pell grant program, shows that many of the most significant changes in benefit determination have affected non-traditional students. To take but one example, Simmons and Turner (2002) examine the effects of the inclusion of childcare expenses under allowable college costs in aid determination and find that the addition of this benefit has a significant effect on enrollment for women with children. In evaluating this benefit, it is critical to assess the link between this increased college participation and attainment and employment outcomes. Other

as an independent student, an individual must not be claimed as a dependent in the prior or current year for tax purposes and may only receive limited cash and in-kind contributions from parents.

changes receiving little attention in the literature are provisions allowing for enhanced benefits to workers displaced by NAFTA and other unemployed workers in the mid-1990s.

Two programs targeting somewhat narrower groups of potential beneficiaries are the Social Security Student Benefit Program and the World War II G.I. Bill. Both initiatives had generally significant effects on both collegiate enrollment and completion (Dynarski, forthcoming; Bound and Turner, 2001).⁴³ The G.I. Bill and the Social Security student benefit program share several design features including the transparency of eligibility determination, meaning that potential beneficiaries knew their eligibility and the level and duration of benefits without additional calculations or waiting for the results of a bureaucratic process, and the substantial size of the benefits, often covering the majority of college costs. In the case of the G.I. Bill, veterans serving more than 90 days (through either conscription or voluntary enlistment) were eligible for a minimum of one year of benefits with an additional year of benefits provided for each year of service up to four years of benefits. Benefits included in the World War II G.I. Bill included up to \$500 in tuition and educational expenses paid to the institution per academic year (with this tuition sufficient to cover the full cost at selective private institutions like the University of Pennsylvania and Williams College at the time) and a monthly cash allowance of \$65 per month for single veterans and \$90 per month for married veterans (with these stipends rising during the 1940s). For the Social Security Student Benefit program, which operated from 1965 to 1982, children of deceased, disabled, or retired Social Security beneficiaries received monthly payments while enrolled full-time in college and unmarried

⁴³ An exception to these results is the collegiate attainment of black men from the South eligible for the G.I. Bill, who did not share the gains experienced by black men from non-Southern states or white men more generally (Turner and Bound, 2002). Explanations for the divergence in these results include the limited supply of higher education opportunities for blacks in the segregated south, as well as potentially lower demand owing to the poor secondary school quality available to these men.

through age 22, with the 1980 annual benefit amount about \$6,700 (relative to a Pell grant in that year of \$2,000).

For veterans returning from World War II, Bound and Turner (2001) estimate that the effect of the G.I. Bill combined with the effect of World War II service on years of college completed was between 0.23 and 0.28 years of college (or 32 to 38 percent) and the effect on college completion rates was between 5 and 6 percentage points (or 39 to 46 percent).

Considering that the G.I. Bill led to a reduction in total college costs of attending a public college of about 64 percent for single individuals and about 87 percent for a married veteran with one dependent, these estimates imply an elasticity of .4 for the effect on years of completed education by World War II veterans, which is very similar to college cost elasticities reported in contemporary analyses of enrollment effects (e.g., Kane (1994)). The evaluation of the effects of the Social Security Student Benefit program on enrollment and attainment yields results parallel in magnitude; Dynarski (forthcoming) uses the death of a parent to estimate program eligibility and finds that college attendance dropped by about four percentage point per \$1000 of grant eligibility. A particularly striking feature of the evaluations of both the G.I. Bill and the SSSB program is the extent to which these programs appear to affect college completion, rather than just initial enrollment.⁴⁴

It is frequently claimed that raising the level of portable student aid to a level on par with the G.I. Bill of the 1940s would transform the extent to which students from the most socially and economically disadvantaged backgrounds would be able to complete collegiate programs.⁴⁵

⁴⁴ Dynarski (forthcoming) argues that the availability of SSSB aid pushed all potential students up the distribution of educational attainment thus “causing those that would have stopped at high school to instead complete one or two years of college and causing those who would have stopped at one to two years to instead complete three to four years.”

⁴⁵ For example, the widely publicized *Losing Ground* (2002) report opens with “The passage of the G.I. Bill after World War II opened higher education to hundreds of thousands of American families who previously had no direct experience with education beyond high school. For the first time in history, the children of people with

Yet, such claims fundamentally overstate the program effects of the G.I. Bill, while missing the point that the estimates of the effects of the G.I. Bill on educational attainment are measures of what economists call the “effect of the treatment on the treated” and do not necessarily provide projections of the likely behavioral response among populations very different from veterans. [Notably, World War II veterans were “selected”, implying that they passed mental and physical screens imposed by the military.] What is more, viewed in the larger picture of higher education policy in the first half of the 20th Century, the G.I. Bill did not lead to a social transformation in higher education, but rather continued a process of democratization beginning with the high school movement and continuing with the evolution in scale and scope of public universities in the 1920s and 1930s (Goldin and Katz, 1999).

What one should conclude in summary from the consideration of federally-sponsored grant aid programs is that, first, there is considerable variation in the effects of these programs on attainment. While there is the potential for significant behavioral effects (as was the case with the G.I. Bill), such results cannot be guaranteed by simply raising the benefits provided by existing programs such as Pell grants under Title IV.

Implications for future research and policy tradeoffs

The economic consequences of the differences between college enrollment and college completion are near their historical maximum. The sustained increase in the economic returns to college completion over the last two decades implies that the divergence between enrollment and completion, as well as continued differences in outcomes by family circumstances, have a substantial impact on inequality as well as intergenerational opportunity. Hence, understanding

average financial means – the sons and daughters of farmers and repairmen – could get a college degree or complete vocational training. In one generation, higher education in America was being transformed from an organization for the few to a core institution of democracy ... (p. 4)”

the determinants of college completion and how public policies affect completion should be a fundamental concern for research at the intersection of economics and higher education.

An overriding conclusion from the data assembled for this analysis is that it is imperative to consider explanations (as well as policy interventions) beyond a myopic focus on “affordability” and student aid. First, many of the outcomes observed in higher education are affected by investments made in elementary and secondary education as well as the family. It is naïve—and wasteful—to posit that opportunities for study in college are likely to lead to BA completion among students who have been unsuccessful or poorly served by institutions at the primary and secondary levels. Secondly, colleges and universities—the institutions forming the supply-side of the market—matter substantially in the process of transforming initial college participation to collegiate attainment and completion. Understanding how these institutions adjust to changes in demand and funding and how students are matched with institutions is critically important. Limited evidence points to ‘soft supply constraints’ (Bound and Turner, 2002) at four-year institutions as one factor limiting degree attainment. Finally, the presence of credit constraints, particularly for high achieving students from poor families may limit degree completion.

However, what is known about the link between college enrollment and college completion is an insufficient basis for advocating direct policy interventions. Very broad based programs such as tuition subsidies or across the board grants to low income students are likely to have minimal effects on college completion while imposing large costs. A primary hurdle to the understanding of the enrollment—completion relationship is the absence of data for evaluation. One glaring failure is the absence of careful recording of collegiate experiences on the major surveys designed to measure economic well-being, including the CPS and the Census. “Some

college” is the only measure of attainment available in the most recent Census enumerations and the CPS in much of the decade of the 1990s for those who have not completed a degree. Unfortunately, this measure does not distinguish between the high school dropout attending college for less than a semester and a high school graduate completing three years of study. Distinguishing between these cases is critical for understanding the connection between enrollment and attainment. To this end, it is imperative to move beyond cumulative measures, recording only the last level of participation, to add measures of the trajectory of educational experiences. For example, recording type (or presence) of high school credential and the duration and type of program for each spell of college participation would be particularly illuminating and not that costly.

