Factors Shaping College Investment and Enrollment Gaps

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George Bulman
UC Santa Cruz

Jesse Cunha
Naval Postgraduate School

Abstract

There is a great deal of policy and research interest in enrollment gaps by socioeconomic status, race, and gender, and the possibility of systematic underinvestment in postsecondary education. In this chapter, we examine the rich and growing literatures studying the underlying factors that shape college-going decisions. To provide structure for interpreting theoretical and empirical evidence, we classify the literature into three broad areas: 1) early-stage influences and investments that shape children's ability and preferences; 2) the college investment decision incorporating potential returns, costs, and financial resources; and 3) college admissions systems and counseling. Synthesizing the literature reveals the crucial role of parents for shaping children's ability and preferences and providing financial support and guidance. The need for intensive support is driven by the limited supply of seats at selective colleges and the complexity and competitive nature of the resulting admissions process. In turn, it is evident that effective interventions are often those that substitute for parental inputs through salient and substantial financial support and frequent, timely, and customized information. The effects of various factors are often most evident on the intensive margin of which colleges students attend rather than the extensive margin of whether or not to attend. Understanding the multifaceted nature of the influences that shape students' preferences, preparation, investment decisions, and successful transitions to college is crucial for interpreting evidence in the literature and developing policies that increase college enrollment and reduce inequality.

1. Introduction

Researchers and policymakers have long been interested in the factors that influence college enrollment, stemming in part from enrollment gaps by socioeconomic status and the possibility of systematic underinvestment in postsecondary education. In this chapter, we review the core factors that influence the college investment decision, including student ability and preferences, economic conditions, household resources, college cost, the supply of college seats, admissions systems, and information about the college-going process. Within this context, we summarize recent evidence in the economics literature about the efficacy of specific policies and interventions and attempt to shed light on why they may or may not be effective at meaningfully reducing underinvestment and enrollment gaps.

A robust literature shows that college attendance, and the quality of the college attended, generally have positive economic returns, both on average and for marginal students (Black and Smith 2006; Hoekstra 2009; Carneiro, Heckman, and Vytlacil 2011; Cunha and Miller 2014; Dale and Krueger 2014; Zimmerman 2014; Andrews, Li, and Lovenheim 2016; Deming et al. 2016; Doyle and Skinner 2016; Grosz 2020). Attendance also likely endows students with non-wage benefits throughout life, such as greater job satisfaction, better marriage and health outcomes, and positive consumption value (Oreopoulos and Salvanes 2011).[1] Furthermore, the college wage premium has been increasing over the last 40 years (Long 2010; Autor 2014; Ma, Pender, and Welch 2019). Why, then, do more students not attend college to reap these benefits? Are students acting rationally and only attending when the benefits outweigh the costs? Or do preferences, financial and informational barriers, and the limited supply of seats at high-return colleges prevent otherwise beneficial investment? In our review, we find that the literature has much to say about these important questions, both from a theoretical point of view and when studying policy interventions.

In light of the sizable returns to college enrollment, evidence of persistent enrollment gaps by socioeconomic status (SES) and race, and growing gaps by gender, is especially troubling. These gaps are evident on the extensive margin of college enrollment and on the intensive margin of attending four-year, selective, and high-return colleges (Pallais and Turner 2006; Bailey and Dynarski 2011; Chetty et al. 2020). For example, students from the bottom-fifth of the distribution of household SES are approximately half as likely to attend any college and one-fourth as likely to attend a four-year college as those in the top-fifth (Digest of Education Statistics 2018).[2] What factors are responsible for these wide and persistent gaps? What policies are most likely to increase productive enrollment, not just at any college, but at the types of high-return institutions that can increase intergenerational mobility? For each of the factors impacting enrollment considered in this chapter, we highlight the implications for enrollment gaps.

To provide a simple, overarching structure for interpreting empirical and theoretical evidence, we classify the literature into three broad areas and organize this chapter accordingly. Specifically, we group the literature as follows:

1. *Ability and preferences*: Students arrive at the college-going decision with a set of academic abilities and preferences for attending college that have been formed throughout their lives. Ability plays a crucial role in determining the financial returns to college, while preferences determine non-financial returns. Ability and preferences also mediate the impact of most other factors in the college-going decision, such as financial resources, the price of college, the likelihood of college admission, and the availability and usefulness of college counseling. Thus, we review the literature studying how parents, early schooling, peers, and neighborhoods form the ability and preferences which ultimately help shape the college investment decision.

2. *Optimal college investment*: Graduating high school students face a complex financial decision which involves choosing a level of college investment that optimizes lifetime utility conditional on their endowment of ability and preferences. This decision incorporates expected financial returns, the cost of college, and household financial resources. To shed light on this decision, we examine the literature studying the sensitivity of college investment to economic conditions, perceived returns, and uncertainty in the presence of risk aversion. We then detail the empirical evidence on the role of

[1] In addition to returns that accrue to individuals, higher education can impact society through greater economic productivity and intergenerational mobility, the high costs of public programs that support underemployed individuals, and the broad ranging positive externalities of education on public health, well-being, crime, and civic engagement.

