The Contributions of Economics to the Study of College Access and Success

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INTRODUCTION - THE ECONOMICS OF HIGHER EDUCATION

This essay provides a comprehensive review of work by economists and others in related quantitative disciplines on the transition of students to college. A particular emphasis is given to the importance of price and financial aid although the role of many other factors is also investigated. Although it would be impossible to discuss each and every contribution to the literature, the goal is to give the reader a sense of the types of research that have been done and the models, methods, and data used. This section describes the general approach of economists to the study of transitions to higher education. The following sections focus on issues related to college preparation, access, affordability, and persistence. The final section discusses major conclusions and ongoing debates within economics about college access and success. It also suggests directions for future research.

This is obviously not the first review of the literature on the economics of education. During the last thirty years, several reviews of the literature have been written. However, given the breadth and depth of the work that has been completed in this area, none gives a full picture of the contribution of economics to understanding the transition to college. Most of the reviews examine the impact of price and aid on enrollment, a construct prominent in economics. One of the first and most comprehensive reviews was done by Leslie and Brinkman (1987). It discusses work on the impact of price and aid on college access, choice, and outcomes until the mid-1980s. St. John (1991) and Heller (1997) provide updates of this review. Related fields have also published reviews of the literature that include the work of economists (Baker & Velez, 1996). The most recent review, Ehrenberg (2004), surveys the literature on the effects of financial aid. In addition, Ehrenberg discusses research on the return to education, the academic labor market, and college institutional behavior. While this paper will draw upon the conclusions of some of these studies, they are used sparingly because they do not have the same focus as this report.

Economic models and theories that relate to education

The process of preparing, applying, and choosing to attend college is influenced by a complex array of interrelated background factors, educational experiences, and social contexts. Most of the work in the economics of education focuses on the individual at the center of this process. As such, within the discipline, most economists who study education use the models and theories of microeconomics, the study of the behavior of individual decision-making units. Given the many factors that influence college enrollment and persistence patterns, the unit of analysis in studies can range from individual students, households, schools, or communities.

Economics relies on models to formally represent the factors that might affect decisions. A model is a simplification of reality that allows one to focus on a particular aspect of a situation and consider the relationships between variables or how changes might impact behavior. Models in economics are often formalized with mathematical equations to represent the factors. The assumptions that govern the models are also important when trying to extrapolate to the real world, but often even simplifying assumptions that are not completely accurate can provide useful insight to understanding complex relationships and phenomena. One key assumption of most economic models is that consumers and producers act purposely. In other words, individuals and firms are assumed to respond to incentives, and they prefer to minimize costs and maximize benefits. These costs and benefits are most easily measured when they are monetary in nature, but non-monetary factors are also known to be important in decisions. Economists often seek to identify the incentives that are important to individuals, measure how policy changes these incentives, and estimate the direction and magnitude of the responses of individuals to altered incentives.

The primary framework in economics of education is the human capital model developed by Gary Becker in his seminal 1964 work. Education is thought to increase human capital, a set of skills that can be “rented out” to employers for income. When deciding whether to continue their education, individuals compare the benefits of human capital to the costs of obtaining it. In terms of higher education decisions, an individual will weigh the costs and benefits, both monetary and otherwise, to decide whether to prepare for college, enroll in a postsecondary institution, and continue until completing a college degree. Theory suggests, and many studies have shown, that college demand will depend
upon the net benefit (benefits minus costs) of education, the prices of alternatives, and the preferences of the individual subject to a lifetime budget constraint. Among the costs of education are tuition and foregone earnings, the income that an individual could have made had he or she decided to enter the labor market rather than attend school. On the other side, the benefits of higher education include increased earnings. Additional non-monetary costs and benefits, such as the psychic costs of studying, the consumption value of college, and possible improved health outcomes due to education, may also be important and are considered in many studies. The public or social benefits of education are also important when considering the return to education at a governmental or societal level. Section 3 elaborates on empirical support of the human capital model and advances to the theory.

Another major theoretical construct that informs economic analyses of educational decisions is markets. In the market for education, consumers (i.e., students) and producers (i.e., schools) respond to prices by demanding and supplying, respectively, a certain amount of education. Under a perfectly competitive market system, prices will be bid down to marginal cost and the amount of education demanded by students will equilibrate with the amount of education supplied. However, this result relies on many assumptions, including that consumers can purchase all of the education they want at the given market price. The violation of this assumption is considered a market failure in economic theory, and such failures provide some of the economic justifications for the intervention of the government in the market for higher education.

As Poterba (1996) summarizes, economics highlights two main market failures suggested as justifications for the extensive use of government financial aid. First, individuals may have liquidity constraints, or the inability to secure capital to pay for their human capital investments. Therefore, capital markets for financing higher education are imperfect, and so subsidies to higher education in the form of financial aid address this market imperfection by providing individuals with access to capital so they can make their optimal college investments. The presence of externalities, another theoretical concept in economics, is a second major market failure. Externalities are defined as spillovers that affect other parties. For example, individuals with more education may be less likely to commit crimes and so their peers are less likely to be victimized, thereby reaping a benefit from the additional education even though they did not receive it themselves. It is considered a market failure that the individual’s private investment considerations ignore any positive externalities education produces for society and may lead students to under-invest in education. A policy that increases individual investments and the resulting educational externalities could therefore move the economy toward the social optimum. Given the cost-benefit analysis framework of the human capital model, many policies such as financial aid have been designed to lower the costs of education with the hope of inducing college enrollment. Aid to colleges may also be justified if colleges and universities provide beneficial public goods such as products or information for the state.

There are many other models and concepts that economists have developed to better understand educational outcomes and behavior. One important insight involves the importance of selection in education. As noted by Willis and Rosen (1979), individuals do not randomly decide to get additional education, and as discussed below, this can complicate empirical efforts to understand the effects of education on outcomes. Additional economic models are discussed throughout the review in the following sections.

The empirical methods and data of economists

Estimating the direction (i.e., positive or negative) and magnitude (i.e., large or small) of responses to inputs and policies is a major undertaking for economists. To truly understand the impact of a particular factor or policy on the decision to enroll and later achieve success in college, one must develop an appropriate strategy to isolate that effect from other possible influences. This is a formidable task for researchers, and economists spend a great deal of time determining ways to deal with possible endogeneity between variables. Variables are considered endogenous when one is related to the other. For example, educational attainment and academic ability have been found to be positively correlated. Economists theorize that this is because education is less costly for higher-ability students in comparison to their peers. A problem develops when trying to determine the causal impact of education on income separate from other factors like ability. Although education and ability are each likely to be positively related to income, it is difficult to isolate the effect of one from the other because they are endogenous. Not adequately addressing concerns about endogeneity could lead to estimates that are biased upward or downward and thus cloud the true nature of the relationships being investigated.

At the core of their work, economists aim to establish a causal relationship rather than one based on the correlation of trends or patterns. The distinction between correlation and causation is an important one as many variables related to issues involving education appear to move together. For example, female students tend to score lower on standardized tests. This, however, does not mean that gender causes students to perform in a certain way. There are other factors such as differences in socialization by gender that may really explain the differences in achievement. Therefore, one should be extremely cautious in interpreting variables that appear related as causally linked.
In pursuit of causality, economists rely on complex estimation techniques usually involving large samples of quantitative data for their analysis. Economists rarely publish work that is only descriptive; instead, econometric techniques and strategies allow researchers to isolate the object of interest while controlling systematically for the influence of other variables. Although similar to general statistics models, econometrics techniques include additional methods designed to specifically deal with the unique concerns of studying social phenomena. In contrast to the sciences, there are few careful, controlled experiments in education, and additional care is necessary to address issues such as selection. For example, the instrumental variables approach has been used to address the problem of endogenous variables like ability. After identifying external factors that impact educational decisions but are not related to ability, researchers have incorporated instruments in their regression analysis to isolate the effect of education on earnings from other influences. Section 5 elaborates on this work.

Economists also take special care to choose an appropriate research design that allows for causal analysis. Studies often utilize “natural experiments” to tackle a question. The introduction of new policies and major changes to existing policies are often exploited for such analysis as doing so allows economists to approximate the more experimental techniques used in the sciences. Examples of such research on financial aid range from examinations of the enrollment and institutional effects of the introduction of the Georgia Hope Scholarship to the elimination of programs like the Social Securing Student Benefit Program. Future sections will elaborate on such studies as well as the differences-in-differences approach often used to determine the effects of such policy changes. Regression discontinuity is another technique economists have used with some success in determining the importance of factors such as financial aid. For example, when grants are given by family income, researchers can examine students just above and below the cutoff to determine the impact of those grants. Section 4 provides examples of studies using this empirical approach.

Because of the complexity of the quantitative models used, this type of work usually demands large amounts of data. Unfortunately, this requirement, along with the concerns about biases, often limits the kinds of questions that can be confidently answered. Traditionally, economists have used large-scale quantitative data collected and maintained by the federal government such as the National Education Longitudinal Study of 1988 (NELS88), the National Longitudinal Survey of Youth (NLSY), or the Current Population Survey (CPS). While these sources have provided a wealth of information, it is becoming more common for economists to use administrative datasets, collected by schools, districts, or states, which can often provide high-quality information. They also often allow researchers to exploit specific natural experiments, as will be demonstrated below in the discussion of the literature.

Organization of the paper

The essay is organized into five additional sections, and each deals with a different set of issues concerning research on college access and success. Section 2 focuses on college preparation and highlights issues related to school resources, high school preparation, expectations, and information about college. Section 3 looks broadly at access. It begins with a discussion of economic models of college demand and then details what is known about how students choose which college to attend and the impact of various admissions policies. The fourth section identifies ways in which families pay for college. Section 4 first discusses college costs and affordability and gives an overview of indirect and direct college aid sources. Then it reviews the long literature on the effects of financial aid on students. Various approaches to answering this question are discussed along with their drawbacks and benefits. Section 5 investigates factors related to college outcomes including persistence and graduation. There is also an extensive discussion of the return to a college degree, a topic of great interest to economists. Section 6 concludes with a summary of the major holes in the economics literature and suggestions for future research.

COLLEGE PREPARATION

As Sections 3 and 5 will discuss, the academic ability of students appears to affect the likelihood of college attendance and persistence. However, academic preparation, as measured by test scores, course selection, and grades, varies substantially by background. Test score gaps by race and income are documented by Jencks and Phillips (1998), Adelman (1999) instead tracks the course-taking behavior of students who were in the tenth grade in 1980 and demonstrates how students differ in the types of courses they take and how well they perform by demographic and income group. More recent data is needed to document current gaps in preparation and performance, but a more important issue is why these gaps exist. Although there are general theories about why students from different backgrounds have varying propensities to get the proper preparation or perform well, the literature continues to wrestle with determining the relative importance of schooling inputs or experiences, families, expectations, and other factors. Due to the complex interactions between background, school quality, and preparation, it is difficult to establish causal relationships between variables.
Using a variety of estimation techniques and data sets, economists have made major contributions to our understanding of the factors that influence academic preparation. This section explores the role of schools, families, and other personal factors such as expectations. First, I examine the effects K-12 schools have on student achievement. Primary and secondary schools provide the educational foundation upon which students build as they consider higher education, and economists have developed an extensive body of literature examining the effects of various types of school resources on the achievement of students. This section also briefly reviews research on the impact of school reforms on increasing the effectiveness of schools. The impact of certain types of academic preparation is also reviewed. Finally, the section considers the role of factors outside of schooling, including parents and expectations.

**The impact of primary and secondary schools on student outcomes**

A significant portion of the economic research on education focuses on inputs and outcomes during primary school. This paper reviews some of this work because even investments at this early level of education could impact long-term college access. For instance, Krueger and Whitmore (2001) analyze the effects of having a small class size in grades one to three on the subsequent performance of students in middle and high school. They find that smaller classes are associated with somewhat higher performance on standardized tests and an increase in the likelihood that students take a college-entrance exam, especially among minority students. Therefore, when examining the outcomes of older students, it is worthwhile to consider earlier educational experiences.

There have been many studies in economics on the impact of school resources on student outcomes. This debate is summarized by the question: “Does money matter?” On one side of the debate, researchers have compared expenditure levels to student outcomes such as test scores. Hanushek (1997, 2003) has been foremost on this side of the debate. He has conducted extensive reviews of the literature and looked at what percentage of studies find statistically significant positive effects of resources on student outcomes. He concludes that school resources do not affect student outcomes. Bettis (1996) comes to a similar conclusion although he concedes that resources may have mattered in past decades, when overall spending was much lower. On the other side of the debate, researchers have argued that the method of vote-counting does not take into account that some studies end up with more reliable estimates than others. Card and Krueger (1996, 1998) examine the issue with research on North and South Carolina. They find that resources are systematically related to student achievement. Guryan (2001) finds that increased spending due to an education finance equalization scheme improved fourth-grade test scores.

While many agree that adequate resources are often necessary to promote high performance among students, expenditures alone are not sufficient if they are spent in wasteful or ineffective ways. Therefore, a significant part of the economics of education literature seeks to identify the particular inputs that matter most in student achievement. The focus of many studies has been teacher quality; only a few are mentioned here. Rivkin, Hanushek, and Kain (2005) use unique panel data from Texas schools and find that teachers have powerful effects on reading and mathematics achievement, though little of the variation in teacher quality is explained by observable characteristics such as education or experience. Rockoff (2004) also uses panel data to estimate the impact of teachers on student achievement. Using repeated observations of teachers in multiple classrooms allows him to isolate the effect of a teacher. His results suggest that there are large differences in teacher quality within schools. Jacob and Lefgren (2004) investigate whether teacher training improves student outcomes, but they find that marginal increases in in-service training had no statistically or academically significant effect on either reading or math achievement in Chicago.

Another major input that has been investigated is class size. Results from the Tennessee STAR class-size experiment suggest that the internal rate of return from reducing class size from 22 to 15 students is around six percent (Mosteller, 1995). More recently, Hoxby (2000) uses variation in cohort size to examine the effects of class size. Her estimates suggest class size does not have an effect on achievement. However, Angrist and Lavy (1999) find very different results in Israel. Using Maimonides’ rule, a law that sets the maximum class size at 40, they construct instrumental variables estimates of effects of class size on test scores. They conclude that reducing class size induces a significant and substantial increase in test scores for some grades.