Beyond traditional micro data, targeted policy experiments (such as the COACH program in Boston) provide one avenue for obtaining a sharper focus on how policy design affects behavior. From a different angle, the opening of detailed administrative data records (such as the institutional student records used by Bettinger and Long in Ohio), particularly when combined with employment and social service records, is likely to improve substantially the understanding of the economic, social and institutional factors affecting college completion. In addition to the need for additional empirical evidence, the observed growth in time to degree and the expansion of enrollment outside the late teens and early 20s suggest the need to revisit our traditional human capital investment theory with the objective of introducing a model that is more successful in capturing the observed pattern of collegiate attainment.

The primary contribution of this essay is in the clear documentation of the relationship between college participation and college completion. There are a number of developments such as the rise in parental education and the growth in the return to college completion that quite

plainly go in the wrong direction to explain the relationship between college participation and college completion. It is plainly more difficult to distinguish among other explanations – such as the relative importance of precollegiate achievement, limitations in the credit markets, and changes in the level and distribution of state and federal policy – in understanding the decline in the college completion rate among those in their early 20s and the stagnation in this rate for those at older ages. These are not easy empirical questions to answer, but they are important to resolve if public investments in higher education are to contribute to economic productivity and to reduce intergenerational differences in opportunities.

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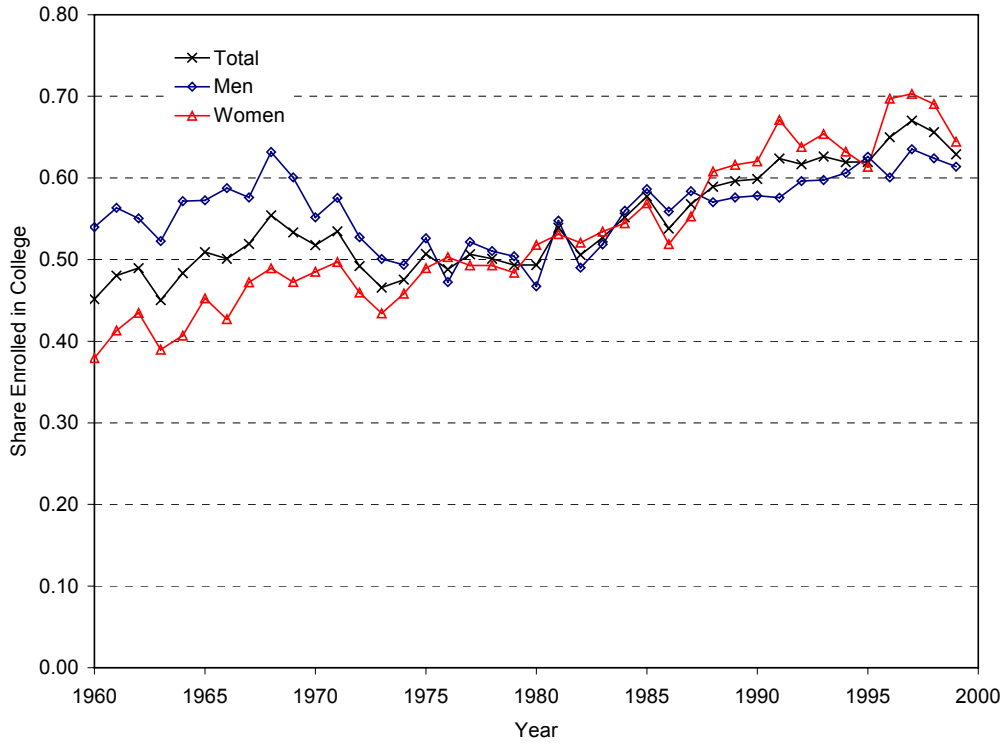
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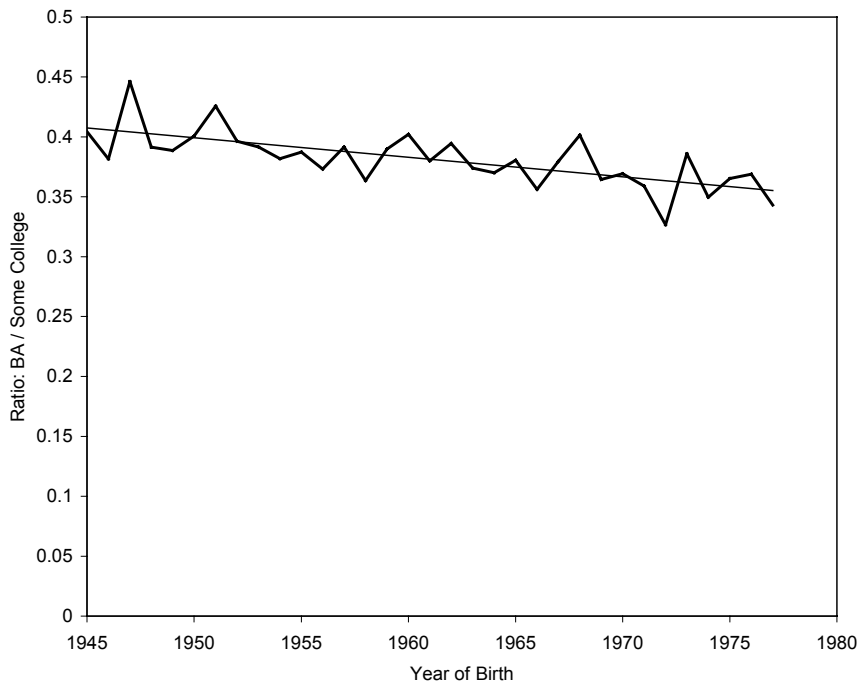
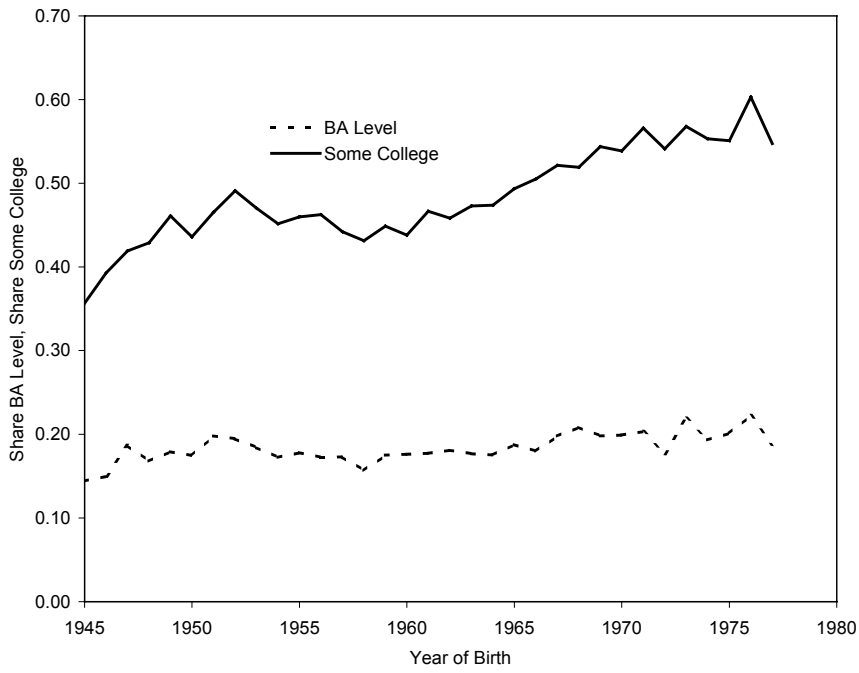
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Figure 1: College Enrollment of Recent High School Graduates