[2] There is extensive evidence that college enrollment gaps by SES are due in part to academic mismatch of high ability students from low-income households to lower-quality colleges (Caroline M. Hoxby and Avery 2012; Smith, Pender, and Howell 2013; Dillon and Smith 2017). Enrollment gaps by gender have emerged over the last four decades, and while it is clear that this is driven in part by academic readiness, there is little consensus about the role of differential returns to college by gender (Jacob 2002; Goldin, Katz, and Kuziemko 2006; Hubbard 2011; Ge and Yang 2013).

household financial resources, borrowing constraints, and college price for determining whether or not students attend college and the types of institutions they select.

3. *College supply and admissions systems*: While the supply of college seats is elastic at non-selective two- and four-year colleges, there is significant competition for the fixed supply of seats at selective four-year public and private institutions. As such, supply constraints may prevent students from making their optimal unconstrained college investment. We examine evidence documenting the impact of the decentralized system of entrance exams and college applications in the U.S., and, because such systems favor wealthier students, the efficacy of affirmative action and "X percent plan" policies for leveling the playing field. We also summarize the large literature examining counseling interventions that provide students with information and assistance during the process of applying to college, seeking financial aid, and enrolling, with a special emphasis on the importance of the intensity and quality of these interventions.

A few common themes emerge from this large and diverse literature. First, parents play a crucial role at nearly every stage, from shaping child aptitude and preferences, to providing financial support and information, to actively guiding students through the admissions and enrollment process. Second, effective interventions are generally those that can substitute for multifaceted parental inputs. For example, financial support is most effective when it is salient and substantial, information when it is timely, customized, and persistent, and assistance when it eliminates real costs and barriers. Third, the intensive margin of college enrollment matters. Shifting attendance into high-quality four-year institutions is likely as important for reducing inequality as inducing extensive margin enrollment at lower-quality institutions, and some policies shift enrollment in the opposite direction. Fourth, underinvestment may be due in large part to the limited supply and resulting competitive admissions processes of selective colleges, highlighting the important, and somewhat understudied, role of the incentives facing colleges and universities. And finally, empirical estimates of the impact of any given policy or intervention should not be interpreted in a vacuum. The effectiveness of policies and interventions are dependent on many factors, such as the academic readiness and preferences of the target population and the presence of other barriers to attendance. For example, the impact of changing college price or introducing a counseling program is likely to vary with student ability and preferences, market conditions, and parental background and resources.

The remainder of this chapter is organized as follows. In Section 2, we introduce a stylized objective function of the college enrollment decision, which highlights several important considerations for the interpretation of the empirical estimates found in the literature. Section 3 considers factors that shape ability and preferences prior to students making their college attendance decisions. Sections 4 and 5 document evidence of the factors shaping actual and perceived returns of college attendance, and household and institutional financial factors that influence college decisions. Sections 6 and 7 highlight the implications of decentralized selective admissions systems and the effectiveness of interventions intended to reduce the barriers created by these systems. Section 8 concludes.

2. The College Attendance Decision

Numerous authors have expanded the classical human capital investment model (Becker 1975) to account for a variety of influences to the college-going decision. To focus our discussion, we present a stylized objective function in the spirit of Keane (2002) and Lochner and Monge-Naranjo (2011, 2012), which captures many of these influences. Consider the following, where students choose the amount of college investment (s) and an amount to borrow (b) to maximize expected utility over two periods, 0 and 1:

$$max_{s,b}\, E[u\big[w_0 * (1-s) + y(s) + b - \big(t(s) - g(s)\big) - c(s)\big] + \theta(s) + \beta * u[E[w_1 * f(s,A)] - r * b]]]$$

In period 0, students choose a continuum of college investment s=[0,1], reflecting the fact that there are various levels of institutions (four-year, two-year, certificate programs) and institutional quality. When s=0, the student does not attend college and earns w_0; when s=(0,1) the student both attends school and works; and when s=1, the student attends a high-quality, four-year college full time and does not work. College students pay tuition t(s) discounted by grant aid g(s), receive college-contingent parental wealth transfers y(s), and incur additional costs c(s) associated with applying to and being admitted to college. The function $\Theta(s)$ reflects the direct (i.e., non-pecuniary) utility of attending college, and can either be positive (e.g., a consumption value of education or preferences for college-specific career paths) or negative (e.g., a psychic cost of studying). After college, earnings are a function of the college investment (s) and student ability (*A*), and students pay back their loans at an interest rate, *r*. The return to college f(s,A) is increasing in s and A (more schooling and greater ability both lead to higher wages), and df(s,A)/d(s) is also increasing in A (the return to schooling is higher for higher ability individuals). Period 1 expected utility is discounted by β.