More work is needed, however, on how resources in secondary school affect college attendance. As one such study, Sander (1993) examines educational outcomes in Illinois for the 1989-1990 school year focusing on ACT scores, high school graduation rates, and the percentage in a high school planning to attend college. Lee and Ekstrom (1987) look specifically at guidance counseling in high school rather than general expenditures. Using data from the High School and Beyond survey, the researchers find that guidance counseling is not equally available to all public high school students. Unfortunately, there has not been significant research on the impact of guidance counseling on student outcomes. In addition to data problems, one difficulty of work on the connection between high school resources and college access is that it is hard to isolate the impact of the resources from many other factors; the quality of one’s high school is strongly related to background characteristics.
The economics literature is also extensive on the successes and failures of various policies designed to redistribute resources among schools in order to either equalize funding or provide aid so all schools can reach a level considered sufficient for providing an adequate education. This extensive literature is not covered here due to the focus of this essay. Also not reviewed in this paper are the numerous studies on the effects of reforms designed to increase school accountability and student choice. However, instead of focusing on the incentives of teachers, schools, and districts, some papers examine the incentives of students. For example, Bishop (1989) suggests the reason students are so poorly prepared for college is due to a lack of personal incentives or economic rewards. Therefore, many states have created graduation exams that students must pass in order to at least partly encourage them to prepare better for college. Bishop (1998) summarizes some of the recent research concerning these curriculum-based external exit exam systems. He suggests that compulsory national standards and reform of the pre-college curriculum should lead to improvements in both teaching practices and student learning. In more recent work, Bishop, Moriarty, and Mane (2000) find that New York State students, who take Regents exams, were one grade-level equivalent ahead than might be expected, given their socioeconomic background, compared to students in other states. Bishop and Mane (2001) more directly test the effect of Minimum Competency Exams on high school graduation, college attendance and early labor market success.

Even with adequate high school preparation, recent work emphasizes that there is a great disconnect between the education provided by high schools and the skills demanded by colleges and universities. Greene and Foster (2003) suggest that only one-third of students who graduate high school are at least minimally prepared for college. Venezia, Kirst, and Antonio (2003) detail how differences between what high schools expect and what colleges demand undermine student access and success in postsecondary institutions. Therefore, without a true K-16 approach, there is reason to doubt that the recent movements to improve primary and secondary schools will increase college enrollment or performance by much.

**Other factors that affect preparation**

While schools are known to be important in access, other factors such as parents are also thought to be crucial in determining college enrollment. Although little of the research documenting the role of these other factors has been done within economics, the theoretical models and patterns found by researchers in other disciplines and fields have been influential in the way economists think about these aspects of a student's life. For example, parents are thought to affect the aspirations of their children. Conklin and Dailey (1981) find that consistent parental encouragement through secondary school years is an important influence on students deciding to aspire toward higher education and enter four-year colleges. Hossler, Schmit, and Vesper (1999) find that the role of parents seems to be a key predictor of college attendance. The authors found that toward the beginning of the college-selection process—during the early high school years—the encouragement of parents is most likely to determine whether or not a student has college aspirations. Other work has shown that the expectations of the student matter greatly in determining whether they enroll. In the Australian context, Carpenter and Fleishman (1987) link college intentions with behavior. College expectations among students may actually be growing. Reynolds and Pemberton (2001) document this trend by comparing the 1979 NLSY to the one initiated in 1997.

What is unclear from the larger literature on aspirations and expectations is whether they cause behavior or are just a symptom of a larger process of motivation and preparation. While economists admit to the important role of parents, peers, and aspirations in college decisions, I know of no systematic work in the area. This is perhaps due to the difficulty in determining whether these effects are due to correlation versus causation. What is interesting about recent findings is that a majority of students, even those who are not taking active steps toward the goal of college enrollment, expect to go to a postsecondary institution. This may relate to problems with what students know (and do not know) about college.

Unfortunately, students and families seem not to know much about how to prepare or pay for college. O'Brien (1992) provides a review of the prior work on the role of information about college costs and aid on access. She finds that the research literature in this area is greatly lacking and often does not control for background characteristics when trying to understand the effect of information on access. The research also does not provide an adequate way to deal with distinguishing between correlation and causation. It may be the case that students who want to go to college seek out the necessary information, and so it is unclear whether increasing the level of information for students in general would have a large or small effect on enrollment. O'Brien concludes that information probably plays only a supporting role in attendance decisions rather than being the most critical factor. Similar to O'Brien, Orfield (1992) suggests that low-income families may not have reliable information about financial aid. He concludes that family background factors play a substantial role in making people aware of their eligibility for aid.

More recently, Horn, Chen, and Chapman (2003) use data from the 1999 National Household Education Survey to investigate how much college-bound sixth- through twelfth-grade students know about the cost of attending college.
They also study the relationships between students’ knowledge of college costs and how they go about preparing for college. In general, students and families overestimate the cost of college and few know the details of financial aid. Unfortunately, these data are restricted to students who consider themselves college-bound, so it is impossible to determine how information, particularly about aid, might affect college expectations.

On a smaller scale, Avery and Kane (2004) use evidence from intervention programs in the Boston Public School system to learn more about student perceptions of the economic value of college and the financial aid and college application process. They find that inner-city and suburban high school seniors report broadly similar educational plans regardless of the wealth of the local area. Moreover, despite unrealistically high estimates of tuition costs, the vast majority of students in each group estimate that college would have a positive net value. Yet, a large proportion of the Boston Public School students who reported that they planned to go to college did not do so. The analysis indicates that these discrepancies between intended college plans and actual enrollment decisions reflect lack of preparation, significant hurdles that arise for low-income students due to lack of familiarity with the college admissions process, and over-optimism. The authors find some evidence that certain interventions may increase the percentage of low-income students who enroll in college.

COLLEGE ACCESS

While the last section focused on variables that influence college preparation, this section examines some of the factors that affect how students make the decision of whether to go to college and which college to attend. As noted in the introduction, economists utilize a human capital demand framework to understand college enrollment decisions. Individuals compare the benefits of a college education to the costs of obtaining it. Since the introduction of this idea by Becker (1964), many papers have built upon the notion of human capital and documented empirical patterns that support this demand framework. The next section discusses a number of studies that relate tuition price and financial aid to college enrollment. Meanwhile, this section reviews the literature that documents differences in access by background and examines non-monetary factors that might explain such patterns. Finally, I discuss research on the importance of supply-side factors such as the admissions policies of postsecondary institutions on college enrollment.

Differences in college access by background and possible explanations

Differences in enrollment rates by background are widely cited in the economics literature. Most work focuses on racial disparities with an eye toward differences in family income. For example, Hauser (1993) documents trends in enrollment by race using annual data from the October CPS. Other studies, mainly from related disciplines or fields, focus on SES, a measure that incorporates family income along with other measures of social capital such as the occupations of the parents. Terenzini, Cabrera, and Bernal (2001) note that despite an enormous investment in equalizing educational opportunities for all Americans, the evidence indicates that significant inequities remain. Once identifying a disparity, most economic studies attempt to quantify the role of different factors in explaining the gaps. The measures often investigated include family income, parents' educational attainment, and local economic conditions. Another prominent theory that many test is that differences in the costs of higher education and the resources required to finance tuition expenses explain enrollment gaps; the next section reviews this extensive literature.

The return to education, an important part of the human capital model, could also be an important explanation for differences in college access. Willis and Rosen (1979) show that as the return increases, so does the likelihood of enrollment. The authors further suggest that the return to education differs by person, and so they introduce the importance of comparative advantage and self-selection in human capital investments. Willis and Rosen conclude that those who did not attend college would have earned less than measurably similar people who did attend, while those who attended college would have earned less as high school graduates than measurably similar people who stopped after high school. Venti and Wise (1983) also find that college human capital investment decisions are strongly mirrored by the likelihood that they will pay off. Moreover, they conclude that individual self-selection, related to both measured and unmeasured attributes, is the dominant determinant of college attendance. Section 5 reviews additional work that examines the role of the return to education.

Among the papers that explore the role of background, tuition costs, and college returns is Kane (1994). He uses a series of cross sections from the October CPS and tests the role of family background, direct college costs, local economic conditions, and returns to college. Black and Sufi (2002) use SES as a measure of family background and find that once accounting for differences, low-SES Black students were more likely to enroll in college than low-SES Whites, particularly during the 1970s. B. Long (2004a) also studies the role of various factors in the decision of whether to attend college for cohorts that graduated in 1972, 1982, and 1992. Differences in family income and parents' educational attainment explain a large part of racial gaps and seem to become more important explanations over time. The literature does not do much to address differences in college entry by minority racial groups other than...
African-Americans. This is likely due to a lack of data on other groups, such as Latinos and Asians, particularly by ethnicity and country of origin.

While race is a prominent construct in much of the research, other work looks at differences by gender. Averett and Burton (1996) consider gender differences in the decision of whether or not to attend college using data from the NLSY. They demonstrate that for men, the higher the college wage premium, the more likely they are to attend college; the same is not found for women. More recently, researchers have investigated the growing trend of more women attending college than men. Charles and Luoh (2003) also document the dramatic changes in relative educational attainment by men and women over the past three decades. They build on the basic human capital model and test it empirically to show that the anticipated dispersion of future wages affects relative schooling patterns by gender. Jacob (2002) attempts to explain the gap in one cross-section of data by examining two potential explanations: returns to schooling and non-cognitive skills. He finds the majority of the attendance gap can be explained by differences in the characteristics of men and women, despite some gender differences in the determinants of college attendance. The results suggest that higher non-cognitive skills and college premiums among women account for nearly 90 percent of the gender gap in higher education. The gender gap in college access and persistence, as well as earlier levels of education, is a major issue that needs further examination.

While a number of papers have tried to attribute racial, gender, and income gaps in access to a variety of factors, a major debate in the literature is what the role of background is in explaining gaps versus college price and financial aid. Carneiro and Heckman (2001) call into question the interpretation that a lack of financial aid is the cause of enrollment differences. Using a longitudinal dataset, the NLSY, the authors conclude that long-term conditions such as family income and background are more to blame than short-term credit constraints in explaining differences in attainment. Black and Sufi (2002) also conclude that tuition costs and local labor markets explain very little of racial differences in college entry. This essay will expand on the debate about the effect of financial aid on college access in a later section.

Another critical factor in college access, similar to those discussed above in terms of college preparation, is the amount and accuracy of information a student has in his or her calculation of the costs and benefits of education. Altonji (1993) recognizes that individuals often do not have complete information to make an accurate cost-benefit analysis and treats education as a sequential choice that is made under uncertainty. A simple model is used to explore the effects of ability, high school preparation, preferences for schooling, the borrowing rate, and payoffs to college on the probability of various postsecondary college outcomes.

Studies outside of the traditional economics literature tend to include additional factors when considering how students make college decisions. For instance, Hossler, Schmit, and Vesper (1999) incorporate social, economic, and educational factors when studying what influences the decisions of students in Indiana between 1986 and 1994. Tinto (1985) considers the role of proximity in college attendance. Many of these ideas have been incorporated into the economics literature as part of studies on the impact of higher education or evaluations of the impact of policy. They are discussed below.

**Beyond access: How students choose which college to attend**

The papers reviewed above treat college enrollment as a general decision. However, researchers have further studied how people choose which college in particular to attend. Manski and Wise (1983), in an influential book, explore the college-decision model using additional information on applications and admissions. They suggest that individual application decisions are much more important than college admissions decisions in the determination of attendance. The authors point out that most applicants are accepted into their first-choice school. Therefore, each individual’s personal cost-benefit analysis leads to self-selection in the application process, similar to the conclusions of Willis and Rosen (1979). Students personally weigh the costs and benefits, and the likelihood of admission. If a person realizes that the likelihood of being admitted is low or that they would not reap a large return from college, then he or she will not apply or attend. This fact has justified the approach of most researchers to concentrate on the student’s decision of attendance rather than the college’s decision of admission. Likewise, Venti and Wise (1982) find that standardized test scores are more strongly related to student application and choice of college “quality” than to college admissions decisions. Hossler, Braxton, and Coopersmith (1989) and Paulsen (1990) further develop models of college choice using interdisciplinary perspectives.

Weiler (1986) instead focuses on the types of college opportunities available to a student. Using a sequential model, he finds that the establishment of a new school affects enrollments at institutions regarded as close substitutes. He concludes that only 20 percent of the students attending the new school would not have attended an existing institution. Rouse (1998) also looks at how the set of schools available affects access by state. States that have more community colleges tend to have higher enrollment rates, although attending a two-year rather than a four-year college may lower the total educational attainment of some students. Kroncke and Ressler (1993) instead look at...
choices between public and private colleges as it relates to the unemployment rate of an area.

B. Long (2004a) further studies how students compare colleges in making decisions. Using extensive student and college information, she examines how individuals chose where to attend college by estimating the importance of price, distance, and quality. The results suggest that although tuition price was an important determinant of attendance for the class of 1972, college costs do not explain differences in enrollment for the class of 1992. However, price is still found to be an important factor when individuals choose between colleges, particularly among low-income students. Jackson (1988) found similar results comparing 1972 high school graduates to those from 1980, and he concludes that students’ decisions about higher education are remarkably resistant to modest changes in the social-policy environment. Researchers have also looked at the special role certain kinds of institutions have on college access. For example, Ehrenberg, Rothstein, and Olsen (1999) instead investigate the role of Historically Black Colleges and Universities (HBCUs) on the attendance rates of African-Americans.

Although the above studies focus mainly on choice between four-year colleges, some work focuses entirely on the two-year versus four-year college decision. Grubb (1988) investigates enrollment and completion rates at public two-year colleges and finds that they are not sensitive to labor-market conditions. Instead patterns tend to persist over time, and Grubb concludes that this is due to institutional rigidities. Rouse (1994) examines the decisions of students on the margin between the two levels of institutions. Rouse and Kane (1995a, 1999) provide background on the history and development of community colleges and review evidence on the impacts of community colleges on educational attainment and earnings. Hilmer (1998) examines the role that fees have on a potential student’s decision to start at a university or a community college. His theoretical model suggests that the student’s decision follows a natural ordering that depends on his or her probability of graduation. Finally, Leigh and Gill (2003) examine whether attending a community college diverts students from eventually getting a bachelor’s degree. They find that the schools increase mean educational attainment by 0.4 to 1.0 years.3

Other work expands on these differences in college choice by background. Sazama (1994) develops a measure of the equality of choice in higher education by using indices of inequality including the distribution of parental income at different types of institutions. The results show substantial systemic differences in equality of choice by institutional type. Background may affect the kinds of things students look for in a college. As Flint (1992) finds, the kinds of characteristics looked for in colleges is related to parental socioeconomic and educational background and college-planning variables (familiarity with admissions, aspirations, financial planning). McDonough (1997) provides a systematic analysis of how social class and schools structure college choice.