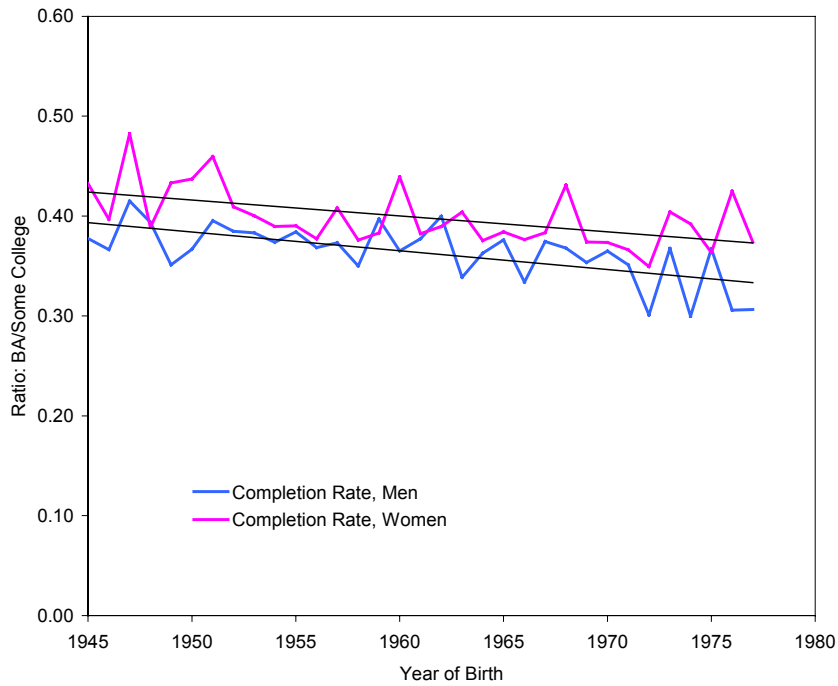
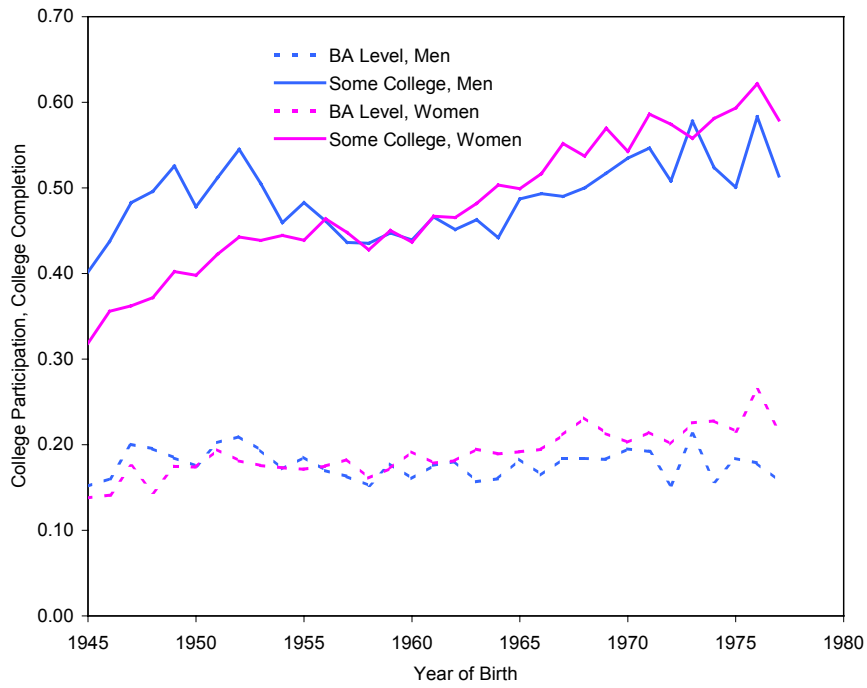
Notes: U.S. Department of Labor, *College Enrollment of High School Graduates* (various years), with data tabulated from the October Current Population Survey. Includes individuals ages 16-24 graduating from high school in the preceding 12 months.

Figure 2: College participation and completion by age 23



Notes: Author's tabulations from the October CPS.

Figure 3A: College participation and completion by age 23 and sex, 1968-2000



Notes: Author's tabulations from the October CPS.