This objective function reflects the three areas of the literature that we summarize in this chapter. First, endowments of academic readiness, A, and college preferences, Θ, are largely determined by the time a student arrives at the end of high school and can be thought of as functions of investments and instilled values during childhood.[3] These factors are likely dependent on parent's income, wealth, and educational backgrounds, as well as the influence of schools, teachers, peers, and neighborhoods. Differences in academic readiness and preferences by SES and gender can lead to subsequent enrollment gaps.

Second, students face a variety of financial considerations. Variation in economic conditions across geography and over time can alter the level of foregone earnings during college, w_0, and the returns to college through w_1 and f(s,A). These factors may also vary by gender, due to the labor market return to physical skills relative to cognitive skills and gender-specific selection into certain occupations. The expectation operator on second period earnings reflects the fact that students cannot perfectly forecast the returns to college, and if expectations are inaccurate students may make ex-post suboptimal decisions. In addition, aversion to risk (captured by the shape of the utility function) can impact the college decision, as enrollment can introduce greater uncertainty about future income and potentially result in high student debt with little or no concomitant wage premium. Parental wealth transfers affect enrollment decisions by increasing overall consumption (which increases the relative utility of consuming college), easing credit constraints if there are borrowing limits, and reducing the cost of college born by the student. Factors that reduce the price of college, such as grants, scholarships, and access to in-state tuition, may ease binding credit constraints and can increase the consumption of college if it is a normal good.

Finally, students may not be able to consume their optimal college investment level due to constraints associated with the supply of college seats. This is most relevant when considering selective four-year institutions, which have less elastic supply and more restrictive admissions requirements. In many cases, additional requirements associated with college admissions (e.g., entrance exams and application fees) can be modeled as costs in the first period c(s). These costs may include the investment necessary to learn about college options and the application process (a cost that is likely decreasing in parental educational background and access to high-quality counseling). However, in some cases, it may be more appropriate to think of the limited number of seats as creating an upper bound on the level of college investment (s) as a function of student ability. This could occur if, for example, a student does not have the test scores or grades necessary to gain admission. Additionally, government policies can alter students' maximum level of investment, for example affirmative action policies, institutional preferences for legacies, or institutional preferences for students who can pay a higher fraction of list tuition.

[3] While academic preparation prior to the college enrollment decision and preference for college attendance reflect the cumulative effect of investments throughout childhood, they may also be impacted by some late-stage policy interventions which in turn impact enrollment decisions. For example, providing students with clearer information about their ability or about the college experience may cause a large enough change in A or Θ to impact the college investment decision.

Interpreting empirical estimates

Equation (1) highlights three important challenges and considerations for interpreting empirical estimates of the causal effects of specific factors impacting the college enrollment process.

Consideration 1: The marginal impact on the college enrollment decision of changing any one factor depends on each of the other factors. For example, increasing access to student loans may not increase attendance if credit-constrained individuals also have low returns to college, weak preferences for consuming college, or have difficulty navigating the admissions process. Thus, a finding that increasing access to loans does not increase enrollment could be incorrectly interpreted as evidence that credit constraints do not exist. More generally, finding modest effects of an intervention or shock to a factor does not rule out the possibility that the factor in question could be important if it was changed in conjunction with other factors.

Consideration 2: The factors impacting the college-going process can operate through multiple channels. Thus, it is important to be cautious when concluding that a specific mechanism explains an empirical result. For example, reducing tuition may relax a binding credit constraint, but it also reduces the price of a normal good (i.e., college education) and increases disposable income which can impact the marginal utility of consumption. Or, increased household resources may simultaneously affect academic preparation, ease financial constraints, and alter consumption decisions through parental wealth transfers. Indeed, it is *rarely* the case that a factor or intervention operates solely through one mechanism.

Consideration 3: In empirical work, the estimated importance of a factor can vary significantly across different populations of study. Differences in study populations are often driven by the availability of data and the potential for credible identification strategies. For example, studies that include the population of college-aged students will necessarily include a large fraction of students who do not face positive returns or have weak preferences for college. In contrast, studies that restrict attention to students who have completed high school, taken a college entrance exam, applied to college, or applied for merit aid, focus on populations with higher propensities to attend college, which may inflate or attenuate the potential response. Researchers and policymakers should take great care to remember this consideration when attempting to generalize findings across studies.