Behrman, Kletzer, McPherson, & Schapiro (1992) focus on how family background affects scholastic achievement and therefore the choice of institutional quality. They find that students from families with high income, better educated parents, or parents with higher socioeconomic status generally do better on tests of scholastic achievement. This academic performance is then positively related to attending a four-year postsecondary school, but not to attending a two-year school. McPherson and Schapiro (1994) analyze data from the American Freshman Surveys of 1980, 1989, and 1993 to determine how family income has affected choice of institution, and how this has varied over time. They find that high-income and middle-income students have shifted away from public two-year colleges, which has made these schools increasingly concentrated with low-income students. However, this trend may have reversed itself during the last decade.

The specific kind of education offered may also be important in college choice. Paulsen and Pogue (1988) relate the curriculum of a college to the types of skills being demanded in the labor market. Using 1965-1981 data on a set of 64 independent colleges in Iowa and Illinois, they find that colleges with an emphasis on traditional arts and sciences tend to have greater enrollment growth when the labor market is improving, while colleges with an emphasis on occupational fields tend to have greater enrollment growth when the labor market is deteriorating.

**Issues with admissions: Affirmative action, standardized tests, and other issues**

Although most students attend the college of their choice and 80 percent of colleges are nonselective, there has been a great deal of concern about how admissions decisions are made and the extent preferences are given to certain groups. Most recently, economists and others have studied the impact of affirmative action. To discern the role of racial preferences, researchers have compared the academic characteristics of students of different races at a particular college. However, researchers often do not have complete information of all the factors that affect admissions to determine with any confidence the extent of racial preferences. For example, Kane (1998a) compares the college application decisions of high school graduates at elite institutions. Although he finds that students of color attended slightly better elite institutions than White students with similar characteristics, he notes that this observation is based only on test score and high school GPA information. Admissions committees, particularly at these types of institutions, take into account a wide variety of criteria, and some of these factors are likely to be subjective measures not easily captured in analysis. For example, many schools require student essays and recommendations from
teachers. Moreover, extracurricular activities and leadership experiences are also important influences in application decisions. Therefore, a summary of the mean test scores of a particular race at a school cannot convey differences in these traits and is not sufficient evidence of racial preferences.

To help determine what role the SAT should take in admissions, several researchers have looked at the predictive value of the SAT on future student performance. Rothstein (2004) asserts that the methods used in most SAT validity studies are not based on reasonable sample selection assumptions and are uninformative about the source of the SAT’s predictive power. After correcting for selection issues, his results suggest that the SAT’s contribution to predictions of University of California freshman grade point averages are about 20 percent smaller than the usual methods imply. Moreover, much of the SAT’s predictive power is found to derive from its correlation with high school demographic characteristics.

Performance on the SAT is also related to how many times students take the exam. Vigdor and Clotfelter (2003) examine this relationship and find that the most common treatment of test scores, which utilizes only the highest of all submitted scores, provides large incentives to retake the test. The likelihood of retaking the exam differs substantially by background, and this places certain applicants at a disadvantage. This includes students with high test-taking costs and those with “pessimistic” prior beliefs regarding their own ability.

Given the differences in SAT scores, Bowen and Bok (1998) explore the consequences of considering race at more selective institutions by examining the academic, employment, and personal histories of more than 45,000 students of all races who attended academically selective universities between the 1970s and the early 1990s. They study how much race-sensitive admissions increase the likelihood that Black students are admitted to selective institutions and demonstrate what effect the termination of these policies would have on the number of minority students at different kinds of selective institutions. The authors go on to determine how well Black students have performed academically in comparison to their White classmates, what success they have had in their subsequent careers, and how actively they have participated in civic and community affairs. They conclude that race is an important factor to consider in admissions given the long-term benefits of the policy. Krueger, Rothstein, and Turner (2005) consider the 25-year goal set by Justice O’Connor in the Grutter v. Bollinger Supreme Court decision and forecast the racial composition and SAT distribution of the elite college-admissions pool 25 years from now. They conclude that projected economic progress will not yield nearly as much racial diversity as is currently obtained with race-sensitive admissions.

In response to the challenges to affirmative action, several states have eliminated racial preferences in admissions. M. Long (2004a) evaluates the behavioral response of college-bound high school seniors to changes in college affirmative action admissions policies during the late 1990s. He concludes that after the elimination of affirmative action in California and Texas, the gap between the numbers of SAT score reports sent by non-minority and minority students to in-state, public colleges significantly widened.

As an alternative to affirmative action, Cancian (1998) compares the effects of race-based programs to admissions policies based on class or economic status. Using the NLSY to simulate the effects of different admission scenarios, she finds that doing so would not produce the same results as programs that target race. Bowen, Kurzweil, and Tobin (2005) also consider the case for considering economic diversity (i.e., income) in admissions. Koretz, Russell, Shin, Horn, & Shasby (2002) instead explore how various approaches to admissions would affect the diversity of the admitted student population in California. “Race-neutral” admissions based solely on test scores and grades were compared with the results of actual admissions before and after the elimination of affirmative action. They found that replacing the former admissions process, which included preferences, with a race-neutral model based solely on GPA and SAT-I scores substantially reduced minority representation at the two most selective University of California (UC) campuses, but had much smaller effects at the other six, less selective campuses.

Instead of using class explicitly in admissions, several states have replaced affirmative action policies with percentage plans. Under these policies, the top proportion of a high school is given admission to some set of public universities. To understand the effects of these programs, researchers have compared levels of diversity before and after enactment. As the oldest program, Texas has been the focus of much of the research in this area. Using a database developed by the UT Dallas Texas Schools Project, Kain and O’Brien (2003) found that the Top 10 Percentage Plan had little effect on Black and Hispanic enrollments at selective public universities during the first year after enactment, but there appear to have been gains in the second year. However, using the most recent data several years after the introduction of the policy, researchers have found that the Black enrollment level is still lower than Pre-Hopwood levels. Furthermore, during the time period the percentage plan was enacted, the number of Black and Hispanic high school graduates increased substantially, and so in order to maintain the same proportion of minority students, the number of students of color should have increased (Kain & O’Brien 2003). In effect, the decline in diversity is underestimated when simply comparing pre- and post-enactment levels.

Quantitative analysis by Horn and Flores (2003) provides further quantitative analysis of the Texas plan along with
those of California and Florida. They draw upon data from state agencies, the federal National Center for Education Statistics, the U.S. Census, institutional and state documents, and interviews, to assess the impact of these policies on maintaining racial/ethnic diversity without using race or ethnicity as a factor in university admissions. They conclude that percentage plans alone do not serve as effective alternatives to affirmative action. Instead, such policies need to be coupled with recruitment, outreach, financial aid, and support programs targeted at underrepresented communities with large minority student populations.

A final aspect of the research literature on admissions by economists focuses on the practice of early decision. Colleges with this policy admit a portion of their class earlier in the admissions season, and Avery, Fairbanks, and Zeckhauser (2003) examine how this affects the likelihood of acceptance. Based on an examination of more than 500,000 college applications to fourteen elite colleges and hundreds of interviews with students, counselors, and admissions officers, they find that an early decision program can greatly enhance a college’s reputation by skewing statistics, such as selectivity, average SAT scores, or percentage of admitted applicants who matriculate. However, these gains come at the expense of distorting applicants’ decisions and providing disparate treatment of students who apply early and regular admissions.

FINANCING POSTSECONDARY EDUCATION

This section reviews how students and families pay for college. As a foundation for this discussion, numerous publications document trends in college costs. One example is McPherson and Schapiro (1989). They link increases in the cost of higher education to federal subsidy policies, a topic that is addressed later in this section. Beyond noting the increasing cost of college, economists have gone further to compare these costs to the incomes of families to get a sense of affordability. College tuition is frequently compared to the median income of American families as a proxy for what families might be able to contribute to postsecondary study. In a more direct analysis, Flint (1994) examines the actual family contributions of dependent students at 396 institutions. He finds that there are many inequities among income groups partly due to differences in the amount of planning and saving parents do in anticipation of college attendance. Goethals and Frantz (1997) note that while students often think colleges charge too much, a little information about the services offered by colleges often leads them to change their opinions. The authors conclude that students’ initial negative judgments reflect reactions based on treatments of the price issue in the popular media.

Given the high cost of college, particularly in relation to family income, the government subsidizes educational costs through many direct and indirect channels. Many books and articles discuss how the federal and state governments as well as private sources help fund higher education, including Quay and Olevnik (1984), Callan and Finnie (1997), and Paulsen and Smart (2001). Because of financial aid, many students are not charged the list price, and therefore, net price (list price minus aid) is a much more accurate reflection of affordability. Hill and Winston (2003) examine net prices for families of different income levels for students attending 28 highly selective, price colleges and universities. While there is considerable variety in net prices, many of these schools charge their low-income students very little. In addition, there is considerable variety among schools. The authors find that virtually all of them charge students in the bottom income quintile a lower net price than they do their wealthier students, but at some, net price as a share of family income rises as incomes increase while at others, it falls. Many other descriptive studies in other disciplines document the net prices faced by students at other types of schools.

The rest of the section discusses the effect of financial aid on student enrollment, choice, and other outcomes. First, I review the role and effects of operational subsidies directed to institutions. Then, I examine the literature on the effects of price and direct financial aid such as grants and loans. As shown by the length of this section, many economists have studied these topics. However, additional research is needed on the relative effects of different kinds of aid. More evidence is also needed to address questions about the ability of aid policy to combat the negative effects of coming from a disadvantaged background.

Indirect subsidies to students in higher education

The next part will discuss financial aid programs that give money directly to individuals. However, students also receive a great deal of support from the government in the form of indirect subsidies that are given to the colleges themselves. The most prevalent indirect subsidies are to public institutions from state governments. These funds allow the schools to charge in-state students a discounted price and explain the disparity in college costs by sector. A number of quantitative studies have examined the effects and distribution of these subsidies along with the factors that influence how much states choose to appropriate.

Several papers address why and at what level states elect to fund public colleges. For example, Johnson (1984) develops a simple model that implies investing in training high-skilled workers has benefits even for low-skilled
workers due to positive externalities and the American income tax structure. Coughlin and Erekson (1986) instead focus on college characteristics and state preferences. They find that institutional quality, statewide demand for higher education, legislative concern for equity and institutional effort, and success in intercollegiate athletics are important determinants. Creedy and Francois (1990) also consider the preferences of the population by exploring majority voting models. Heller (2001a) is a recent example of a study in a related field on the state role in higher education policy.

While in-state students are generally charged a subsidized price at public colleges, nonresident, out-of-state tuition levels can vary. Several papers examine how nonresident tuition prices are set. Greene (1994) finds that a state's relative strength in attracting both population and students leads to higher tuitions in general, and that large numbers of private colleges and perhaps lack of job openings lead to higher tuition for nonresidents as do small fiscal gains from high-income newcomers. Rizzo and Ehrenberg (2004) instead find that a key explanatory variable is the share of out-of-state students enrolled under reciprocity agreements. They find that public universities use out-of-state enrollments primarily to augment student quality, not to make up for losses in state appropriations. Out-of-state enrollment levels are relatively insensitive to out-of-state tuition levels charged by institutions.

Because state operational subsidies to colleges benefit students without consideration for income, one line of research has tried to document the distribution and tax incidence of the subsidies. Many question whether aid irrespective of income is the best method to provide support since the subsidies may primarily help infra-marginal students, those who are without need even when facing unsubsidized costs and who would attend college regardless of receiving aid. Moreover, the method of financing the aid may cause unintended redistribution. State appropriations per student vary greatly across colleges, and therefore, attendance patterns at the state's public universities, colleges, and community colleges will have a substantial impact on the amount of aid students of each income level receive. Using California data, Hansen and Weisbrod (1969a and 1969b) found that college attendance at highly subsidized schools is primarily a middle- to upper-income activity. Since all income groups pay taxes, they argue that state subsidies could be regressive depending on the progressivity of state sales, income, and property taxes. They followed up this analysis with a response to their original article (1971) and an additional 1978 study. Hansen also published an article on the subject in 1970. These findings have sparked a rich debate that has yet to be settled. Some of the earliest papers are Pechman (1970), Hartman (1970a and 1970b), and Pechman (1972) along with responses from Hansen and Weisbrod in 1971 and 1978. More recently, Lee, Ram, and Smith (1999) assess the distributive effects of state subsidies in Illinois.

Because operational subsidies allow public colleges to charge students a reduced price, they are a form of in-kind financial aid. Students only receive the "aid" if they attend the public college, and this partly explains why public colleges are cheaper than private colleges. Research has shown that the in-kind nature of state tuition subsidies impacts student decisions. As suggested by Peltzman (1973), the public subsidies appear to discourage students from investing in education beyond what is offered at the subsidized schools because the students would be forced to give up the benefit. Predictions from a model developed by Ganderton (1992) suggest that students choose a substantially lower quality public college than they would have chosen in the private sector, suggesting that distortions caused by aid may be harmful to students. B. Long (2004b) further investigates the issue using a conditional logistic choice model. Similar to Ganderton, her results suggest that the level and distribution pattern of state subsidies strongly influence decisions. When in-kind subsidies are large, students appear to choose public colleges even if the gap in resources between public and private options is substantial. The results also suggest that the in-kind subsidies create incentives for students to favor public four-year colleges over two-year institutions.

In addition to state operational subsidies, colleges receive federal subsidies through the tax treatment of most colleges as non-profit firms. Therefore, donations are treated as tax-deductible contributions, and this provides incentives for individuals and companies to give to colleges. When the government has considered changing these rules, colleges have worried greatly about the possible loss of funds as discussed by Auten and Rudney (1986) and Dye (1986).

An introduction to direct financial aid to students

Much more of the research focuses on funding that students get directly to pay for college. A number of sources outline the basic programs available and provide general information on aid usage. Some of these by economists include Clotfelter (1991), McPherson and Schapiro (1998), and Kane (1999a). Examples from related fields include Mumper (1996) and King (1998 and 1999). In addition to describing the aid programs, work such as Kane (1999a) and McPherson and Schapiro (1998) also note the procedure for getting aid and the way the government calculates need.