Figure 3B: College participation and completion by age 23 and race, 1968-2000

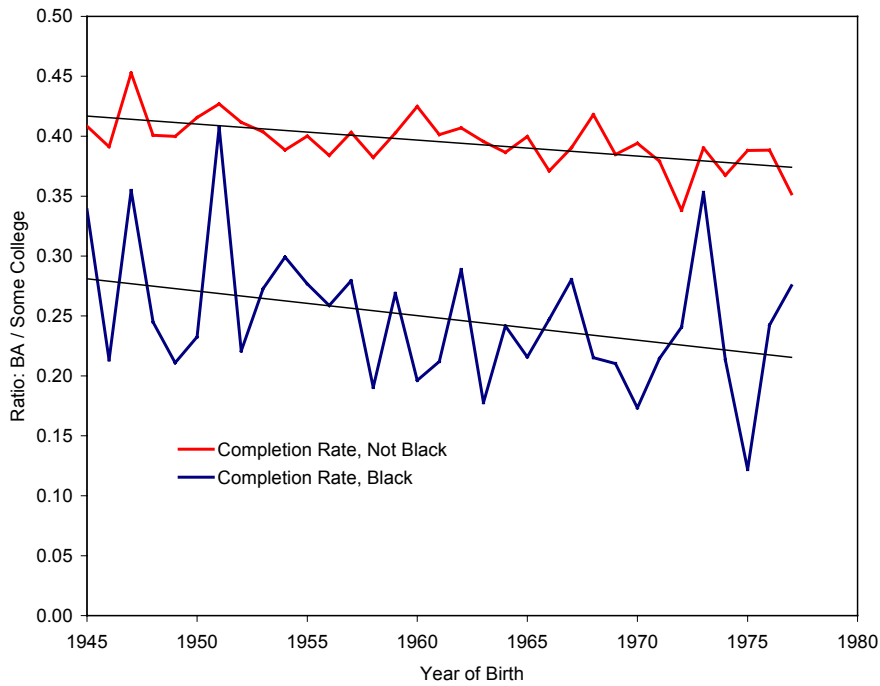
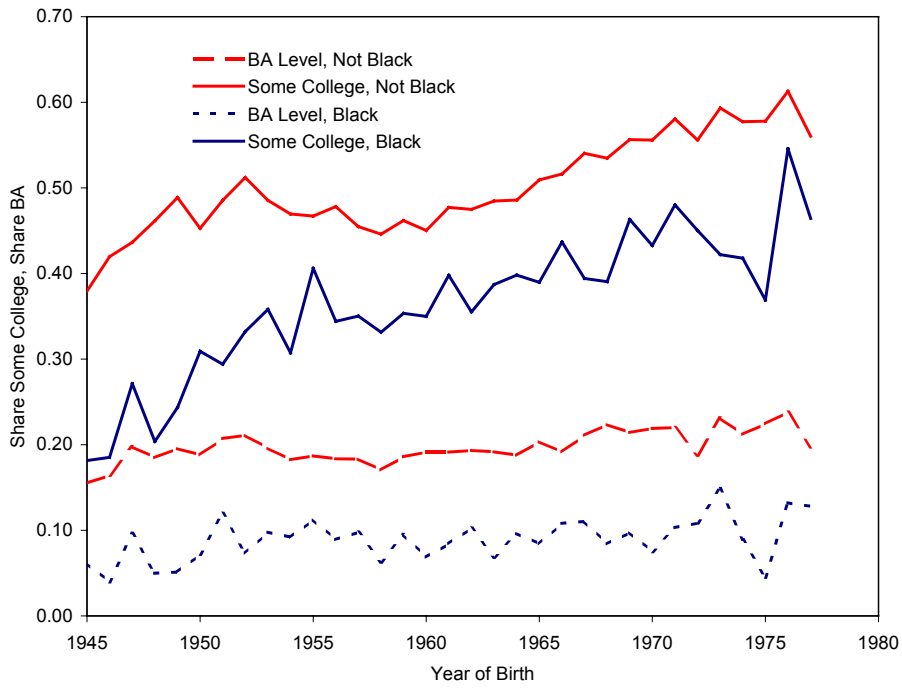
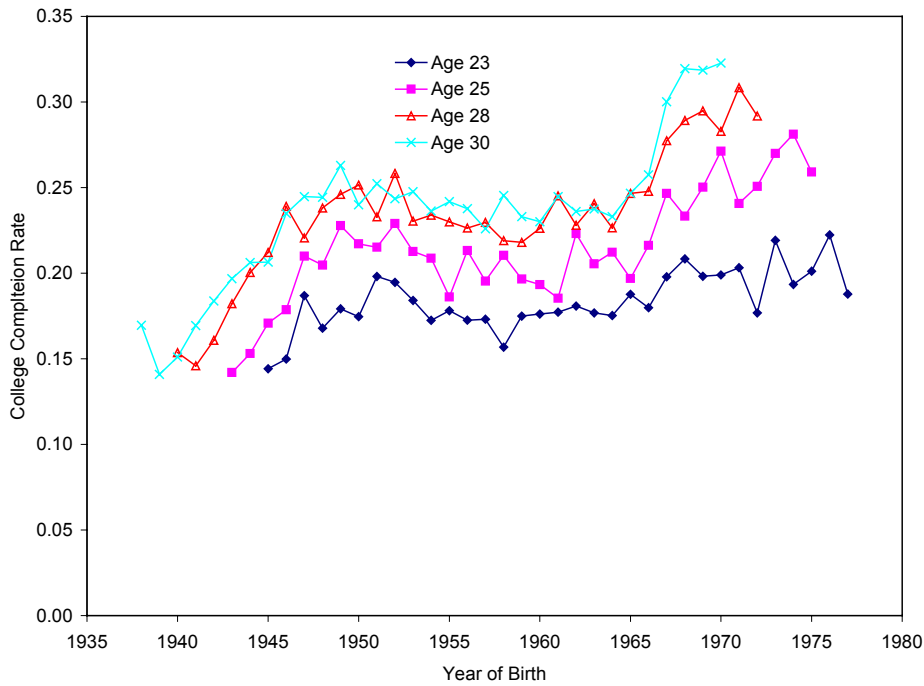
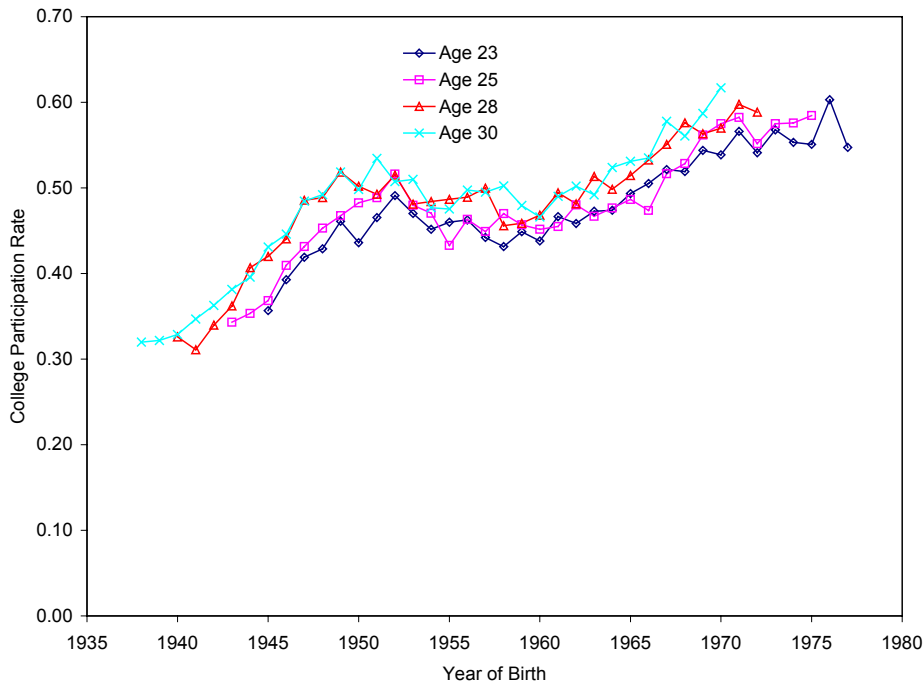
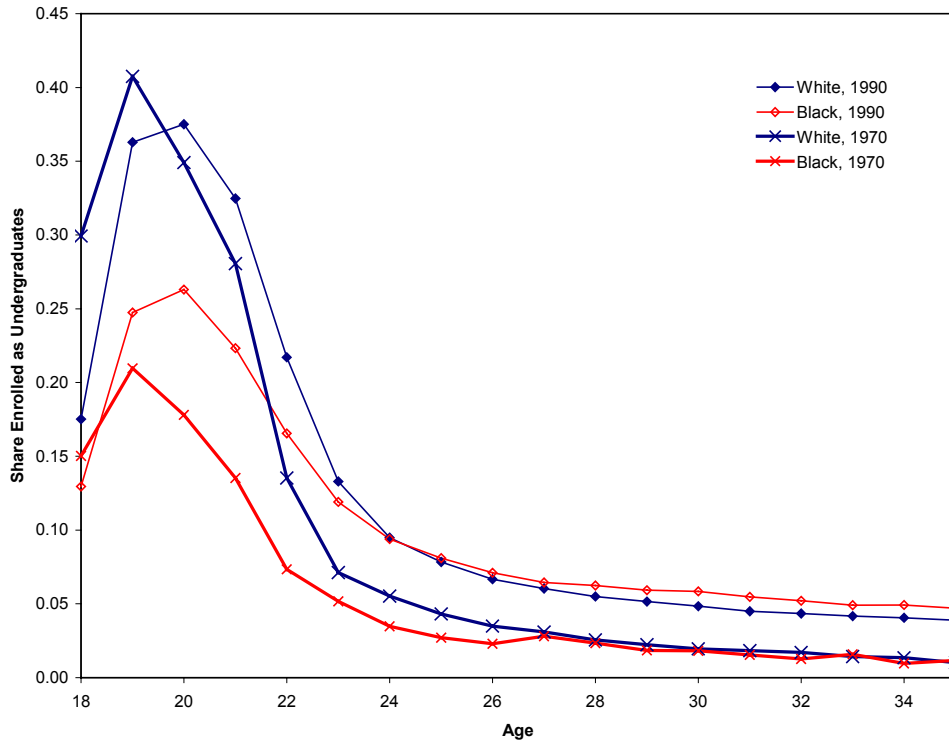