3. Ability and Preferences

Ability (A) and preferences (Θ) are largely determined by the time a student arrives at the end of high school, and both can be thought of as functions of the cumulative investments made in children throughout their lives. As demonstrated by numerous studies (e.g., Murnane, Willett, and Levy (1995) and Arcidiacono, Bayer, and Hizmo (2010)), students with greater ability entering college tend to have higher returns to postsecondary education (that is, $df(s,A)/ds$ is increasing in A). Preferences enter our stylized choice function as an additive, non-pecuniary utility parameter (Θ) that students receive from attending college. While there may be a short-term disutility ($\Theta<0$) from attending college for some students - for example, the psychic cost of studying - there is strong evidence that the life-time non-pecuniary returns to college are large and diverse, ranging from greater happiness and job satisfaction to better health and relationships (Oreopoulos and Salvanes 2011). Therefore, more able (higher A) students and those with greater non-pecuniary consumption value of college ($\Theta>0$) will be more likely to enroll, all else equal.

An understanding of the underlying drivers of ability and preferences is important in light of the wide disparities on these dimensions by SES. For example, less than 40 percent of students whose households are at the bottom of the earnings distribution have characteristics associated with basic college readiness (graduating from high school, having test scores above the bottom quartile, and a grade point average of at

least 2.0), while 90 percent of children in the highest-earning households meet this standard of readiness.[4] Further, even by 10th grade, there are large disparities in stated plans for college, with 55 and 84 percent of students from the lowest and highest income households stating that they plan to attend a four-year college when they graduate. In this section, we discuss the main influences on children's ability and preferences - parents, teachers, school, peers, and neighborhoods - and summarize the empirical literature which has studied how these influences impact college enrollment. We note that it is often difficult to separately isolate the determinants of preferences and ability. For example, more educated parents can foster greater ability in their children while at the same time teaching them about the non-pecuniary benefits of a college education. Likewise, high-performing peers and schools can simultaneously increase student ability and their taste for college. It is also important to recognize that ability is acquired sequentially, so early investment may be necessary to reap the benefits of later-stage interventions, and that ability is multidimensional, with both cognitive and non-cognitive skills influencing college outcomes (Cunha and Heckman 2007; Cunha et al. 2006).

Parental influence

Several studies have used clever natural experiments to isolate the causal impact of early childhood experiences on the college-going process, often by demonstrating that ability and preferences are transmitted intergenerationally from parents to children. For example, Sacerdote (2007) finds that children adopted by more educated mothers were more likely to graduate from college, even after controlling for family income and demographics. And Carneiro, Løken, and Salvanes (2015) find that paid maternity leave in Norway led to reduced high school dropout and increased college enrollment for their children.

Cunha and Heckman (2007) highlight the importance of dynamic complementarities in human capital investments in children, whereby early-life investments increase the effectiveness of later-life investments. Thus, a lack of early-life investment in human capital may lead to a lack of college readiness and limit the effectiveness of later-stage interventions. Carneiro et al. (2020) find that parental investment, as proxied by parental income, has the largest impact on college outcomes when children are younger than 5 and older than 12. However, it is not clear that parents fully understand the importance of investments in their children. For example, Boneva and Rauh (2018) study parental beliefs about the returns to investments made at different times in a child's life and find that parents believe that late investments are more important than early interventions and that investments are substitutes, not complements, both of which contradict the empirical evidence.

Early childhood schooling

Similar to parental influence, the quantity and quality of early childhood schooling can impact college enrollment by developing foundational skills and abilities. For example, the Head Start program, which provides free preschool to disadvantaged children, has been shown to increase college enrollment, especially among Black students and students with high ability mothers (Ludwig and Miller 2007; Deming 2009). Likewise, several papers have shown that smaller Kindergarten class sizes experimentally introduced by the Tennessee STAR program led to higher rates of taking college entrance exams (Krueger and Whitmore 2001) and entering and graduating from college (Chetty et al. 2011; Dynarski, Hyman, and Schanzenbach 2013).

Despite inconclusive early evidence on the impact of school funding on academic achievement (E. A. Hanushek 1986), several recent studies find that increased funding in primary school improves students' test scores, high school graduation rates, and college attendance (Jackson, Johnson, and Persico 2016; Hyman 2017b; Lafortune, Rothstein, and Schanzenbach 2018). For example, Hyman (2017) studied a school finance reform in Michigan and reports that a 10 percent increase in per-student spending led to a 3-percentage point, or 7 percent, increase in college enrollment. Many of these papers find that increased

[4] Based on data in the 2002 Education Longitudinal Study (https://nces.ed.gov/surveys/els2002/).

funding has a greater impact on students with higher ex-ante ability, reflecting the important role of dynamic complementarities.

Teacher quality has also been shown to increase ability and college attendance. For example, Chetty, Friedman, and Rockoff (2014) show that students who had high value-added teachers in grades 3-8 were more likely to subsequently enroll in college. And, Deming et al. (2016) demonstrate the positive impact of school accountability reforms which increase teacher effort, finding that students attending public schools at risk of being rated "low performance" experienced subsequent gains in achievement test scores and eventual college completion.