Focusing exclusively on the role of the federal government, Gladieux and Hauptman (1995a and 1995b) provide overviews of federal aid policy and trace the evolution of programs noting their accomplishments and problems. Johnstone (2003) explicitly lays out the fundamental assumptions and aims of federal aid. These include the notions
that higher education should be the province of the states and that taxpayers, parents, students, and philanthropists should appropriately share the costs for higher education. Another assumption is that aid should be sufficient to enable students whose parents have contributed a reasonable amount to attend higher-priced private colleges. Johnstone also points out problems with this framework including the assumptions about parental contributions amidst the increase in non-nuclear families and the current trend toward merit-based rather than need-based aid. Finally, Baum (2003a) calls for the federal government to refocus the national financial aid agenda on providing access to higher education for all qualified students. She argues that because the various other partners in the financial aid system base their policies on narrower agendas, the federal government must be the entity responsible for creating incentives for all partners to act in accordance with a clearly articulated national goal focused on college access.

Most of the work that addresses state aid focuses on the indirect subsidies that have been discussed in the previous section. However, with the increase in state merit-based scholarship programs during the last decade, more work is starting to focus on states as a major player in the realm of direct aid. For example, Cornwell and Mustard (2001) examine the extent to which Georgia's lottery-funded scholarship transfers resources, paying particular attention to differences in race, income, and education. Additional work is discussed below in reference to how state merit-based aid has affected student outcomes. Institutions have also gained more attention recently as providers of financial aid to students. McPherson and Schapiro (1998) outline the use of institutional aid at different kinds of institutions and analyze the types of students receiving the aid.

The rest of this section reviews the enrollment and choice effects of financial aid. While the question of whether price or financial aid matters in college access is significant, it is not an empirically straightforward endeavor. To study the effect of price, many researchers have estimated the relationship between attendance and tuition levels using cross-sectional data. However, this strategy has several drawbacks including concerns about aggregation and omitted variable bias. The study of the effect of aid is even more complicated due to the fact that the receipt of aid is correlated with other factors known to influence college decisions. Therefore, much of the research reflects the search for clever ways to avoid these estimation problems.

Cross-sectional studies and studies of changes in price

Under the demand framework, investment in higher education should be negatively related to tuition costs, and lower costs, perhaps through financial aid, should increase the probability of enrollment. Leslie and Brinkman (1987) provide a comprehensive meta-analysis of research that examines the validity of this theory. In terms of the access question, the authors ask whether aid is at least partly responsible for the fact that some students attend college. Furthermore, they try to determine what proportion of students would not have entered college in the absence of aid. In general, they find that without grant aid, the enrollment of low-income students would be reduced by 20 to 40 percent. The estimated effect on middle-income students is much smaller (7.4 to 19.5 percent). Leslie and Brinkman summarize that the magnitude of the effect varies by type of aid, sex, race, and level of academic achievement. According to work that used student surveys, about one-fourth to one-half of those asked indicated that they would not attend either full-time or part-time without aid.

Most estimates of the effect of cost reviewed by Leslie and Brinkman (1987) are based upon variation in aggregate, cross-sectional data. Researchers relate college investment to tuition and/or financial aid levels across a number of geographic areas. Since that review, there have been many additions to the literature using a similar estimation strategy. For instance, Heath and Tuckman (1987) examine the impact of financial aid and price on college access using a simultaneous equation model, which explicitly formulates the interrelated nature of the several demand functions representing progression through higher education. Instead of looking at enrollment, Savoca (1990) examines the decision to apply to college. She finds that calculations that incorporate this price effect on applications into earlier estimates of the tuition elasticity of enrollments suggest that the true elasticity may be double the size reported in the literature.

Kane (1995) provides more recent estimates utilizing several data sources (HSB, NLSY79, and October CPS) and exploiting both between-state differences and within-state changes in public tuition prices over time. He finds that, during the late 1970s and 1980s, states with higher public tuition levels had lower college entry rates, and within-state tuition increases led to lower enrollment rates. Low-income students and those attending two-year colleges seemed to be most affected. Differences in four-year tuition levels yield smaller estimates as do within-state responses to tuition-level changes over time.

While these studies provide further evidence of the importance of tuition in college decisions, studies based on cross-sectional data may suffer from several empirical problems. College choice studies based upon cross-sectional variation in state-level tuition data are primarily identified by fixed differences between states. These estimates could be misleading because it is difficult to distinguish the impact of tuition from any other characteristic of the state that has remained constant over time. Interpreting state variation as a natural experiment for tuition changes
has the problem that omitted state factors may be correlated with enrollment, subsidy level, and tuition. For example, if unobserved state preferences for higher education cause a state to provide larger tuition subsidies, the unobserved preferences could be negatively correlated with the mean tuition level of the state. The resulting parameter on tuition would be biased downward. This would suggest that the relationship between enrollment and tuition cost has been underestimated using state cross-sectional data. However, state income per capita may be positively correlated with tuition levels. This would result in the relationship between enrollment and price being exaggerated in estimation.

One of the most common ways researchers have tried to address concerns about biases in cross-sectional work is to examine changes in tuition prices by using time-series data. Therefore, any constant underlying preferences differ out of the analysis. McPherson and Schapiro (1989) do so to examine the contradictory results that although researchers tend to find aid has large effects, historically, these effects are not readily discernible in the aggregate data. Their controlled econometric analysis of time-series data for White students shows significant effects of aid on enrollment for students from low-income families. Further work in 1991 reports on a disaggregated analysis of time-series evidence on enrollments and net costs over the 1974-1984 period. St. John (1993) looks at the impact of college tuition and student aid changes during the 1980s on enrollment using price-response measures to examine why total enrollment remained stable while low-income enrollment declined. The author suggests that this technique is useful for explaining the consequences of price policy choices.

Other work looks at changes in tuition price at a particular institution or group of colleges. Chressanthis (1986) presents empirical evidence on the impact of tuition rate changes on college undergraduate headcounts and credit hours over time in a case study framework and with econometric analysis. The findings support the implications derived from human capital investment models. Wetzel, O'Toole and Peterson (1998) analyze the sensitivity of enrollment yields to changes in real net cost at a large, urban, public university over a six-year time period. They find that, while enrollment yields are generally insensitive to changes in net cost, sensitivity for Black students is roughly two-thirds higher than for White students. This would suggest that since minority students have been responding positively to financial aid, cuts in grant funding by the government might restrict minority access in the future. As a third example, Noorbakhsh and Culp (2002) examine the effects of two years of substantial increases in nonresident tuition in the Pennsylvania State System of Higher Education. The empirical findings indicate nonresident demand was price-elastic while the model was not robust enough to explain the variation in demand by resident students. The large tuition increase coupled with an elastic demand caused a significant loss of nonresident enrollment and tuition revenue in the system.

Another concern about financial aid studies is the level of aggregation in many studies. While many papers use state averages to measure the costs students face, this could mask the vast heterogeneity in college price, quality, and subsidies. Tuition levels vary significantly across states, but most of the variation exists at a finer level. Tuition levels vary greatly among different levels of schools by sector and selectivity. Using a state mean as a proxy for tuition price may not truly be reflective of the costs students face. Moreover, the price charged may depend on the characteristics of the student (i.e., residence, ability level, family income). B. Long (2004b) addresses this problem by using a conditional logistic model to characterize the matches between individuals and nearly 2,700 colleges. In this way, she is able to observe the impact of the particular price each college would charge each student as well as student-college-specific variables such as distance and relative test scores.

**Studies using a natural experiment approach**

Looking at changes over time is also a useful way to examine the impact of a particular financial aid program. Determining whether aid has an effect on attendance is difficult because aid is correlated with many characteristics that influence schooling decisions. However, the introduction of a new program that affects some youth but not others can provide a useful research opportunity. In several cases, researchers have compared enrollment rates for different groups before and after a new policy is created. This may also be considered as using the introduction of an aid program as “natural experiment,” in which a particular group is “treated” with a policy intervention and compared to a control group that is not eligible for the aid. As summarized by Dynarski (2002) in a review of the literature using quasi-experimental methods, this type of work presents firm evidence that subsidies increase college attendance rates, attainment, and choice.

This “before and after” technique was used to study the Pell Grant, introduced in 1972 as the BEOG. Kane (1996) investigates the impact of this new program by comparing the enrollment rates of low-income students for a period before and then after 1972 using the October CPS. The other income groups, which were not eligible for the aid, serve as the control group. To avoid the influence of the Vietnam draft on men’s decisions, a known impetus for encouraging many men to enroll, Kane only studies women. Kane finds that enrollment grew 2.6 percentage points more slowly for the lowest quartile, contrary to predictions. Only public two-year college enrollment seemed to grow more quickly for low-income youth. Other work by Manski and Wise (1983) and Hansen (1983) also found no disproportionate growth in college enrollment or completion of a bachelor’s by low-income students. Turner (1998) and Ozden (1996) also present
evidence on the impact (or lack thereof) of the Pell Grant program.

Researchers have been surprised not to find an effect. Several explanations for the lack of an enrollment impact have been discussed. Since total enrollment rates did not increase, this could suggest some relative shifts in enrollment among different types of colleges. There could also be problems with the analysis. Year-to-year fluctuations may obscure underlying trends, so increasing the number of years in comparison would be helpful. The models also do not control for variation in other factors that might affect demand. On the other hand, Leslie and Brinkman (1987) present the following counterfactual: they suggest that the aid may have worked well enough to maintain the distribution of students during the 1970s and 1980s, more or less, but not increased student choice. The most convincing explanation for the lack of a response among low-income students to the Pell Grant deals with problems with the program itself. Researchers suggest that low program visibility, the complexity of the application process, and intimidating audit procedures contributed to limiting the aid program from having a large impact. It is important to note that the current Pell Grant program is somewhat different than it was in the early 1970s. Therefore, it is unclear whether these studies reflect on the present nature and effectiveness of the policy. Researchers continue to recommend simplifying the program and increasing its visibility among low-income populations.

Instead of studying the introduction of a new program, Dynarski (2003a) examines the impact of eliminating a financial aid policy. The Social Security Student Benefit (SSSB) Program gave 18- to 22-year-old children of dead, disabled, or retired Social Security beneficiaries monthly support while they were enrolled full-time in college. At its peak, it provided grants totaling $3.3 billion annually to one out of ten students. In 1982, Congress decided to discontinue the program. Dynarski estimates that doing so reduced college access and attainment by noting a difference of over 25 percent between the treatment and control groups. This translates into $1,000 (1997 dollars) of grant aid increasing education attainment by 0.20 years and the probability of attending college by 5 percentage points. Ehrenberg and Luzadis (1986) also document how the SSSB benefited families while in existence.

Other good work using a natural experiment orientation has been done to examine the impact of the Georgia Hope Scholarship. Introduced in 1993, the program pays for the in-state public tuition of Georgia residents with a B-average in high school; residents choosing to attend in-state private colleges received $3,000 during the early years of the program. Dynarski (2000) uses the October CPS to compare enrollment rates in Georgia to other southern states before and after the program. She finds that Georgia's program has had a surprisingly large impact on the college-attendance rate of middle- and high-income youth. The results suggest that each $1,000 in aid ($1998) increased the college attendance rate in Georgia by 3.7 to 4.2 percentage points. However, the evidence further suggests that Georgia's program has widened the gap in college attendance between Blacks and Whites and between those from low- and high-income families. Also, the main effect appears to be on college choice rather than general enrollment. Cornwell, Mustard, and Sridhar (2002) also examine Georgia Hope but instead use the Integrated Postsecondary Education Data System (IPEDS). They estimate that the scholarship increased the overall freshman enrollment rate by 6.9 percentage points, with the gains concentrated in four-year schools. They also find that HOPE raised the enrollment rates of both Black and White students in Georgia schools, with the state’s historically Black institutions playing an important role.

Dynarski (2004a) summarizes results from the Georgia Hope analysis and includes evidence on other states that have since established similar programs. She finds that the new programs typically increase the attendance probability of college-age youth by 5 to 7 percentage points. The merit programs also shift students toward four-year schools and away from two-year schools. Dynarski concludes that the Georgia HOPE Scholarship, which has been found to widen racial gaps in college attendance, is atypical in its distributional impact, with the other state's programs tending to have a more positive effect on the college attendance rate of Blacks and Hispanics. This is likely due to HOPE’s relatively stringent academic requirements and a provision that channeled the most generous scholarships to higher-income students, but has been recently eliminated.

Heller and Marin (2003) highlight concerns about the merit aid programs due to the concentration of benefits among upper-income students. While these programs have been found to affect college enrollment and, in particular, choice, the authors question whether this is the best use of funds given the fact that upper-income student have less financial need. Their volume includes several studies by economists that highlight these main conclusions. Singell and Stone (2002) come to similar conclusions studying data from a large public university over several years. The results suggest that merit-based aid increases enrollment for all students, but that financially-able students respond disproportionately, even with academic merit held constant. Therefore, increased emphasis on merit in financial aid may exacerbate the trend toward greater income inequality in the U.S., even among students of equal academic merit.

Regression discontinuity is another approach that has been used to approximate a natural experiment. Van der Klauuw (2002) estimates the effects of financial aid offers on college enrollment in this way. The paper shows how discontinuities in an eastern college’s aid assignment rule can be exploited to obtain credible estimates of the aid effect without having to rely on arbitrary exclusion restrictions and functional form assumptions. The results affirm the importance of financial aid as an effective instrument in competing with other colleges for students. Kane (2003) also...
uses this estimation technique to analyze the impact of the Cal Grant program. To be eligible for the grant, students must meet thresholds in income, assets, and high school GPA. The results suggest large impacts (3 to 4 percentage points) of grant eligibility on college enrollment among financial aid applicants, with larger impacts on the choice of private four-year colleges in California. Moreover, because there are several dimensions of eligibility, the analysis allows for specification tests.

### The effect of price and grants on particular groups

As already noted in some of the above studies, the impact of aid has been found to differ by background and other demographic characteristics. Blakemore and Low (1983) examine differences by race and gender in the demand for higher education and the role of financial aid. Seftor and Turner (2002) instead focus on older, nontraditional students. They examine how changes in the means-tested federal Pell Grant program affects enrollment decisions of potential students in their twenties and thirties. The results indicate sizable effects of the introduction of the Pell Grant on college enrollment decisions for older students. Although there has been some work on differences by race, gender, and age, much more work is needed in this area. Racial and ethnic minorities are quickly becoming a larger part of the population, and society needs to understand how policy might affect their outcomes. Moreover, with more women in college than men, it may be important to investigate whether the aid has had a role in this trend. Finally, nontraditional, older students make up a large proportion of higher education, and unfortunately, little is understood about their decisions and choices. Many researchers in related disciplines have conducted analyses in this area (e.g., St. John & Noell, 1989; Jackson, 1989; Hossler, 1999; and Bosworth & Choitz, 2002).