Figure 4: College completion and enrollment by age



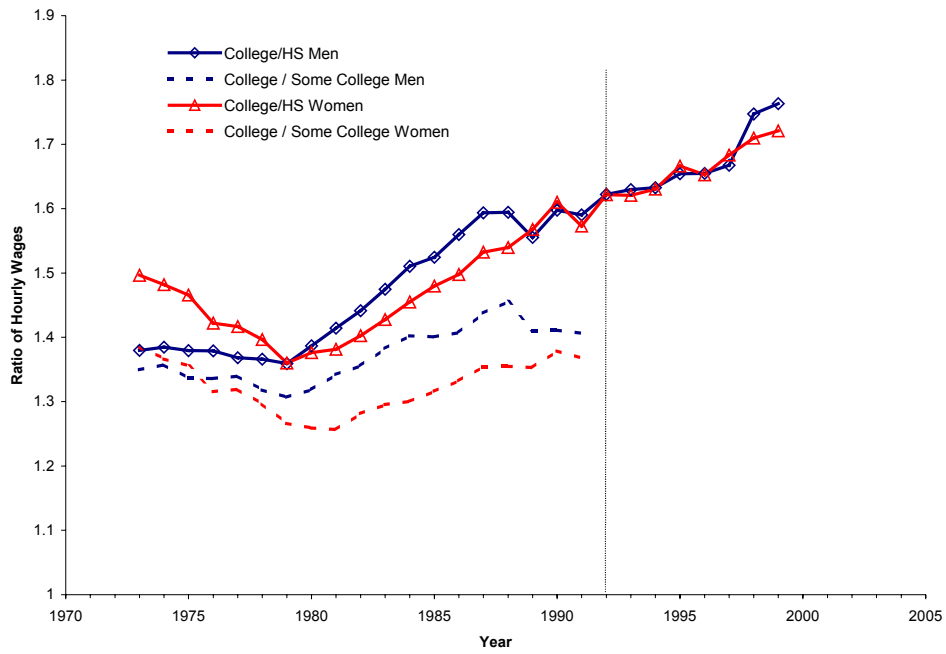
Notes: Data are from author's tabulations using the October CPS, 1968-2000. Individual weights are employed.

Figure 5: College enrollment by age and race



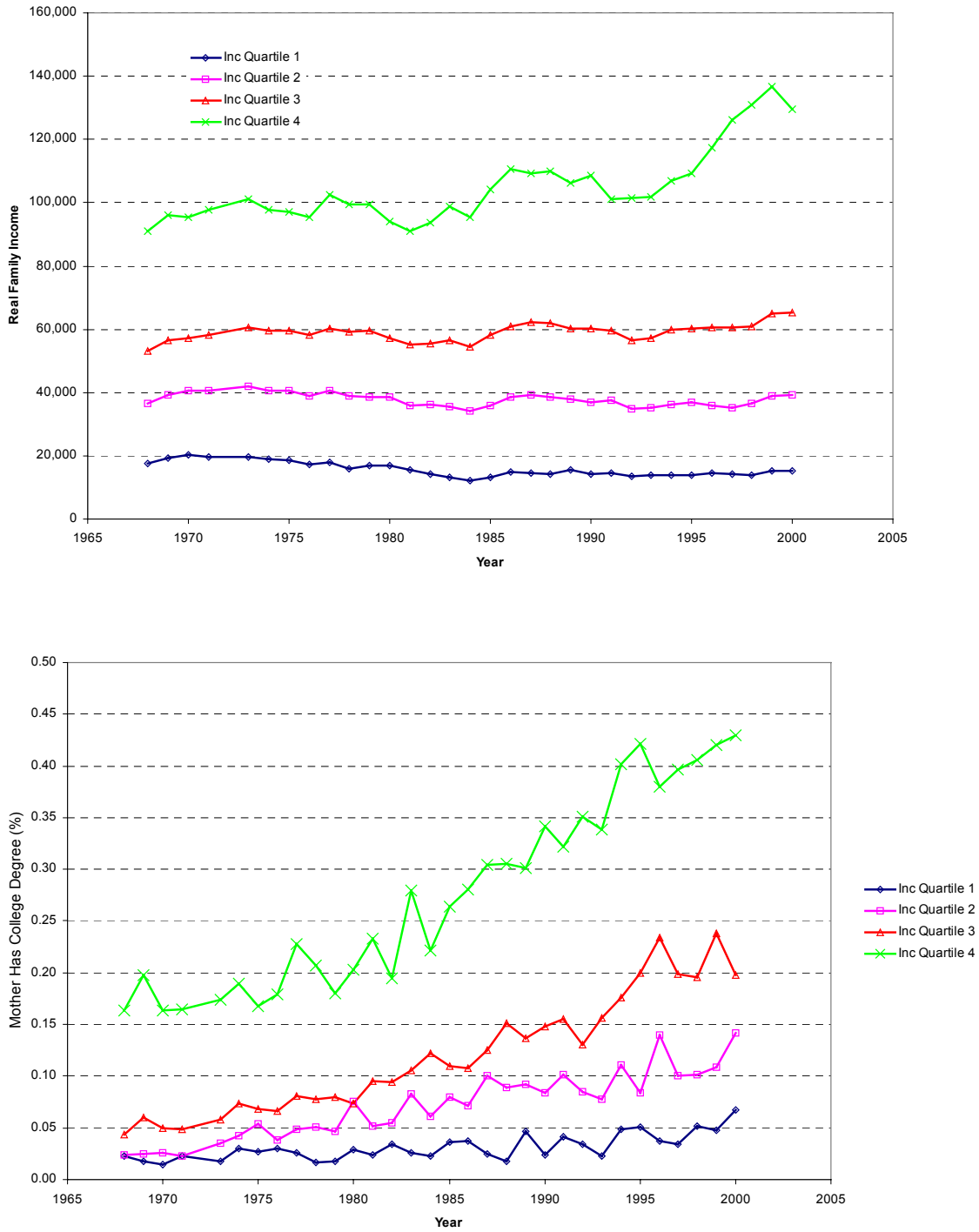
Notes: Author’s calculations from 1970 and 1990 Census micro data. “Enrolled as undergraduates” includes those enrolled with educational attainment greater than 12 and less than 16 completed years in 1970 and attainment at least “Some College” and less than a BA degree in 1990.

Figure 6: Relative wages by education



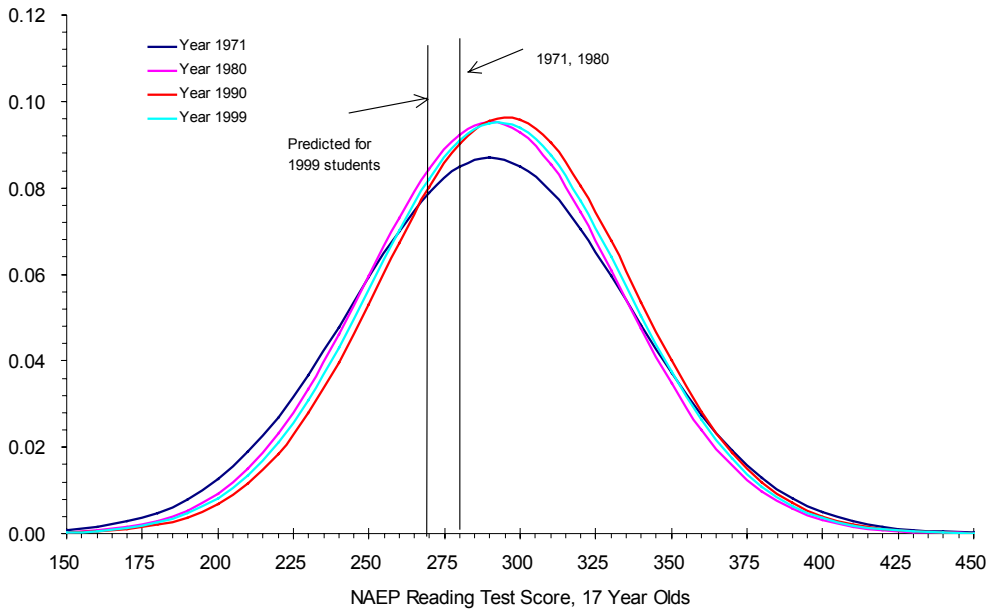
Source: Economic Policy Institute. The vertical broken line indicates the change in the CPS question recording college attainment from years of completed education to discrete degree categories.