High school type and quality

Following children through their educational careers, a large literature has studied the impact of high school type and quality on college attendance. Relative to public schools, Catholic schools have been found to increase college attendance, especially for urban and Black students (Evans and Schwab 1995; Neal 1997; Altonji, Elder, and Taber 2005). Similarly, minority students who were randomly assigned to receive a voucher to attend a private high school were more likely to attend college (Chingos and Peterson 2015). Angrist et al. (2016) studied students randomly assigned into oversubscribed charter schools, and found positive, yet insignificant, impacts of charter school attendance on college enrollment overall, but strongly significant impacts on four-year college enrollment. Echoing the findings for oversubscribed charter schools, there is evidence that public school choice programs affect the college outcomes of students who are able to attend their preferred high schools (Deming et al. 2014; Lavy 2015).

Looking beyond schools into specific courses and curricula, a series of well-identified papers have shown that students who took more math courses, more advanced math courses, or more remedial math courses are more likely to enroll in college (Aughinbaugh 2012; Cortes, Goodman, and Nomi 2015; Dougherty et al. 2017; Clotfelter, Hemelt, and Ladd 2019; Hemelt, Schwartz, and Dynarski 2020). Beyond helping students pass college math entrance exams, math ability may provide a necessary signal to the student that they are the "type" of person who will succeed in college.

Peers and neighborhoods

Finally, a series of papers have studied the impact of student's peers and neighborhoods on college attendance, generally finding that high quality peers, neighborhoods, and school quality increase the likelihood of college attendance. Chetty et al. (2011) show that students who were randomly assigned to Tennessee STAR classrooms with higher-performing peers in grades K-3 had higher subsequent college attendance rates. Chetty, Hendren, and Katz (2016) follow children from families who were randomly offered vouchers to move to better neighborhoods in the Moving to Opportunity experiment and find that children who moved before age 13 had higher college attendance rates, while older children had slightly lower college attendance rates. Consistent with those findings, Chetty and Hendren (2018) find that children in families who moved to better neighborhoods are more likely to enroll in college, effects which are monotonically larger the younger the child was at the time of the move. In terms of peers in high school, Billings, Deming, and Rockoff (2014) found that students from a large school district who were reassigned to a different school with lower quality peers (measured as a larger fraction of minority students) were less likely to attend college.

4. Monetary return to a college education

A primary reason for pursuing a college education is the expected financial return in the labor market. In our stylized objective function (equation 1), this is enters via $w_1 * f(s, A)$, and our assumption that f(s) is increasing in s reflecting a large and robust empirical literature showing a positive return to college for a wide variety of students (Card 2001; Hoekstra 2009; Zimmerman 2014). In fact, the overall earnings gap between individuals with four-year college degrees and those with high school degrees widened substantially during the 1980s and has persisted in magnitude over the last 30 years (Ma et al. 2018). A

secondary financial reason for attending college may be because individuals with four-year degrees experience far smaller increases in unemployment in response to adverse economic conditions. This was plainly evident during the Great Recession (December 2007 to June 2009), when the unemployment rate rose 2.1 percentage points for those with a four-year degree, compared to a 5.3 percentage point rise for those with only a high school education.[5]

In this section, we review the literature on how actual and perceived labor market returns shape college enrollment decisions.

Labor market returns

The monetary return to college reflects the difference in potential earnings for an individual with and without a college degree, as well as differences in the likelihood or ease of finding employment. Both the monetary return to college and the differential unemployment rate of college and non-college-educated workers has varied over time in response to demand for skilled labor and the supply of workers. A large literature has documented that youths respond to market signals in their educational choices. Market forces influence both the extensive margin of whether to go to college and the intensive margins of which college to attend and which major to pursue.

It has long been known that high school students' college enrollment decisions respond to the employment opportunities in the non-college-educated sector, and that these impacts are mainly seen in two-year college enrollments (Betts and McFarland 1995). Recently, Charles, Hurst, and Notowidigdo (2018) showed that the housing boom of the early 2000's increased employment opportunities in low-skilled jobs, which led to reduced two-year college enrollment. Likewise, Foote and Grosz (2019) show that two-year college enrollment increases in response to local labor market downturns. An important issue is whether students responding to current market demand are making myopic, suboptimal long-run decisions, and Charles, Hurst, and Notowidigdo (2018) show that cohorts who saw a decline in college enrollment due to the housing boom did not subsequently increase enrollment during the bust. This finding suggests that these individuals may be missing out on productive educational investments that would have paid off throughout their lifetime.

Temporal labor market forces are less likely to impact high ability youths' decisions to attend college, but there is evidence that college-bound students choose majors in response to occupation-specific labor market conditions. Interest in this determinant of human capital acquisition dates back at least to the 1950s with work by Arrow and Capron (1959) and later by Freeman (1976) who study how market wages for engineers and scientists are impacted the decision of youth to enter those fields. More recently, Ryoo and Rosen (2004) showed that engineering students are responsive to both current and forecasted future demand for engineers. Similarly, Schweri and Hartog (2017) show that healthcare trainees who expect a greater return to a nursing degree are more likely to attend nursing college.[6] As with the extensive margin decision of whether to attend college at all, an important consideration is whether students' choices of major reflect current or future market demand: whether students' correctly incorporate future market demand for skills in their current choices impacts whether it is necessary to advertise and subsidize education in high-demand occupations (such as current policies advancing education in STEM fields)[7].