A final group that has received special attention in the economics literature is veterans. With the G.I. Bill, this group is eligible for special support for higher education. Angrist (1993) examines the effect of veterans’ benefits on education and earnings. Using data from the 1987 Survey of Veterans, the author presents estimates of the effect of veterans’ benefits on schooling completed since entering the military and on subsequent earnings. Veterans’ benefits are estimated to increase schooling by roughly 1.4 years, which implies annual earnings approximately 6 percent higher than would have been expected in the absence of the benefits. Bound and Turner (2002) further the analysis by studying whether military service, combined with the availability of post-war educational benefits, led veterans to increase their investments in education. Using Census data, the results indicate that the net effects of military service and the widely available funding for college through the G. I. Bill led to a moderate gain in the postsecondary educational attainment of World War II veterans. Stanley (2003) also finds that the combination of the Korean War and WWII G. I. bills probably increased postsecondary attainment among all men born between 1921 and 1933 by about 15 to 20 percent, with smaller effects for surrounding cohorts. He suggests the impacts of both programs on attainment were apparently concentrated among veterans in the upper half of the distribution of socioeconomic status.

Due to the draft, the Vietnam War itself probably acted as an incentive to enter college. Card and Lemieux (2001) use data on enrollment and completed education of cohorts of men and women born between 1935 and 1959 to estimate the effect of draft avoidance behavior on the schooling choices of men who faced the highest risk of service during the Vietnam-era draft. They find a strong link between the risk of induction faced by a cohort of men and their enrollment and completed education relative to women. Additional work examining this relationship has been used to study the return to education and will be discussed in a future section.

### The enrollment effects of loans

While the work discussed above focuses on the effect of tuition price and grants on attendance, the government and colleges also give out other forms of aid such as loans and work-study subsidies. Due to the fact that these types of aid either need to be repaid or require a work commitment, they may have a different impact on access than price or grants, aid that does not have to be repaid. This section looks at the effect of loans, an area of research that has many unanswered questions.

Several papers discuss the increasing use of loans as a way to fund higher education. For instance, Baum (2003b) discusses how the introduction of the unsubsidized federal Stafford Loan program in 1993 marked the beginning of a rapid increase in usage. She also presents survey evidence that half of the respondents reported feeling burdened by their debt payments. Fossey and Bateman (1998) also question whether loans are a good form of aid, and authors in the edited volume debate whether the loan burden is excessive. King (1999) brings another voice to the controversy by questioning whether the debt is more for convenience rather than need. Unfortunately, I know of no good work to determine the motives of borrowers and whether loans have been essential to enrollment. However, Baum (1996) cautions about the intergenerational implications of shifting the burden of college payment from parents to students for any reason.

Beyond debt burden, another concern with loans is that students may have varying propensities to use the aid by
background. Baum (2003a) concludes that more adequate grant funding continues to be necessary as the prospect of substantial borrowing discourages enrollment among some students, especially those from low-income and underrepresented groups. This is another part of literature that deserves further attention as the orientation of government aid moves more towards loans and the Pell Grant loses its value. Most of the research that has been done in this area is in related disciplines. Hira and Brinkman (1992) study the influence of socio-demographic variables and students' knowledge about their educational loans on the amount of total debt. Sjogren (1999) looks at differences in borrowing between male and female undergraduates using three national data sets. While some differences both in borrowing patterns and behaviors were found, men and women were found to be borrowing similar amounts.

Even with the widespread use of loans, little is known about how their availability affects college access. Dynarski (2003b) asks whether the availability of government loans affects schooling decisions. Identifying the effect of loans is empirically challenging, because eligibility for federal loans is correlated with observed and unobserved determinants of schooling. Dynarski exploits variation in loan eligibility after the Higher Education Amendments of 1992, which removed home equity from the set of assets that are taxed by the federal financial aid formula. She concludes that loan eligibility had a positive effect on college attendance. Loan eligibility also appears to shift students toward four-year private colleges. Finnie (2002) provides additional analysis on the impact of student loans in Canada. However, much more work is needed in this area.

The current loan system requires students to repay the amount they borrow. However, researchers have explored other possible ways to conduct loans programs. Several papers have considered the benefits and costs of having income-contingent loans instead. Krueger and Bowen (1993) outline the debate among policy-makers about income-contingent loans and illustrate the role economic analysis could have in informing the debate. Chapman (1994) builds on the work of Krueger and Bowen illustrating the view that income-contingent loans offer default-protection for borrowers. This feature could be very relevant for risk-averse students and those from disadvantaged backgrounds given that default on a college loan could mean diminished access to other credit markets.

Economists have rarely examined the determinants of loan default in the current system. One exception is a study conducted by Podgursky, Ehlert, Monroe, Watson, & Wittstruck (2002), which uses panel data and finds that students who are continuously enrolled or who complete their program are far less likely to default than students who drop out during the same period. The authors also illustrate the potential use of the model in targeting default prevention resources to students most at risk of default. Looking instead at Canada, Schwartz and Finnie (2002) analyze borrowing and repayment patterns using data from the National Graduates Survey (NGS) of the class of 1990. Overall, women borrowed only slightly less than men, repaid as quickly as men (despite lower earnings), but reported having significantly more difficulty in repayment. More research in this area might contribute to the debate about whether the loan burden is excessive.

The effects of tax credits and savings initiatives

The 1997 creation of the Hope and Lifetime Learning Tax Credits marked a dramatic shift in the way in which federal support for college expenses is distributed to students and their families. Unlike other aid programs, the tax credits have exceptionally broad eligibility requirements, and there is a significant delay between when a recipient enrolls in college and when they receive the benefit. When first introduced as a possible policy, many researchers debated their likely effects. Cronin (1997) considers the interaction of the tax proposals debated by Congress with the Pell Grant program and shows that many students from low-income families would not benefit from a nonrefundable tuition credit. Kane (1997 and 1998b) suggests that the primary weaknesses of the higher education tax proposals are that they are not very well targeted.

Since enactment, the most comprehensive study of the usage and effects of the Hope and Lifetime Learning Tax Credits is conducted by B. Long (2004c). This study examines the impact of the credits on students, families, colleges, and states. Using several data sources, the author analyzes the distribution of the benefits and the effect on enrollment decisions and college pricing. Analysis of tax return data suggests that what was intended to be a transfer to the middle class did benefit families with incomes between $30,000 and $75,000 the most. Insufficient tax liability due to low-income levels and the interaction of the credits with other aid programs prevent many low-income individuals from qualifying for a benefit. Additionally, many eligible students did not claim a credit, particularly those from minority groups. Further analysis finds no evidence of increased postsecondary enrollment among eligible students in spite of the stated goal to increase access to higher education. On the other hand, some states and public institutions appear to have responded to incentives to increase the prices of colleges at which students face a low marginal cost. Bichelmeyer, Lefebvre, Marquis, & Seak-Zoon (2003) provide figures on usage among adult learners pursuing postsecondary education.

Along with creating the Hope and Lifetime Learning Tax Credits, the 1997 legislation also gave families incentives to save for their children's education. Kane (1998b) suggests that the policy would do little to encourage parental saving
since many families would benefit more from the Hope Scholarship credit than from the Education IRAs. In other work, Hoxby (1998a) also reviews the tax incentives for higher education.

Since enactment, Dynarski (2004b) has explored the incentives created by various tax savings instruments including 529s and Coverdell tax-advantaged savings accounts. She finds that the advantages of the 529 and Coverdell rise sharply with income. Those with the highest marginal tax rates benefit the most from sheltering income, gaining most in both absolute and relative terms. In addition, the tax penalties that are assessed on families whose children do not use their Coverdell accounts to pay for college hit some families harder than others. Those in the top two tax brackets benefit more from non-educational use of a Coverdell than those in the bottom bracket gain from its educational use. Ma (2004) examines the effects of education-saving incentives on the level of private saving by households. Using wealth data from a survey of TIAA-CREF participants, she attempts to estimate whether saving in education-saving programs offsets other household savings. The results suggest that education-saving incentives in general do not offset other household savings and stimulate saving for households with high propensities to use education-savings accounts. I expect that further work will be done in this area as data become available.

Is financial aid an effective policy for access?

After years of research and evidence, the overarching question remains as to whether financial aid has improved college access and could it do so in the future. More generally speaking, can financial aid work as a policy instrument to alleviate poverty and inequality? Schwartz (1986) is an early attempt to look at the overall effect of aid. The author examines whether publicly-provided student grants have achieved wealth-neutral college attendance in 1980 defined as an equal probability of college attendance across household income. The paper concludes that while student grants have encouraged a movement toward wealth neutrality, they have not completely removed the positive effect of income on the probability of college attendance. More recently, Kane (1999b) and others have also found enrollment gaps under the current system of aid and have suggested that additional financial aid is needed to reduce inequality in access.

However, some researchers suggest that the true reasons for differences in access are related to other background factors. As noted in an earlier section, Carneiro and Heckman (2001) estimate the determinants of educational choices at each age and conclude that the long-term influence of family income and background is more to blame than short-term credit constraints in explaining differences in attainment. Additional long-run factors that might be important include primary and secondary schooling inputs. If so, then financial aid at the last minute is unlikely to completely address concerns about inequality. Cameron and Heckman (1999) present similar arguments in their paper on whether tuition policy can combat inequality in wages. Carneiro and Heckman (2002) test for evidence of credit constraints. They also suggest that long-run factors are the major determinants of the family income-schooling relationship and that less than 10 percent of the population is truly credit constrained. On the other hand, the authors call into question whether information is truly a problem in the current system as has been emphasized by researchers on the other side of the debate. If few students are aware of the availability of such resources, then this could help to explain why financial aid does not have more of an effect, and short-term resources could be important. Much more research is needed to contribute to the debate about the role of financial aid versus other factors in addressing inequality, and Heckman and Krueger’s study (2004) is an example of the continuing discussion.

The debate about the effectiveness of the current landscape of aid is all the more important given shifts in the types of aid programs available to help students pay for college. Savoca (1991) examines whether the shift in the composition of aid away from grants toward loans adversely affected college enrollments in the 1970s and 1980s. Her estimates suggest that the probability of attending college falls when loans replace grants, dollar-for-dollar, in the financial aid package, but the effect is small. More recently, St. John (2001) summarizes prior studies with a focus on untangling how changes in student financial aid policy have influenced changes in opportunity, while Berger and Kostal (2002) try to understand the consequences of these shifts. Looking at the state level, Balderston (1997) finds that the higher education system in California is increasingly relying on loans to help students pay for college. Heller (2003) instead focuses on state financial aid policies themselves and documents the recent trend from providing need-based aid to providing merit-based aid or aid with some merit component.

The effect of aid on college choice

Beyond affecting access, financial aid may also affect college choice. The introduction of aid could have two effects. First, more institutions become affordable with the presence of financial aid. Second, the relative prices of different institutions could change if the aid is only applicable to certain schools. To answer the question, some studies focus on the enrollment distribution of students from different income levels at high-cost versus low-cost institutions, public versus private colleges, and two-year versus four-year schools. Leslie and Brinkman (1987) review several studies on the impact of aid on choice and conclude that the effect of the Pell Grants on choice is unclear. However, the positive-choice effects of state student aid have been more clearly established. Moreover, application and enrollment
patterns at least hint that student aid has had a beneficial effect on student choice. More recently, as noted above, financial aid has been found to affect the public/private and four-year/two-year decisions (B. Long, 2004b; Ganderton, 1992). Dynarski (2000) and Cornwell, Mustard, and Sridhar (2002) each suggests that the Georgia Hope Scholarship affected whether students decided to attend college in-state versus out-of-state.

Quantitative research in related disciplines also suggests that aid expands the range of colleges considered by a student. Flint (1991) concludes that aid increases student choice because although he finds systematic relationships between student ability, family income, and college choice set characteristics for a general college-bound sample, they do not exist for students who had applied for financial aid. Perna (1998a) does further analysis on the subject by examining the extent to which receipt of financial aid influences the price level of the college or university attended. However, neither of these studies have a clear methodology for establishing whether financial aid caused students to choose from a wider range of schools or if it is merely correlation, and so this issue has not been settled.

In addition to government aid, institutional aid is likely to affect college choice. Leslie and Brinkman (1987) conclude that an institution could increase its enrollment share by increasing the amount of aid it offers. A $100 net price difference is estimated to have a positive enrollment effect of 1.8 percent on the higher cost college. One of the studies reviewed in the meta-analysis, Fuller, Manski, and Wise (1982), uses a conditional logistic model to analyze the choices. The results confirm that aid may be an important determinant of postsecondary school attendance and that individual academic ability relative to the academic standards of a college is an important determinant of which of available college alternatives is chosen. More recently, B. Long (2004a) finds the same patterns among more recent cohorts of high school graduates using a conditional logistic model with tuition information net expected federal grant aid.

To best understand the role of aid, one needs information about actual institutional financial aid offers, a difficult requirement to meet. Most of the studies using this information focus on particular groups of institutions or students. For example, Curs and Singell (2002) examine the application and enrollment processes for in-state and out-of-state students at the University of Oregon. The results suggest that prior studies may underestimate student price responsiveness by separately focusing on the application or enrollment decision. Moreover, the elasticity estimates are found to differ for in-state and out-of-state students and can be sensitive to whether the price variation occurs across individuals or over time.

However, much more of the work in this area focuses on selective, private institutions, which until recently gave out the lion’s share of institutional aid. Moore, Studenmund, & Slobko (1991) look at choice of a selective college. They find that relative tuition and scholarships affect the probability of enrollment for financial aid applicants, but that loans and work-study assistance have no statistically significant effect. Parker and Summers (1993) study the effect of changes in tuition and fees on the matriculation rate of applicants admitted to a group of selective liberal arts colleges. The authors find that an increase in the level of tuition and fees charged by a college causes a significant reduction in the share of admitted applicants who choose to enroll. Linsenmeier, Rosen, and Rouse (2002) examine the effect of a change in the financial aid policy in which low-income students would no longer be required to take out loans as part of their need-based aid packages. Finally, Buss, Parker, and Rivenburg (2004) study selective liberal arts colleges and find that both relative tuition and financial-aid levels play a significant role in determining the enrollment yield of a college.

Avery and Hoxby (2004) instead use an original survey to collect information from high-aptitude students and test whether students respond to their menus of colleges and financial aid offers like rational human capital investors. They find that the typical high-aptitude student chooses his college and responds to aid in a manner that is broadly consistent with rational investment. However, they also find some serious anomalies: excessive response to loans and work-study, strong response to superficial aspects of a grant (such as whether it has a name), and response to a grant’s share of college costs rather than its amount. Also calling into question whether aid is always beneficial in promoting choice, Somers and St. John (1997) find that aid offers are sometimes not enough to encourage attendance at a particular institution. In this study of four institutions and from earlier work published in 1993, they suggest that colleges study their aid policies and adjust them to assure access.