Figure 7: Family background characteristics of potential college students



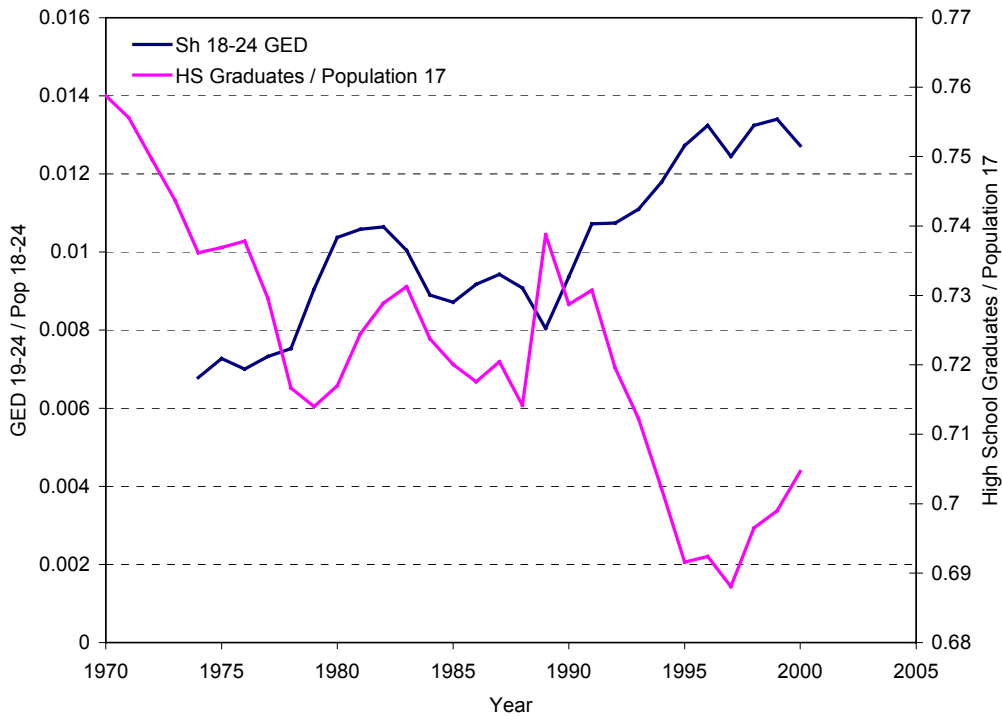
Notes: Author's tabulations from the March CPS.

Figure 8: Student achievement by cohort



Notes: Means and standard deviations of test performance in each year are from NCES tabulations. Computation of the normal distribution and predicted ability of marginal college students are author's calculations.

Figure 9: GED Recipient and High School Graduates



Notes: The left axis (and blue line) shows the number of GED recipients ages 19-24 relative to the population ages 18-24. This series is computed using Tables 15 and 106 from the Digest of Education Statistics (2001). The series on the right axis is from Table 103 of the Digest of Education Statistics.

Figure 10: Enrollment by type of institution

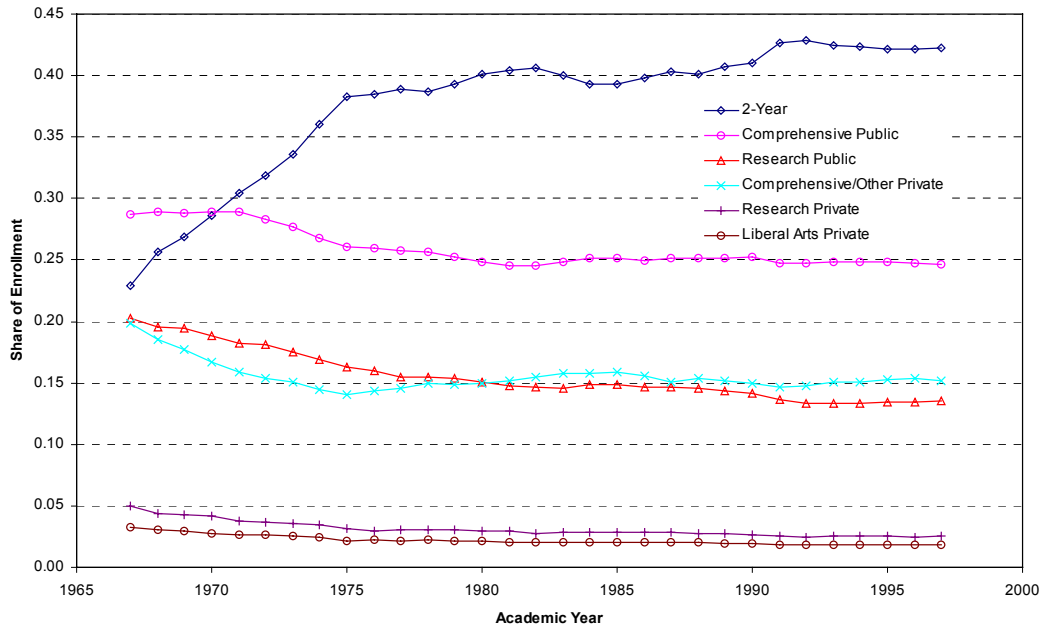
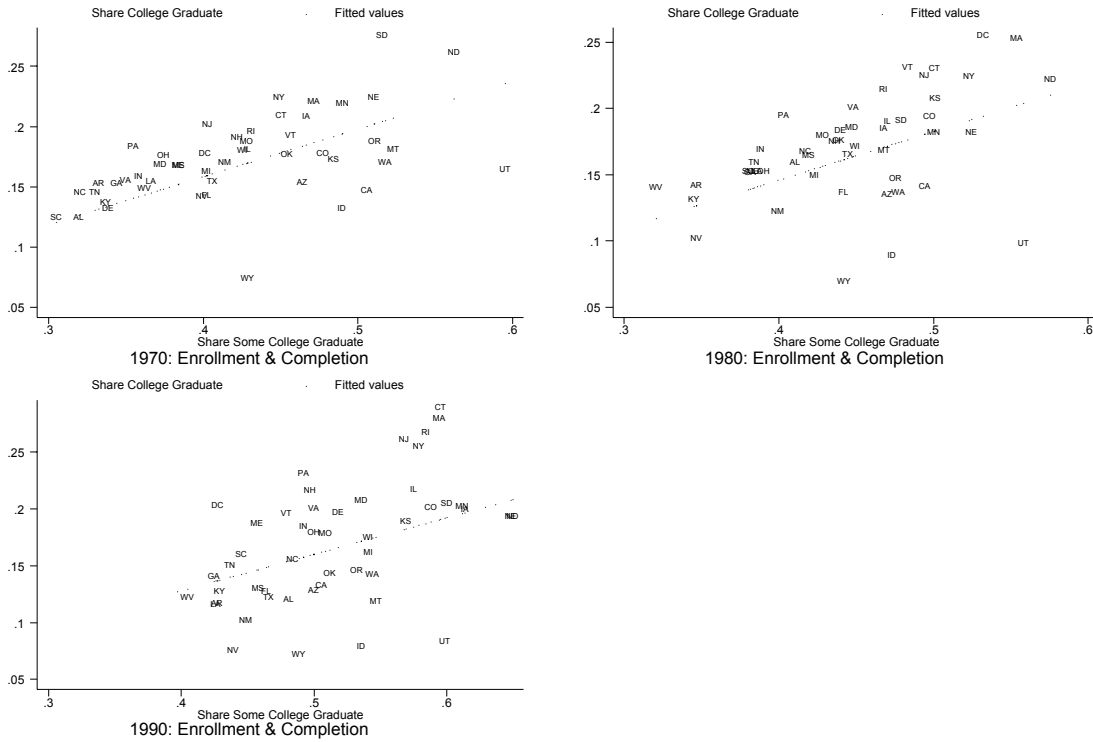
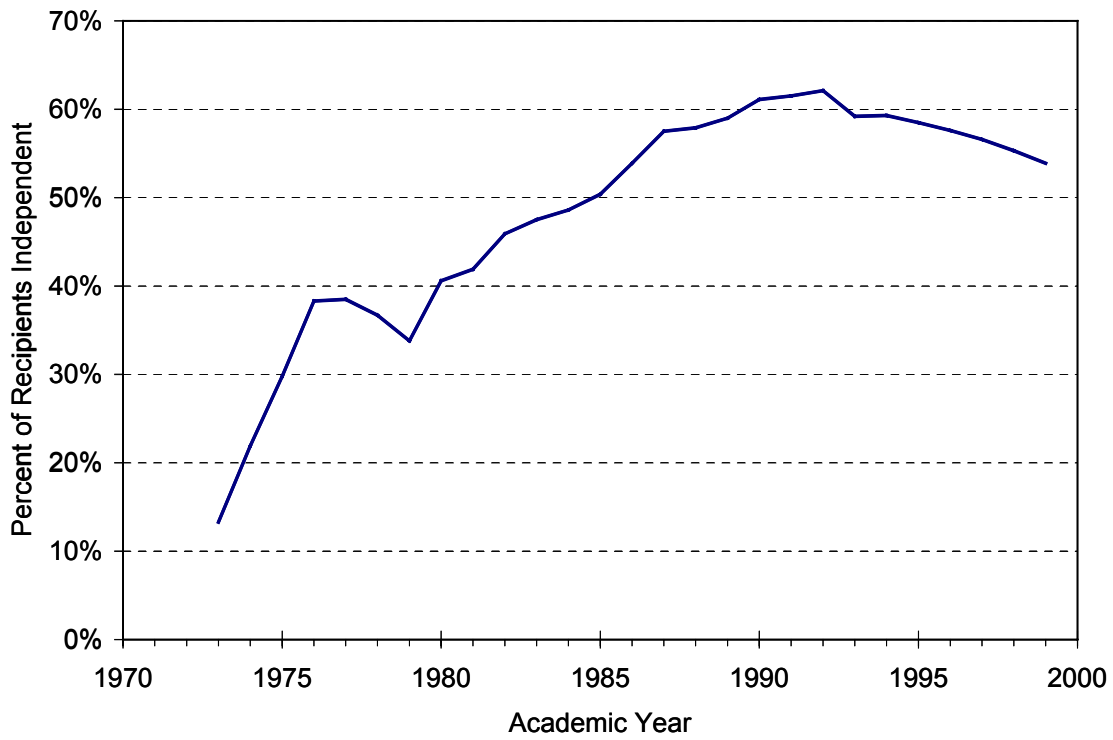