In addition to the research discussed above, which examines how students respond to variation in expected future earnings stemming from market forces, Abramitzky and Lavy (2014) and Abramitzky, Lavy, and Segev (2019) study the impact of a perhaps more salient change in returns. Specifically, they exploit a natural experiment in which Israeli Kibbutzim shifted from equal sharing to productivity-based wages, which implied that students would begin to be compensated for educational investments. They find

[5]https://www.bls.gov/charts/employment-situation/unemployment-rates-for-persons-25-years-and-older-by-educational-attainment.htm

[6] Students also respond to information about the returns to specific colleges. For example, Hurwitz and Smith (2018) show that students are more interested in applying to colleges whose recent graduates earn more in the labor market.

[7] For example, see the federal government's strategic plan for advancing STEM education: https://www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf

that this change led to increased college attendance and induced students to major in high return fields, such as computer science, engineering, and natural sciences.

Expected returns and risk aversion

Imperfect foresight implies that students necessarily make educational investment decisions based on *expectations* of uncertain future returns. This raises two main questions: (1) whether students have correct expectations of the return to college and (2) whether students are averse to uncertainty over future wages and the likelihood of employment that may stem from a college education.[8]

Researchers have long understood that the average return to college is not equal to the cross-sectional difference in earnings between those with and without college degrees and that the causal returns may differ across individuals. The question, then, as posed by Manski (1993) is whether high school students act as "adolescent econometricians" and correctly infer what their *individual* return to education will be. The empirical evidence is mixed about whether students' expectations are "correct." Earlier studies found that beliefs about future earnings conditional on schooling are relatively accurate (Dominitz and Manski 1996; Avery and Kane 2004; Rouse 2004). However, several more recent studies have found that perceived returns to schooling are inaccurate, with students both underestimating (Jensen 2010; Bleemer and Zafar 2018) and overestimating returns (Hastings, Neilson, and Zimmerman 2015). These disparate results could reflect inherent variation in the accuracy of beliefs across the population, and more empirical evidence is needed to begin to draw generalizable conclusions.

Several studies have found that providing accurate information about returns increases students stated intentions to pursue a college degree (Oreopoulos and Dunn 2013; Bleemer and Zafar 2018; Lergetporer, Werner, and Woessmann 2018), and others have found that accurate information changes educational decisions (Hastings, Neilson, and Zimmerman 2015). Because providing information is relatively inexpensive, projects such as the "College Scorecard" and other methods of disseminating accurate information about college returns may be valuable for policymakers.

An important question addressed by this literature is whether less accurate beliefs among low-income students helps to explain the college enrollment gaps by SES. Avery and Kane (2004) and Rouse (2004) conclude that this is not the case, finding that low-income and high-income students in the U.S. have similarly accurate beliefs. However, Bleemer and Zafar (2018) show that providing information about returns lowers the SES gap in intended college enrollment. Also, Jensen (2010) finds that even though an information intervention has similar impacts on stated intentions to enroll in college for lower- and higher-income students, only the higher-income students see increases in educational investment in high school (his study does not follow students into college).

Next, we turn to the issues of uncertainty and risk aversion in the college decision. Levhari and Weiss (1974) formalized a model showing that a risk-averse student (or parent) is less likely to invest in education if there are uncertain returns. Aversion to risk is most likely to impact students with potential returns to college and monetary and psychic costs that cause them to be closer to the margin of enrollment. Several studies have found that higher expectations of the variance in returns or greater risk aversion are associated with lower rates of college enrollment (Attanasio and Kaufmann 2014; Belzil and Leonardi 2007; Checchi, Fiorio, and Leonardi 2014). In addition, the importance of risk preferences may be increasing over time because, while the average returns to college have gone up, so has the variance in returns (Autor, Katz, and Kearney 2008). As with beliefs about the returns to college, risk aversion seems to be an important factor in the continuing college enrollment gap by SES.

One way students can mitigate the risk of investing in an expensive college degree with an uncertain return is to view the problem as a series of smaller, sequential decisions. Students may find it optimal to

[8] A third question is how students acquire information on the returns to college. Several papers have shown that exposure to college educated individuals increases students' likelihood to pursue higher education (Loury 2004; Bifulco, Fletcher, and Ross 2011; Goodman et al. 2019), but it is unclear whether the impact is due to information about the returns to college, or through some other channel such as information on monetary costs or non-pecuniary benefits and costs.