The other effects of financial aid

Because a lot of financial aid is distributed according to income and assets, the presence of the programs may affect the incentives families have to save for college. Feldstein (1995) investigates this possibility by looking at the effect of existing college scholarship rules. The analysis shows that families that are eligible for college scholarships face “education tax rates” on capital income of between 22 percent and 47 percent in addition to regular federal and state income taxes. The empirical analysis developed here, based on the 1986 Survey of Consumer Finances, implies that these high tax rates have a powerful adverse effect on the accumulation of financial assets. Dick and Edlin (1997) also note that college financial aid functions as an income tax. The paper estimates the size and determinants
of these income and asset taxes. The authors find that the marginal income tax typically ranges from 2 to 16 percent and the marginal asset levy from somewhat under 10 percent to as high as 25 percent. Given these results, if a typical family chooses to accumulate $100,000 in assets rather than consuming these resources, the paper concludes that it would lose $10,000-$20,000 in financial aid.

More recently, M. Long (2004b) suggests that the incentives created by aid on savings are overestimated and sensitive to the assumptions used in estimating the implicit tax rate. Additionally, he points out that the 1992 exemption of home equity and other changes in federal policy have substantially eliminated the savings disincentive. Souleles (2000) instead examines the impact of paying for college on a household’s standard of living. Using the Consumer Expenditure Survey, the main finding is that households appear to do a relatively good job smoothing their consumption into the academic year, despite large expenses. There is some evidence of a delayed reduction in consumption, and of a decrease for households with children first beginning college, but the magnitudes of these reductions are rather small.

RETENTION AND THE COMPLETION OF POSTSECONDARY DEGREES

This section explores studies focused on the outcomes of students during and after college. First, I review the literature related to college persistence and graduation including the role of financial aid. Then, I outline the findings on factors that affect college performance and major choice. Finally, I discuss the extensive literature on the returns to a college education. This has been an area of great interest to economists, and many studies attempt to estimate the gain in earnings while avoiding selection bias. A section also describes work on whether college quality matters.

Factors that influence persistence

Questions about persistence in higher education have historically been difficult to study due to a lack of longitudinal information about student outcomes. It is expensive for the government or colleges to track large numbers of students over time. However, several studies document the trends, and I expect that more work will be forthcoming with the availability of new datasets. Grubb (1989) examines the tendency to leave higher education without completing credentials using two of the longitudinal datasets collected by the NCES on the high school classes of 1972 and 1980. He measures the dropout rate in several different ways, and the results suggest that dropping out increased during this period and is substantially higher in community colleges, technical institutes, and private vocational schools. Choy (2002) uses a more recent longitudinal dataset by the NCES to track persistence outcomes.

Researchers have long thought that financial aid is related to persistence outcomes. Since that time, there have been a number of studies that have analyzed the relationship between financial aid and persistence. A core problem in this work is that the characteristics that are positively correlated with receiving aid (i.e., being from a low-income family or having high test scores) are also likely to be related with educational outcomes. Therefore, a simple comparison of recipients to nonrecipients is not a satisfactory research strategy. Although many studies have used this methodology to shed light on the issue, their results should not be interpreted as causal evidence. In a rare study using exogenous variation, Bettinger (2004) studies the causal effects of Pell Grants on persistence using differences in awards caused by small differences in family size and income. Unfortunately, the results are not robust to various specifications.

As part of their extensive meta-analysis of the literature on higher education, Leslie and Brinkman (1987) reviewed studies on persistence to ask the question of whether aid helps students to finish college. They conclude that aid has helped recipients to persist about as well as nonrecipients. They also find that the size of the effect has grown in a positive direction in recent years (until the late 1980s) and that it increases with the size of the award. The results differ by background. Leslie and Brinkman assert that non-White aid recipients do not persist as well as White aid recipients. Finally, when the types of aid are compared, grants appear to have a more positive effect on persistence than loans.

Since the Leslie and Brinkman paper, many studies have been completed by researchers in related disciplines using NCES longitudinal datasets. While they highlight interesting patterns, they do not have a way to deal with the selection issues due to the fact that students do not receive aid randomly. Among the studies are several projects by St. John. His 1989 paper is a comparative study using the NLS72 and HSB. He finds that loans alone were negatively associated with first-to-second year persistence in the 1970s, but not the 1980s. The findings also suggest that all types of aid packages were positively associated with year-to-year persistence during the 1970s and 1980s. St. John (1990) advances the analysis and concludes that low-income students were more responsive to grants than loan or work-study increases, and high-income students were not responsive to aid changes. St. John and Starkey (1995) compare the effect of prices to financial aid on within-year persistence using the 1986-87 National Postsecondary Student Aid Survey (NPSAS). They find that decisions made by students from all income groups are more sensitive to
tution price than to student aid. Perna (1998b) instead uses the subsample of 1989 freshmen from the Beginning Postsecondary Student Survey. Her analysis shows that although simply receiving financial aid is unrelated to persistence, the effects of financial aid on persistence appear to depend on type and package of aid received.

Other work on persistence includes Cabrera, Stampen, and Hansen (1990). This study explores the effects on the ability to pay on persistence using a national sample of 1,375 college students attending public four-year institutions. The authors find that aid moderates the effect of goal commitment on persistence. In a 1992 study, Cabrera, Nora, and Casteneda surveyed 466 students in a large, urban commuter college to investigate the relationship of student finances to academic persistence. The results suggest that financial aid equals opportunities for students, facilitates academic and social integration, and increases student commitment to the institution.

Several studies focus on the relationship between persistence and aid at a particular institution. Somers (1995) develops and tests an institutional model to measure the effect of student aid. He creates a comprehensive theoretical model of student matriculation that examines first-time attendance, within-year persistence, and year-to-year persistence of the entering class at an urban public university. Likewise, Singell (2001) estimates the decision to enroll and re-enroll using detailed individual data from a large public university. The results indicate that some types of need-based aid improve retention, but that merit-based aid has the largest retention effects (particularly for well-to-do enrollees).

DesJardins and Ahlburg (2002) study how changes in institutional aid might affect persistence. Using estimates from a hazard model of college student departure, they simulate how changing aid packaging from loans to scholarships would affect students’ departure decisions over time. They find that this would have a large impact on retention and that fronloading aid would have a more modest impact. The results also suggest that financial aid represents more to the student than just the dollar value of the aid offered. The authors conclude that increased knowledge about the temporal effects of different types of financial aid will help policy-makers make more informed choices about the structure of financial aid packages.

As several of the papers suggest, the relationship between persistence and aid likely differs by background. Paulsen and St. John (2002) find a strong correlation between financial barriers and persistence (re-enrollment) rates for poor and working-class students. Using data from the NPSAS, the researchers find that every $1000 increment in tuition fees reduced the probability of poor and working-class students re-enrolling in college or university the following year by 16 percent and 19 percent, respectively. Other contributions to the study of persistence in related fields include Braxton (2000) and Tinto (1982 and 1993).

However, money is not the only possible factor that might influence college persistence. Stinebrickner and Stinebrickner (2003a) study low-income individuals at a liberal arts college with a full tuition subsidy. They find that reasons unrelated to the direct costs of college are very important in explaining gaps between low- and upper-income students in persistence and other outcomes. Stinebrickner and Stinebrickner (2004) instead look at time use to explain persistence.

Many other studies look at the ultimate goal in persistence: completing a college degree. As with general year-to-year persistence, measuring degree completion can be difficult. For years, the U.S. Census Bureau measured educational attainment by years of education completed. However, as discussed by Ureta and Welch (1998), it is better to ask respondents directly about degree recipiency, and the Census has made this change along with including a greater level of detail on the diversity of college degrees. These kinds of changes along with the availability of additional data sources have enabled more researchers to look at the issue. Turner (2004) documents the changing dynamic between college enrollment and college completion and provides a framework for assessing the factors responsible for this shift. Divergence between college enrollment and college completion, as well as the extension of the length of time taken by students to complete degrees, are explained in terms of changes in the characteristics of potential college students and adjustments on the supply side of the market including the level and distribution of higher education resources.

Additional work focuses on how the return to college affects degree completion. DeBrock, Hendricks, and Koenker (1996) study student athletes at Division I National Collegiate Athletic Association (NCAA) colleges and find empirical evidence that traditional labor market opportunities unrelated to sports are significant explanatory variables of the persistence of athletes. In addition, they find support for the hypothesis that professional opportunities have a significant impact on the graduation rate of athletes. DesJardins, Ahlberg, and McCall (2002) also investigate the role of relative rates of return to graduation in student decisions. The authors conclude that stopout and graduation may need to be modeled as “competing” events, and that some factors (like financial aid) may not appear to increase graduation, but these variables may actually promote degree attainment by reducing student stopout.

Degree completion is especially a concern at community colleges, and several studies have focused on whether these
types of schools divert students from getting a bachelor’s degree. While they have been found to increase access to higher education as discussed above, the lack of structure at community colleges may also cause them to divert students from ever attaining a four-year degree. Rouse (1995) reviews the research related to this topic and estimates the impact of community colleges on educational attainment. She uses community college accessibility as an instrumental variable for the type of college attended. The results suggest that two-year college students diverted from a four-year college complete fewer years of education. Overall, community colleges are found to increase total years of schooling, but do not change the likelihood of attaining a bachelor’s degree.

Other work looks specifically at the likelihood that students transfer from two-year to four-year colleges. Ehrenberg and Smith (2004) develop a methodological approach that can be used to address the success of transitions from two-year to four-year institutions within a state. Using a different framework, Hilmer (1997) notes that community college attendance may actually be a strategic path to attending a higher-quality university. His analysis indicates that overall, students choose higher quality universities if they first attend community colleges, with the largest quality increases being observed for students who come from poor families, are of low ability, or who perform poorly in high school.

Ehrenberg and Mavros (1995) instead study degree completion by doctoral students. This paper uses data on all graduate students who entered Ph.D. programs in four fields during a 25-year period at a single major doctorate-producing university to estimate how graduate student financial support patterns influence their completion rates and times-to-degree. Competing risk “duration” or “hazard function” models are estimated. The authors find that completion rates, and the mean durations of times-to-completion and to dropout are all sensitive to the types of financial support the students received. Other things held constant (including measured student ability), students who receive fellowships or research assistantships have higher completion rates and shorter times-to-degree than students who receive teaching assistantships or tuition waivers, or who are totally self-supporting. A major finding is that the impact of financial support patterns on the fraction of students who complete programs is much larger than its impact on mean durations of times-to-degree or to dropout.

Degree completion may also be related to macroeconomic factors such as cohort size. Stapleton and Young (1988) explore this notion and argue that the postwar baby boom caused substantial fluctuations in both the economic rewards to education and educational attainment over the last three decades. If substitutability between young and old workers diminishes with education, the present value of lifetime earnings for a boom cohort is depressed more for highly educated workers, reducing incentives for educational attainment. The opposite is true for cohorts before and after the boom. The authors find that the diminishing substitutability hypothesis explains the declines in both the returns to college and college completion rates in the 1970s, and predicts a substantial increase in educational attainment for post boomers.

College academic behavior and performance

Beyond persistence and degree completion, researchers are very interested in how well students perform academically in college. Given that only a few papers have been written on factors related to student success, this is an area that needs further study. Adelman (1999) finds that a student’s academic resources, defined by measures of academic content and performance in secondary school, are the most critical factors in determining college enrollment and success. However, descriptive papers that document these patterns fail to deal with biases. Student background is likely to affect behaviors that impact student success, and one needs to differentiate between the effects of background from the effects of academic preparation or performance.

Many students are placed into remediation once entering college. Bettinger and Long (2005a) examine how higher education attempts to assimilate students in need of remediation and to prepare them for future college-level work and labor-market success. Using a unique dataset of students in Ohio’s public higher education system, the paper explores the characteristics and features of remedial education, examines participation within the programs, and analyzes the effects of remedial education on student outcomes in college. The authors control for selection bias by comparing similar students who had different propensities to be placed into remediation due to college choice. The results suggest that remediation serves as a way for colleges to sort students; many do not complete the remediation and drop out. Those that do complete the remediation seem as likely to persist as similar students who were not placed in the courses, but their time-to-degree appears to be extended.

Much of the work on performance in college-level courses focuses on the predictive value of standardized testing, discussed above. However, Dee and Jackson (1999) look at student demographics to test whether they are related to a student’s ability to keep the Georgia Hope Scholarship, which requires a minimum GPA in college. They find that conditional on measures of student ability, there are no statistically significant differences between White, Black, and Hispanic students. However, they find that there are dramatic differences across academic disciplines. Becker and Powers (2001) and Bettinger and Long (2005b) instead focus on class size and other class-specific variables. Bettinger
and Long (2005c) study the impact of different types of instructors. This paper attempts to quantify how having adjunct instructors affects student performance and persistence. The paper also analyzes how taking an adjunct in a particular discipline affects the likelihood of enrollment and success in subsequent courses within the same subject. The authors find that although students who have adjunct instructors and graduate assistants appear to do worse than students with full-time faculty members, the effects are small and differ by discipline.

Students also need to make decisions about which field to major in, and researchers have studied the factors that may impact this decision. Economists have focused on the returns to different decisions. Berger (1988) also finds, holding family background characteristics constant, that individuals are likely to choose majors offering greater streams of future earnings rather than, as some have argued, majors with higher beginning earnings at the time of choice. Eide and Waehrer (1998) include in their analysis of college-major choice the option value of college attendance represented by the probability of and rewards from graduate school attendance. The results indicate that the option value is a significant, positive factor in the choice of liberal arts and science majors. Montmarquette, Cannings, and Mahserejian (2002) compute expected earnings to explain the probability that a student will choose a specific major among four choices of concentrations. Using data from the National Longitudinal Survey of Youth, the authors evaluate the chances of success in all majors for all the individuals in the sample. The results of the paper suggest that the expected earnings variable is essential in the choice of a college major. They do find, however, significant differences in the impact of expected earnings by gender and race.

As noted in the above studies, there are differences in major patterns and effect of major by gender. Several papers have focused on issues related to these tendencies. Eide (1994) examines how changes in the major distribution affected the gender wage gap for college graduates during the 1980s. The results show that convergence in major distribution between males and females contributed to a decline in the gender wage gap for college graduates. Turner and Bowen (1999) use data on choice of major and individual scores on the SAT to examine the extent to which observed differences between men and women reflect the effects of pre-collegiate preparation as opposed to other forces. They find that differences in SAT scores account for only part of the observed gap and that differences in preferences and labor market expectations help to explain gaps.