Figure 11: College participation and completion by state



Notes: Author's calculations using 1970, 1980, and 1990 micro data. Share some college and share college completion is calculated at age 23 and state reflects the place of residence five years prior in order to measure outcomes without the effects of migration.

Figure 12: Share of Pell grants awarded to students classified as independent students



Source: *Trends in Student Aid*, College Board, 2000, Table 7. “Academic year” refers to the academic year beginning in the indicated year.

Table 1: Average annual rates of increase in college completion and college participation, 1968-2000

	Share BA Degree (1)	Share Some College (2)	Ratio BA / Some College (3)	Diff. Some Col. - BA (4)	Share BA Degree (5)	Share Some College (6)	Ratio BA / Some College (7)	Diff. Some Col. - BA (8)
<i>All</i>								
Age 23	0.007 (0.002)	0.011 (0.001)	-0.004 (0.001)	0.013 (0.001)				
Age 25	0.012 (0.002)	0.012 (0.001)	0.000 (0.001)	0.011 (0.001)				
Age 28	0.014 (0.002)	0.014 (0.002)	0.001 (0.001)	0.013 (0.002)				
Age 30	0.016 (0.002)	0.015 (0.002)	0.001 (0.001)	0.014 (0.002)				
<i>White</i>					<i>Black</i>			
Age 23	0.007 (0.002)	0.011 (0.001)	-0.003 (0.001)	0.013 (0.001)	0.016 (0.006)	0.025 (0.003)	-0.008 (0.004)	0.027 (0.003)
Age 25	0.013 (0.002)	0.011 (0.001)	0.002 (0.001)	0.010 (0.001)	0.019 (0.005)	0.030 (0.004)	-0.010 (0.004)	0.035 (0.005)
Age 28	0.014 (0.002)	0.014 (0.002)	0.000 (0.001)	0.013 (0.002)	0.026 (0.006)	0.025 (0.003)	0.001 (0.004)	0.025 (0.004)
Age 30	0.016 (0.002)	0.015 (0.002)	0.001 (0.001)	0.014 (0.002)	0.029 (0.003)	0.031 (0.004)	-0.002 (0.003)	0.033 (0.004)
<i>Men</i>					<i>Women</i>			
Age 23	-0.001 (0.002)	0.005 (0.001)	-0.005 (0.001)	0.007 (0.002)	0.013 (0.002)	0.017 (0.001)	-0.004 (0.001)	0.019 (0.001)
Age 25	0.004 (0.002)	0.005 (0.002)	0.000 (0.001)	0.005 (0.002)	0.020 (0.002)	0.019 (0.002)	0.001 (0.001)	0.018 (0.002)
Age 28	0.005 (0.003)	0.005 (0.002)	0.000 (0.001)	0.005 (0.002)	0.025 (0.002)	0.023 (0.002)	0.002 (0.001)	0.022 (0.002)
Age 30	0.006 (0.003)	0.007 (0.002)	-0.001 (0.001)	0.009 (0.002)	0.028 (0.002)	0.024 (0.002)	0.004 (0.001)	0.020 (0.002)

Notes: Data are from author's tabulations using the October CPS, 1968-2000. In each equation, the dependent variable is the log of the variable indicated in the column heading and the coefficient estimate corresponds to the year of observation. Individual weights are employed and standard errors are corrected for hetero-skedasticity.

Table 2: College participation by family income and achievement

Test Tertile	Family Income Quartile			
	Lowest	Second	Third	Fourth
High School and Beyond, 1980-82 (a)				
Bottom	0.34	0.37	0.42	0.42
Middle	0.41	0.42	0.51	0.57
Top	0.47	0.55	0.56	0.68
NLSY1977-83 (b)				
Bottom	0.11	0.15	0.16	0.14
Middle	0.28	0.38	0.33	0.35
Top	0.52	0.56	0.60	0.74
NELS 1988 (c)				
Bottom	0.48	0.50	0.64	0.73
Middle	0.67	0.75	0.83	0.89
Top	0.82	0.90	0.95	0.96

- (a) From Carnerio, Heckman, and Manoli (2002), Figure 3-2.
 (b) From Carnerio, Heckman, and Manoli (2002), Figure 3-3.
 (c) From Ellwood and Kane (2001), Table 2.