"try out" college, paying only for the semester in which they are enrolled and leaving the option open to either continue based on the updated information they have learned about their ability, the psychic costs or benefits of college, and possibly information about future returns. A long literature dating back to Weisbrod (1962) and continuing through Altonji (1993), Stange (2012), and Stinebrickner and Stinebrickner (2012) has studied, theoretically and empirically, the "option value" of college enrollment, and concludes broadly that the option value is large and can help explain why the rate of college persistence is so low. While "trying out" college may be optimal from a student's point of view, it is unclear whether this is optimal from a social point of view given the fact that the state generally subsidizes college.

5. Financial Resources and Costs

Section 3 detailed the important role that household financial resources can play in shaping students' academic ability and the potentially strong correlation between resources and preferences for attending college. Household income, wealth, and access to credit may also affect students directly at the time of the enrollment decision. Parents can make college-contingent transfers, y(s), that reduce the cost of college to a student, ease borrowing constraints, and increase disposable income, which increases the marginal utility of consuming college relative to other goods. In addition, wealthy parents can also ease borrowing for college by taking out loans themselves, or by acting as co-signers on students' loans. However, parental resources reduce eligibility for need-based grants and scholarships, potentially reducing access to college for students whose parents do not provide the level of support assumed by aid formulas. Understanding the role of household resources is crucial in light of the wide disparity in income and assets across U.S. households with school-aged children. While the top fifth of these households have incomes exceeding $170,000 per year, the bottom fifth have median incomes of just over $20,000 (U.S. Census 2020). Further, more than 30 percent of households with middle- and high-school aged children had less than $25,000 of net worth, while 23 percent had a net worth exceeding $500,000 (US Census 2018). Thus, notable effects of household resources on college enrollment through any mechanism (e.g., easing constraints, contingent transfers, increasing consumption) could translate into substantial enrollment gaps in attendance by SES and race.

In addition to household resources and credit constraints, this section considers the crucial role of college price for shaping students' decisions about whether and where to attend college. Because college price captures both list tuition, t(s), and grant aid, g(s), the importance of federal, state, institutional, and private grants for financing college cannot be understated in the U.S. postsecondary education system. For example, list tuition at four-year public and private institutions is $13,830 and $36,330, respectively, while average net prices are $3,820 and $13,830 (Ma et al. 2019). The wide disparities between list and net prices highlight the fundamental role played by grants at colleges and universities, while low in-state tuition levels highlight the importance of state subsidies.[9] At two-year public colleges, list prices tend to be very low, and average net prices are close to zero, indicating that constraints would stem from the need for parental support and loans to finance housing and other expenses, rather than tuition and fees.

Income and wealth shocks

Isolating the causal effect of household resources at the time of the college transition is inherently difficult because income and wealth are strongly correlated with other factors influencing college enrollment, such as parental education and children's academic preparation. Nonetheless, several studies have estimated this relationship by leveraging exogenous variation in income and wealth generated by job loss, tax policies, housing market fluctuations, and winning the lottery. Large effects of income and wealth shocks on college enrollment would indicate that either households face binding constraints or that parental

[9] In contrast to the increasing importance of grant aid, average loan aid has decreased over the last 10 years. Approximately 60 percent of four-year college students graduate with debt, which averages $27,200 and $33,500 for borrowers at public and private institutions, respectively (Ma et al. 2018).

transfers induce greater consumption of college education. In contrast, small effects would indicate that few college-ready students are deterred by binding borrowing constraints alone and that the strong correlation between household resources and college outcomes stems from factors such as prior investment in ability and preferences.

Parental job loss during high school creates a sudden change in income, potentially reducing parents' financial contributions and students' access to credit. The size of the income shock generated by job loss is inherently tied to household income (i.e., low-income households experience smaller shocks) and job loss may be associated with other causal channels such as psychological distress. Perhaps because the effect of job loss on college attainment is context specific, empirical evidence in the literature examining job loss is mixed. Coelli (2011) and Pan and Ost (2014) find very large negative enrollment effects from job loss, while Hilger (2016) estimates a response that is an order of magnitude smaller.[10] Of particular note is that Hilger (2016) finds smaller effects for lower-income households, suggesting that other barriers (such as academic preparation or lack of parental financial support for college) may prevent large responses. The Earned Income Tax Credit also represents a sizable income shock for lower-income households (with a maximum benefit of more than $6,000). Bastian and Michelmore (2018) find no significant effects of EITC exposure during high school on college enrollment rates. Manoli and Turner (2018) exploit a regression kink design. They find no significant effects of EITC received during a child's junior year of high school at the lower- or higher-income eligibility kink, but a significant effect during a child's senior year at the lower kink.