The type of financial aid a student has may affect major choice. One concern is that debt level influences a student’s major and career choice. Students may be reluctant to enter low-paying fields if they have large college loans even if the job is desirable in many other ways. As with other work on higher education, the propensity to have large loans is related to student background, and it is difficult to determine whether the debt or other background characteristics are affecting major or career choice. Therefore, results should be interpreted with caution because they may not reflect causal relationships. St. John (1994) analyzes data from the HSB and finds that social background, high school achievement, high school major choice, and college influenced major choice. However, he did not find that debt burden was associated with major choice. Schapiro, O’Malley, and Litten (1991) investigate the impact of debt on the decision to attend graduate school. They find that debt does not inhibit graduate school attendance but that certain individual and institutional attributes have statistically significant effects on rates of progression.

Field (2002) instead looks at career choice. She uses quasi-experimental data from NYU Law School’s Innovative Financial Aid Study to explore how the timing of career-contingent financial aid influences its effectiveness in encouraging law students to enter public interest work. The results indicate that debt timing matters: law school graduates who receive tuition waivers rather than ex-post loan assistance have a 32 percent higher rate of first job placement in public interest law and a 91 percent higher rate of clerkships. Furthermore, recipients of tuition waivers are more likely to enroll in law school conditional on being admitted.

One factor believed to be related to student performance is peers. The distinctive thing about educational production is that other students may affect the outcomes of an individual, and therefore, colleges are very concerned about how to construct a student body. Their existence would motivate much of the restricted supply, student queuing, and selectivity and institutional competition via merit aid and honors colleges that we see in American higher education (Winston & Zimmerman, 2004). Therefore, a number of recent economic articles have tried to identify the role of peer effects. Goethals, Winston, and Zimmerman (1999) discuss the assumption that students learn better in the company of better students than with weaker ones. They present a methodological investigation of the role of peer effects among college and university students.

One technique used is to compare the background and outcomes of roommates. Sacerdote (2001) uses data from Dartmouth College at which freshman-year roommates and dorm-mates are randomly assigned. He finds that in this group, peer effects are very important in determining levels of academic effort and in decisions to join social groups such as fraternities. Residential peer effects are markedly absent in other major life decisions such as choice of college major. Zimmerman (2003) uses similar data from Williams College. He finds that students in the middle of the SAT distribution may have somewhat worse grades if they share a room with a student who is in the bottom 15 percent of the verbal SAT distribution. The effects are not large, but are statistically significant in many models.
Stinebrickner and Stinebrickner (2001) examine peer effects in a context where many students are from disadvantaged backgrounds. The paper finds strong evidence of peer effects for females and suggests that a net gain is likely to result from combining students from diverse backgrounds. Kremer and Levy (2002) use a sample of roommates to study the effects of peers on alcohol use. The authors find that on average, males assigned to roommates who reported drinking in the year prior to entering college had one quarter-point lower GPA than those assigned to non-drinking roommates. The 10th percentile of their college GPA was half a point lower than among males assigned non-drinking roommates. For males who themselves drank frequently prior to college, assignment to a roommate who drank frequently prior to college reduces GPA by two-thirds of a point. Overall, the paper is consistent with models in which peers change preferences.

Epple, Romano, and Sieg (2003) instead develop predictions regarding the market consequences of peer effects in higher education and offer empirical evidence about the extent to which those predictions are borne out in the data. The authors develop a model in which colleges seek to maximize the quality of the educational experience provided to their students. From this model they deduce predictions about the hierarchy of schools that emerges in equilibrium, the allocation of students by income and ability among schools, and about the pricing policies that schools adopt. In the empirical analysis, they use both university-level data provided and student-level data. The findings suggest that there is a hierarchy of school qualities, which is characterized by substantial stratification by income and ability. The evidence on pricing by ability is supportive of positive peer effects in educational achievement from high ability at the college level. However, the evidence on pricing also suggests that more highly ranked schools exercise some degree of market power. This is reflected in the substantial variation of price with income coupled with discounts to more able students that are modest at best.

Employment in college may have an effect on outcomes, and several papers try to disentangle its effects. As college has become more expensive, more and more students are working on campus, and the effects of this practice are likely to be important in college outcomes. Ehrenberg and Sherman (1985) are among the first to study this issue. They use panel data from 1972 to 1979 to study how male college students’ employment while in college influences their academic performance, persistence in school, decisions to enroll in graduate school, and post-college labor market success. Gleason (1993) instead uses the HSB to examine the effects of employment on grade point averages, dropout rate, and post-college wages. He finds that while working students were more likely to drop out than non-working students, they did better in the labor market if they graduated. Beeson and Wessel (2002) study students at a mid-sized doctoral university in the Midwest using a longitudinal survey and find that students working on campus academically persisted at higher rates from fall to spring of their first year, and year to year thereafter.

In contrast to the other work, Stinebrickner and Stinebrickner (2003b) call into question whether employment has a positive effect on students. Using unique data from a college with a mandatory work-study program, they find that “naïve” OLS results indicate that a positive and statistically significant relationship exists between hours worked and grade performance. However, an instrumental variables approach, which takes advantage of unique institutional details of the work-study program at this school, indicates that working an additional hour has a negative and quantitatively large effect on grade performance at this school. Therefore, the authors suggest that researchers should be cautious when drawing policy conclusions about the relationship between hours worked and a particular outcome of interest unless he/she is confident that potential problems associated with the endogeneity of hours have been adequately addressed.

The last major area of interest to researchers is the role of athletics. Mixon (1995) analyzes data from the NCAA and finds that success in basketball aids colleges in attracting quality students. Therefore, athletics may play a positive role in the mission of higher education. Mixon and Treviño (2005) further this argument by examining the relationship between a university’s football heritage and its freshman retention and graduation rates. They find a positive and significant relationship, and this supports the hypothesis that athletics provide students with a respite from the psychic costs. On the other side of the debate, Shulman and Bowen (2000) call into question the role of athletics in higher education.

The returns to higher education

As discussed in Section 3, college demand is partly driven by the benefits derived from postsecondary education. In his seminal book, Mincer (1974) presents a systematic analysis of personal income distribution and the theory behind the return to education. The framework is a human capital model based upon the aggregate earnings distribution of White, male, urban workers and the net investments in human capital among these workers. More recently, Ehrenberg and Smith (2000) outline the theory in this popular textbook.

Core to the question about the return to education is what researchers are measuring. The most prominent theory is that education increases the human capital or productivity of an individual. However, it may be the case the
education serves as a signal of productivity rather than augmenting skills. Individuals who are very productive find it easier to get more education than others and therefore gain the signal. Education could also serve as a signal if individuals with a degree are forced to demonstrate a hard work ethic during the course of postsecondary study. In this way, education could have signal value even if it did not enhance productivity.

Several papers test the signaling value of education. Some find sheepskin effects, a jump in the return to education for years that degrees are completed. Some interpret this as proof of a signaling effect as they believe that the last year of college should not have any different impact than earlier years. For instance, Jaeger and Page (1996) use data from the 1991 and 1992 CPS and find that degree receipt substantially increases the effects of high school and college degrees. Chatterji, Seaman, and Singell (2003) also test the signaling hypothesis. The results provide evidence of a significant, positive, gender-specific return to a signal and indicate a downward bias in the return to education from excluding the signal measure.

However, a simple comparison of the wages of those with and without college schooling does not reflect the true causal effect of education on earnings. Economists worry about several biases. First, ability is likely to be positively correlated with education levels. More specifically, individuals who have greater ability incur fewer psychic costs when getting additional education and so they choose to attend for longer than those with less education. This is connected to the signaling theory as the lower cost of education to high-ability individuals suggests educational level is a good signal of ability. It may also be the case that individuals with greater ability reap larger returns from education than others. The return to education is also likely to be affected by selection bias. As discussed above, economists assume potential students make decisions about whether to attend based on their individual cost-benefit analysis. Therefore, holding costs constant, people who decide not to attend college probably would not have realized large benefits from a degree. On the other side, individuals who do decide to attend may have reaped a lower salary than average if they had not gone to college. For these reasons, researchers may underestimate the returns for those who decide to attend and overstate the returns foregone by those who decide not to attend. Card (1999 and 2001) outline these econometric problems in trying to estimate the return to schooling.

Economists have used a variety of methods to deal with these possible biases. Foremost, researchers have tried to separate the effect of ability from the productivity gains of education. First, researchers have tried controlling for all observable characteristics and, most importantly, test scores. This is similar to comparing the returns to different levels of education for individuals with the same test scores. However, test scores are not perfect measures of ability, and so this is not a satisfactory method to deal with ability bias.

Another way economists have attempted to deal with the empirical problems is to focus on twins when estimating the return to education. Identical twins have the same genetic makeup, family influences, and neighborhood environment and should therefore experience the same return to each year of education. There are a number of studies that have compared the earnings of twins with different years of education. Ashenfelter and Krueger (1994), Ashenfelter and Rouse (1998), and Rouse (1999) use data from a survey conducted at the annual Twinsburg Twins festival. Rouse (1998) incorporates the results of all the studies and finds a ten percent return per year of schooling completed. The within-twin regression estimate of college’s effect is smaller than the cross-sectional estimate. The studies do have problems with mismeasurement, possible incorrect reporting, and the prospect that twins who attend the festival are somehow different from the norm. Moreover, because the twins are supposed to be alike, the fact that they get different levels of education begs the question of how strong this assumption is.

Behrman and Rosenzweig (1999) also study twins to estimate the return to education while accounting for ability biases. Neumark (1999) also uses a similar strategy. Finally, Isacsson (2004) relaxes some restrictions of previous twin-based estimates of the effects of education on earnings. He rejects the notion that the logarithm of annual earnings and years of schooling is linear and concludes that the ability bias could be of different signs and of different magnitudes in different parts of the educational distribution. Isacsson suggests that estimates of the average return to years of schooling that rely on a classical measurement error model are upwards biased by approximately 30 percent.

Additional convincing analyses of the causal link between schooling and earnings use an exogenous source of variation in education outcomes. Economists have tried to identify factors that increase the likelihood of attending college but are not related to ability. For example, Kane and Rouse (1995a) and Card (1995) use proximity to a college as a factor. Individuals who live close to a college are more likely to attend than similar individuals who do not live in close proximity to one. Card (1995) finds that men who grew up in local labor markets with a nearby college have significantly higher education and earnings than other men. When college proximity is taken as an exogenous determinant of schooling, the implied instrumental variables estimates of the return to schooling are 25 to 60 percent higher than conventional ordinary least squares estimates.

Other researchers have used mandatory schooling laws. Due to school-start age policy and compulsory school attendance laws, Angrist and Krueger (1991) found that the season of birth is related to educational attainment. Individuals born in the beginning of the year start school at an older age and can therefore drop out after completing
less schooling than individuals born near the end of the year. Using quarter of birth as an instrument that predicts educational attainment, they examine the impact of compulsory schooling on earnings. They find that the instrumental variables estimate of the return to education is close to the ordinary least squares estimate, suggesting that there is little bias in conventional estimates.

Angrist (1990) instead uses the Vietnam draft as a source of exogenous variation in schooling. Using data on draft lottery numbers, he asserts that men with higher numbers were more likely to attend college to avoid the draft. He finds that, in the early 1980s, the earnings of White veterans were approximately 15 percent less than the earnings of comparable non-veterans. Lemieux and Card (2001) do similar work using Canadian World War II veterans. They also find that the instrumental variable estimates are large or larger than the corresponding ordinary least squares (OLS) estimates. However, because men in the military have lower wages due to having less experience, the lottery may not be a good instrument (Angrist & Krueger, 1991).

Another category of research analyzes the returns to a two-year college. Researchers have debated whether there is a return to getting an education at a community college without completing a degree. Grubb (1993) suggests that students who enroll in two-year colleges without completing degrees earn no more than comparable high school graduates. Second, he asserts that degrees from two-year colleges and vocational and technical institutes only indirectly lead to higher earnings by providing students with access to jobs in which they can accumulate experience and on-the-job training. However, Kane and Rouse (1995b) note that several of the variables used in Grubb's paper are mismeasured and that, when they are corrected with reasonable alternatives, his conclusions are no longer valid. As a result, Grubb (1995) revises these statements after making corrections to his NLS72 data. In this paper he finds that for men, the effects of vocational associate degrees are insignificant, whereas the effects of vocational credits earned are significant. He concludes that economic benefits may accrue to small amounts of community college.

In separate work, Kane and Rouse (1995a) study the specific returns to two-year and four-year college attendance and degree completion. Controlling for family income and measured ability wage, they find wage differentials for both two-year and four-year college credits are positive and of similar magnitude. Finally, Leigh and Gill (1997) find positive returns for degree and non-degree community college students. These returns are estimated to be about the same size for returning adults as they are for continuing high school graduates. In other work on the returns to education, Arias and McMahon (2001) examine dynamic rates of return to high school and college education for males and females from 1967 to 1995. Rather than focusing on a college education, Hill (2001) examines the impact of general training on women and compares training methods including formal education, on-the-job training, and other training. As theory dictates, Hill finds that younger, more educated women tend to train more than other women.

In general, most research studies, regardless of method, find a 5-12 percent return in income for each year of education in the United States. However, focusing on the monetary returns to education ignores many other possible returns. First, earnings numbers usually do not include employee benefits. Education may also produce non-monetary and social returns. In terms of the individual, education may have intangible benefits like the increased ability to understand and appreciate the behavioral, historical, and philosophical foundations of human existence. Moreover, individuals with more education tend to have more interesting and pleasant jobs and are less likely to be unemployed. For example, Haveman and Wolfe (1984) identify a number of non-market effects, and their calculations imply that standard estimates of the benefit of incremental schooling significantly understate the full value of such investments.

Given the substantial return to education, several papers have considered the role of education in combating inequality. Levin and Kelley (1994) argue that education requires a range of complementary conditions in order to provide a payoff and cannot do the job by itself. They further suggest that research may overstate the effects of education by not considering the complementary conditions that must be in place to realize the relation that is embedded in cross-sectional data.

Variation in returns: Does college quality matter?