Table 3: College completion participation and completion, by cohort and family income

Year 16	Family Income Quartile			
	Lowest	Second	Third	Fourth
College Participation				
1969-1973	0.21	0.29	0.45	0.68
1974-1978	0.33	0.36	0.47	0.69
1979-1983	0.25	0.44	0.60	0.77
College Completion				
1969-1973	0.06	0.10	0.18	0.32
1974-1978	0.09	0.13	0.19	0.38
1979-1983	0.06	0.21	0.24	0.47

Notes: Fry and Turner (2000)

Table 4: Undergraduate enrollment rate for women with and without children, Decennial Census data

a. Enrollment rates

Age	Undergraduate Enrollment Rate, Women w/ 0 Kids			Undergraduate Enrollment Rate, Women w/ Kids		
	1970	1980	1990	1970	1980	1990
18	0.32	0.31	0.22	0.01	0.03	0.04
19	0.43	0.45	0.44	0.02	0.04	0.07
20	0.37	0.41	0.48	0.02	0.04	0.07
21	0.31	0.36	0.43	0.02	0.04	0.07
22	0.14	0.20	0.28	0.02	0.03	0.07
23	0.06	0.10	0.17	0.01	0.03	0.06
24	0.04	0.08	0.12	0.01	0.03	0.06
25	0.03	0.07	0.10	0.01	0.03	0.06

Notes: Author's tabulations using Census microdata files for 1970 (2%), 1980 (5%) and 1990 (5%). Undergraduate enrollment rate is defined as the number of individuals enrolled in school with at least a high school degree divided by the total number of women in the age group.

b. Grade Attending

	No Kids		With Kids	
	1970	1980	1970	1980
1st	0.36	0.34	0.35	0.47
2nd	0.27	0.25	0.28	0.28
3rd	0.20	0.19	0.21	0.15
4th	0.16	0.22	0.16	0.11

Notes: Author's tabulations using Census microdata files for 1970 (2%) and 1980 (5%).

Table 5: Enrollment distribution by type of institution, selected years

	1967	1977	1987	1997	
<i>Undergraduate Enrollment Levels</i>					
Public 2-yr colleges	1,022,577	2,565,620	2,776,972	3,216,056	
Public 4-yr non-research universities	1,711,669	2,432,307	2,617,718	2,823,671	
Public 4-yr research universities	780,042	1,017,506	1,082,989	1,121,342	
Private 4-yr non-research universities	1,050,264	1,219,115	1,417,868	1,629,666	
Private 4-yr research universities	356,262	384,560	413,152	425,872	
<i>Undergraduate Enrollment Shares</i>					
Public 2-yr colleges	0.21	0.34	0.33	0.35	
Public 4-yr non-research universities	0.35	0.32	0.32	0.31	
Public 4-yr research universities	0.16	0.13	0.13	0.12	
Private 4-yr non-research universities	0.21	0.16	0.17	0.18	
Private 4-yr research universities	0.07	0.05	0.05	0.05	
<i>BA Degree Shares</i>					
					Completion Rate of 1st Time Freshmen (NLS 72)
Public 2-yr colleges	0.00	0.00	0.00	0.00	0.24
Public 4-yr non-research universities	0.40	0.46	0.44	0.45	0.59
Public 4-yr research universities	0.22	0.22	0.21	0.20	0.72
Private 4-yr non-research universities	0.26	0.23	0.25	0.26	0.59
Private 4-yr research universities	0.12	0.09	0.09	0.09	0.81

Notes: Author's tabulations from HEGIS/IPEDS "Degrees Conferred" and "Fall Enrollment" surveys. Liberal arts colleges are included with private research universities.

Table 6: Within-state resource and enrollment effects on completion
 Dependent Variable is inter-census difference in Ln BA Share [D BA_t-BA_t-10]

dlmba	Coef.	Std. Err.
D Ln Some College	0.856	(0.101)
D Share Com Coll Enroll	-1.990	(0.652)
D Share 4-yr Oth Pub Enroll.	-2.101	(0.701)
D Share Research Pub Enroll.	-1.727	(0.682)
D Share 4-yr Oth Pri Enroll.	-1.600	(0.767)

Dependent Variable is inter-census difference in completion rate [D CR_t-CR_t-10]

dcr	Coef.	Std. Err.
D Share Com Coll Enroll	-0.649	(0.200)
D Share 4-yr Oth Pub Enroll.	-0.653	(0.219)
D Share Research Pub Enroll.	-0.550	(0.209)
D Share 4-yr Oth Pri Enroll.	-0.533	(0.239)

Notes: Author's tabulations using 1970, 1980, and 1990 Decennial Census and enrollment shares by state calculated in 1967, 1977, 1987, and 1997. Each difference is calculated at the state level for those ages 23, 24, and 25 by residence 5 years prior; DC, AK, HI are excluded. Each regression includes a constant, dummy variables for age level, and 1990. Enrollment shares are derived from HEGIS-IPEDS data and are measured in 1967, 1977, and 1987 for each Census year. The omitted enrollment share category is "4-yr private liberal arts & research." Standard errors are corrected for heteroskedasticity.

Table 7: Six-year completion rates by type of institution

Type of Institution (Carnegie Classification)	N=	Mean	Std. Dev.
<i>Private</i>			
Research 1	17	0.84	0.15
Other Doctorate	31	0.69	0.12
Comprehensive	48	0.6	0.14
<i>Public</i>			
Research 1	53	0.61	0.13
Other Doctorate	67	0.46	0.15
Comprehensive	80	0.37	0.13

Notes: Data from NCAA reports.

Table 8: Within-state changes in the share of state higher education appropriations and college completion

Dependent Variable	Coefficient of Interest	Coef. (s.e.)	Other
4-Year Share of State Appr.	Time trend	-0.002 (0.000)	State fixed effects
Ratio BA degrees conf. to undergraduate FTE Enr.	4-Year Share of State Appr.	0.049 (0.021)	State and year fixed effects
Decennial Diff. (90-80) in State Completion Rate (BA/Any College)	Decennial Diff. (85-75) 4-Year Share of State Appr.	0.353 (0.125)	Age-specific dummy variables

Notes: Measures of the share of state appropriations to four year institutions and 2 year institutions are from the author's calculations using data from the HEGIS/IPEDS surveys of institutional financial characteristics. Data on degrees conferred and enrollments are also from the author's calculations using data from the HEGIS/IPEDS surveys. Census-based completion rates are calculated from the 1980 and 1990 Census micro data. Share some college and share college completion is calculated at ages 23-25 and state reflects the place of residence five years prior in order to measure outcomes without the effects of migration. Calculations are based on 47 continental states, as South Dakota lacks a community college system.

Table 9: Effect of tuition and resources on enrollment and completion

Dependent Variable (in Logs)	Type of In- state Tuition	Coef. (s.e.)
FTE Enrollment	Flagship	-0.12 (0.02)
	Other 4-yr	-0.09 (0.02)
BA Degrees	Flagship	-0.11 (0.02)
	Other 4-yr	-0.09 (0.02)

Notes: Author's tabulations from HEGIS/IPEDS "Degrees Conferred" and "Fall Enrollment" surveys. Tuition data are from Washington State Higher Education Control Board. Each set of estimates represents the effect of tuition (measured in lns) on FTE enrollment or degrees as indicated (also measured in lns) using data from 1967-1967 at the state level with state and year fixed effects.