While education may play an important role in reducing poverty, recent research suggests that not everyone get the same benefit. The return to education appears to differ by background and other characteristics. Altonji and Dunn (1996) investigate how family characteristics affect the return to education. Many other papers focus on the widening distribution of returns. Carneiro, Heckman, and Vytlacil (2001) estimate the return to education allowing it to vary by individual. Carneiro, Hansen, and Heckman (2001) discuss estimating the distribution of returns to educational interventions. Carneiro, Heckman, and Manoli (2002) present methods for estimating the distributions of the economic rates of return to schooling among different schooling groups accounting for self-selection and attrition. The methods they develop apply to estimating the distributions of any treatment effects. Finally, Cawley, Heckman, and Vytlacil (2000) investigate the role of cognitive ability in the recent rise in the return to education.
Hoxby and Long (1998) attempt to explain why the variation in the earnings of college-educated workers has grown substantially. Three theories are investigated. The first is increasing demographic diversity. Second, an increasing return to aptitude over time could explain the results. Finally, there has been increasing segregation on the basis of aptitude among colleges and an increasing correlation between the average aptitude of a college's student body and its expenditure on education inputs. They find that of the growth that can be explained, about 1/4th is associated with changing demographics, 1/3rd with an increased return to measured aptitude, and 5/12ths with the third explanation.

As indicated by the work of Hoxby and Long (1998), the return to a college education may differ by type of institution. This has been a popular topic of research among economists trying to answer whether college quality matters. James, Alsalam, Conaty, and To (1989) is among the first work on the topic. Brewer and Ehrenberg (1996) and Brewer, Eide, and Ehrenberg (1999) are also examples of research examining whether the return to education differs for students who attend elite private colleges. Each uses cohort information from the National Center for Education Statistics (NCES) datasets. Monks (2000) instead uses the NLSY to examine earnings differentials across both individual and institutional characteristics. He shows that graduates from highly or most selective colleges and universities earn significantly more than graduates from less selective institutions. There is, however, variation across racial and gender groups in the returns to individual and college characteristics.

Estimates of the return to college quality must also deal with biases. As discussed above, students do not randomly choose the colleges they attend, and so one cannot compare the returns of students who attended different colleges in a straightforward manner. To deal with selection issues, Behrman, Rosenzweig, and Taubman (1996) study twins to estimate the return to different types of college. Focusing on a sample of female identical and non-identical twins, they find that Ph.D.-granting, private universities with well-paid senior faculty and smaller enrolments produce students that have significantly higher earnings in life. Dale and Krueger (2002) instead compare students that were accepted and rejected at a similar set of institutions to remove the effect of unobserved characteristics that influence college admission. Using the College and Beyond dataset, they find that students who attended more selective colleges do not earn more than other students. However, they find a substantial internal rate of return from attending a more costly college. Finally, the payoff to attending an elite college appears to be greater for students from more disadvantaged family backgrounds.

Hoxby (1998b) does cost-benefit analysis of the effect of attending a more selective college. She estimates the lifetime earnings of graduates of various colleges and compares them to the costs of attending those colleges. Her results show that across the entire spectrum of colleges, people who invest in education earn back their investment several times over during their careers. When earnings are corrected for differences in aptitude, she finds that graduates from selective colleges still tend to earn more over their careers.

Several papers also examine the impact of college quality on outcomes other than earnings. Eide, Brewer, and Ehrenberg (1998) investigate the impact of attending an elite private college on graduate school attendance. They use data on three cohorts of students and find that on balance, attendance at an elite private college significantly increases the probability of attending graduate school, and more specifically, graduate school at a major research institution.

Specialty colleges may also incur differential benefits for certain populations. Rothstein (1993) studies the impact of single-sex versus co-ed colleges. Ehrenberg and Rothstein (1994) instead examine whether Historically Black Colleges and Universities (HBCUs) confer unique benefits to Black students. Constantine (1995) tackles a similar question and estimates the effect of attending an HBCU on future wages of Black students. She finds that although the pre-college characteristics of students who attended HBCUs predicted lower wages, the value added in future wages from attending HBCUs was 38 percent higher.

**AREAS FOR FUTURE RESEARCH**

Economists have made many important contributions to our understanding of the factors related to college access and success. There have been numerous studies on how various inputs and policies affect student behavior. However, as noted throughout the essay, there are several areas that deserve further study. Often the lack of research on a subject is not due to lack of interest. Economists are steadfast in the pursuit of credible strategies to deal with the many confounding biases inherent in social phenomena, and sometimes there are neither appropriate research tests (i.e., quasi-experimental set-ups) nor the necessary data to answer some of the most pressing questions. Regardless, this section outlines some of major holes in the economics literature with the hope that they will one day be addressed.

**College preparation**
Concerning the issue of college preparation, much more work is needed to understand how the resources of primary and secondary schools affect college attendance. First, college entry should be used more often as a criterion to judge schools. In addition, researchers need to focus on the role of particular inputs. While several papers have studied the impact of factors such as teacher quality and class size, it would be useful to know whether guidance counseling makes a difference and in what ways, and there are likely to be other aspects of schools that matter.

Additional work is also needed to document trends and differences in academic course-taking and performance. With the current debate on academic standards and curriculum with No Child Left Behind, research is needed to shed light on how what is taught affects students' later success beyond high school. Furthermore, although there are general theories about why students from different backgrounds have varying propensities to get the proper preparation or perform well, it is unclear from the literature what the exact causes are or what policies might act as solutions. As noted above, guidance counseling may help, but little work has been done on the topic to resolve the debate. Furthermore, economists have failed to examine the level of agreement (or disagreement) between the preparation provided in secondary schools and the skills needed in higher education. Little is known about what the best preparation would be, and research is needed on how to streamline the educational systems better.

Finally, the preparation literature does not have clear answers about the role of expectations and information in college access. They may just be proxies for a student's level of motivation and preparation, or they could be potential areas in which policy interventions could make a difference. It is interesting that recent findings suggest that a majority of students expect to go to a postsecondary institution even as many of them do not take active steps toward the goal of college attendance. The research currently does not provide an adequate way to deal with distinguishing between correlation and causation, and a solution to this problem would be a major contribution to the literature.

**College access**

Although economists have greatly contributed to researchers’ understanding of the role of costs and benefits in college demand, additional work is needed to clarify the role of parents, teachers, peers, and neighborhoods in college decisions. These types of background factors might affect preferences or the perceptions of the costs and benefits of postsecondary study. Additionally, traditional demand models assume perfect information, and analysis is needed to test this assumption.

The literature also needs to be expanded in terms of addressing differences in college entry by minority racial groups in addition to African-Americans. With the changing demographics of the country, it is important to understand the decisions of Latinos and Asians, particularly by ethnicity. Finally, much more information is needed to understand the growing gender gap in higher education.

**Financing a postsecondary education**

Economists have made wonderful contributions in deciphering the effect of financial aid policies on college access. However, additional research is needed to resolve the current debate about the relative role of resources in comparison to long-term family circumstances and academic preparation. At the core of this controversy is whether aid policy is the best way to increase access or if other policy instruments should be exercised to address long-term problems.

Furthermore, although there has been some work on the differential effect of aid by race, gender, and age, much more work is needed in this area. As stated above, it is important to learn how the effect of policies might vary by race and gender as the demographics of the country change and more women are enrolled in college than men. Additionally, although nontraditional, older students make up a large proportion of higher education, very little is understood about their decisions and choices. With the growing need to retrain workers, determining their needs will be important for the future.

Finally, several papers document the growing orientation of the aid environment toward loans. However, little is known about the motives of borrowers, and the debate continues on whether loans have been essential to enrollment or are used more for convenience. Research in this area would also reflect on the debate about whether the loan burden is excessive. Moreover, although many suspect that borrowing discourages enrollment among some students, especially those from low-income and underrepresented groups, there is little evidence to support this claim. Finally, the long-term consequences of loans need to be considered. For example, the growth in loans may affect career decisions and the timing of marriage and having kids.

**Retention and the completion of postsecondary degrees**
The fifth section highlights the extensive work by economists on the return to education. While researchers have generally found a return to education and there appears to be a return to quality, it would be useful to know more about the returns to less traditional pathways through college such as attending a community college or getting a certificate rather than degree. Additionally, with the average time to degree growing, research is needed to understand how this affects returns. Finally, the returns to different groups of students would be informative.

However, there is a much larger hole in the economics literature on what factors affect college success. Although there have been a number of papers on persistence, few institutional factors have been investigated. While research on primary and secondary schools investigates the role of teachers, class size, and curriculum, there is little work on similar issues in higher education. Furthermore, few papers have credible strategies to deal with the selection issues inherent in studies of persistence.

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Notes

1. Jackson and Weathersby (1975) and Siegfried (1986) also consider the evidence on the impact of price on college demand.
2. Also see Becker and Tomes (1986) for additional development of the theory of human capital.
3. There is additional work on the effect of community colleges on earnings. These papers are discussed in a later section.

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APPENDIX: RESEARCH RELATED TO SUPPLY-SIDE ISSUES (not discussed in the text)

The authors employ a simple enrollment demand model to investigate the regional market environment of a private, church-related, comprehensive institution of higher education offering undergraduate, graduate and professional education. The authors conclude that tuition price subsidies play a critical role in managing enrollment demand at this institution.

The author presents options for the reform of the financial aid system for higher education in the United States and recommends that the federal government and institutions of higher education switch roles with regard to financial aid so that institutions take primary responsibility for loan guarantees, and the government take primary responsibility for grants.

Effects of state policy on private higher education institutions are assessed by means of multivariate analyses of several national longitudinal data bases. Increases in the level of state student aid (dollars per student) were associated with: (a) overall enrollment increases in the less selective private institutions; (b) increased enrollments of low- and middle-income students; and (c) decreased tuition charges in the more selective institutions. In the less selective private institutions, direct institutional aid appears to be “passed through” to students in the form of increased expenditures.

The author suggests that increases in financial aid in recent years have enabled colleges and universities blithely to raise their tuitions, confident that Federal loan subsidies would help cushion the increase. In 1978, subsidies became available to a greatly expanded number of students. In 1980, college tuitions began rising year after year at a rate that exceeded inflation. Federal student aid policies do not cause college price inflation, but there is little doubt that they help make it possible.

This paper examines the relationship between student measures of teaching quality and institutional revenue sources. The results indicate that a greater reliance on private subsidies is associated with higher measures of teacher quality. A greater reliance on public subsidies, however, leads to lower teacher quality ratings. The importance of these results for shaping public policy decisions is also discussed.


Despite the involvement of two-thirds of economists, the higher education industry remains incompletely understood. Among the topics related to higher education that invite further research are the rapid increase in college costs, the interaction of tenure and the end of mandatory retirement, and the effects of college enrollment on income inequality. Data from surveys of freshmen suggests that the gap in socioeconomic status between students in private universities and other young people has grown over time.

This study examines the relative contributions of human and physical resources in the production of private undergraduate education. The theoretical orientation emphasizes interdependence among inputs and outputs in higher education. In addition, the study introduces an output variable reflecting the quantity and quality of institutional production.


This paper provides a model of optimal financial aid policies for a selective university. The model implies that the financial aid package to be offered to each category of admitted applicants depends on the elasticity of the fraction that accept offers of admission with respect to the financial aid package offered them, the propensity of the category to enroll, the elasticity of the category’s average quality with respect to the number admitted, and the relative weight the university assigns them in the utility function. While the latter must be determined subjectively, the former parameters are subject to empirical estimation. The authors conclude with a study of one institution’s data and illustrate how they may be estimated. These estimates are then applied to illustrate what the “optimal” financial aid policy would be for the university.


This paper examines the divergence of interest between universities and state governments concerning standards for admitting in-state versus out-of-state students. The authors develop and test a model that illustrates the divergence of interest between universities and their states. They find that public universities set lower minimum admissions standards for in-state than out-of-state applicants, presumably following their states’ preferences, while private universities on average treat both groups equally. However, they find that states in fact gain financially when public universities admit additional out-of-state students. This is because attending a public university in a particular state increases marginal students’ probability of locating in the state after graduation by the same amount regardless of whether students are from in-state or out-of-state. And because marginal out-of-state students earn more, their expected future state tax payments are higher. The results suggest a rationale for public support of flagship public universities that can attract high-ability students.


This paper examines the effects of financial aid policies on the behavior of postsecondary institutions. Using the introduction of the Georgia HOPE Scholarship as a natural experiment, it investigates the impact of the policy on college pricing, institution aid, expenditures, and state appropriations. The results suggest that four-year colleges in Georgia, particularly private institutions, did respond by increasing student charges. In the most extreme case, colleges recouped approximately 30 percent of the scholarship award. As a result, the institutional responses reduced the intended benefit of the scholarship and increased the cost of college for non-recipients.


McPherson and Schapiro argue that the federal government needs the partnership of individual colleges and universities to achieve its college access goals. Directly opposing the idea prevalent among federal policy-makers that “a dollar going directly to a college or university is a dollar wasted,” they propose creating a “cost of education” allowance to be paid to higher education institutions for each Pell grant student enrolled. This system would provide colleges with a needed economic incentive to enroll Pell grant students rather than more affluent students, while reaffirming the partnership between the federal government and colleges in promoting college access.


Academic institutions seeking excellence attract good students through reputation. How high should their academic level be set? Suppose that teaching seeks to maximize aggregate discounted student achievement, while reputation deduces from this the risk of student failure. The inter-temporal optimal policy (a) tailors academic objectives and standards to maximize the achievement of its current students; (b) optimizes achievement using as many instruments...
as possible, such as individual teaching, tutorials, teaching according to skill; (c) minimizes the costs of these policies for students.


Measures determinants of out-of-state enrollments in institutions of higher learning throughout the United States. Tobit regression results suggest that college size, status, selectivity, collegiate sports participation, and other factors significantly influence a university's percentage of nonresident student enrollments. The economics of college student migration are important to college administrators eager to attract higher revenues from nonresident tuition fees.


Provides a simple model that addresses the questions of competitive pricing and allocative efficiency. Prices that charge customers for what they get on net (output minus input) from the firm both are competitive and support efficient allocations; these prices internalize the apparent external effects of customers on each other.


Empirically models and tests role of merit and need in the offer, level, and packaging of non-need-based subsidized and unsubsidized aid at a large public university. Finds that provision of each aid type depends on need, merit, and the discretion of financial aid office that adjusts aid package to account for the observed self-selection of student applicants.


Examines the relationship between key state policy variables and the competitive position of private colleges and universities. The findings suggest state policies in this era of strong demand for higher education and constrained public sector capacity should use price signals to encourage students to consider seriously whether private higher education might serve their needs as well as or better than public institutions.


Higher education is an industry where markets don't clear, prices on average cover less than a third of production costs, the resulting student subsidies are given in strikingly different amounts by different schools, creating a sharply hierarchical market. And an input important to production can be bought only from the firm's own customers. This paper describes the resulting structure of costs, prices, subsidies, and hierarchy using an augmented theory of nonprofits.


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