Families may treat wealth and income differently. Several studies have focused on how variation in housing wealth impacts college enrollment, but it is important to note that doing so necessarily focuses on families with any wealth. Lovenheim (2011), Cooper and Luengo-Prado (2015), and Hotz et al. (2018) find evidence that greater housing wealth due to fluctuations in housing markets leads to increased enrollment on the extensive margin, and Lovenheim and Reynolds (2013) document increased enrollment at flagship institutions on the intensive margin. In contrast to housing wealth, exploiting variation in lottery wins allows the study of wealth shocks on a wider range of the distribution of household resources. Bulman et al. (2016) exploit lottery wins that generate a range of income shocks across low- and high- income households. Their estimates generally reveal modest average effects, but a high upper bound for wins far larger than the cost of college, which is consistent with parental transfers generating increased consumption of college as a normal good. As in Hilger (2016), they find smaller effects for lower-income households, suggesting that borrowing constraints at the time of the college transition alone are unlikely to deter a large fraction of low-income households from attending college.

Borrowing Constraints, Consumption Smoothing, and Parental Transfers

In addition to reduced form estimates of the effects of household income and wealth shocks, several studies have estimated structural models to shed additional light on the specific roles of borrowing constraints, consumption smoothing over time, and parental transfers.[11] Constraints can take the form of students being unable to afford college, being averse to accruing high levels of debt, or being unable to borrow enough to smooth consumption between the college and post-college periods (Cowan 2016).

Early studies of the relationship between household financial resources and college enrollment outcomes attributed the strong correlation in the cross-section to the presence of binding credit constraints. However, subsequent analyses revealed that much of the correlation disappears after accounting for differences in children's academic ability that have already emerged by high school, indicating that long-run investment rather than short-run constraints explain most of the resource-college correlation (Cameron

[10] Likewise, Chen, Fan, and Liu (2019) find very modest effects of job loss in Taiwan, but large negative effects of divorce, attributing the differential effects to the greater psychological shock of divorce relative to job loss.

[11] See, for example, Keane (2002) and Lochner and Monge-Naranjo (2012) for more extensive examinations of the prior literature on the role of household resources and borrowing constraints.

and Heckman 1998; 2001; Carneiro and Heckman 2002; Cameron and Taber 2004).[12] An alternative to constraint- and ability-based explanations is that parents may induce college attendance by providing transfers that reduce the price of college. Keane and Wolpin (2001) find that parental transfers are important, and "essentially none" of the relationship between resources and outcomes is due to capital market constraints. Likewise, Brown, Karl Scholz, and Seshadri (2012) argue that constraints do not bind for a high fraction of households, but find they could bind for children whose parents provide transfers that fall short of the expected family contributions assumed by aid formulas.

Belley and Lochner (2007) and Lochner and Monge-Naranjo (2011) document an increasingly strong relationship between household resources and college outcomes over time which they attribute to increasingly binding credit constraints. Such findings are consistent with reduced form studies that document large income-shock effects, implying that short-run constraints (and not just prior investments in student ability and preferences) are an important deterrent to college enrollment. However, subsequent studies have largely documented a more modest role for short-run constraints. Simulations that remove constraints or limit access to loans suggest that few families are unable to send children to college due to borrowing constraints alone and that tuition subsidies, which operate through other mechanisms, have much larger effects (Johnson 2013; Abbott et al. 2018). Most recently, Lawson (2017) finds that tuition subsidy effects do not operate primarily through reducing short-run borrowing constraints, and Caucutt and Lochner (2020) argue that easing only late-stage constraints will have modest effects in the absence of greater early-childhood investment. In conjunction with reduced-form evidence of small effects of large income shocks in high school (Bulman et al., 2016; Hilger, 2016), there appears to be a growing consensus that few students are deterred from attending college solely by binding constraints at the time of the college transition.

College prices and financial aid

Financial aid is a primary policy tool for increasing access to college. Aid takes on numerous forms, from federal grants, loans, and tax credits to state-subsidized tuition and institutional and non-profit scholarships.[13] Aid also varies in terms of eligibility requirements and can be based on need, merit, or residency, as well as generosity, timing, and salience. Reducing the price of college could alter enrollment decisions through multiple mechanisms, including easing credit constraints, reducing the cost of college relative to other goods, and income effects that increase consumption during and after college. Unlike the household resources literature in which modest effects are the norm, a relatively high fraction of studies in the financial aid literature reveal substantial impacts. This is likely to reflect, for example, that financial aid operates through additional mechanisms (e.g., reducing the price of college), is contingent on college attendance, and accrues directly to the student rather than parents. Further, many forms of aid may function as explicit or implicit recommendations to attend college. Nonetheless, there remains uncertainty about the efficacy of programs as fundamental as Pell Grants and Hope Scholarships, and there is increasing evidence that pairing aid with counseling or recruitment may be necessary to alter student outcomes reliably.

Need-based grants target lower-income students and are likely to reduce enrollment gaps by family income. Likewise, students from lower-income households may be more price-sensitive than their peers and thus benefit from subsidized in-state tuition at public colleges. However, there are numerous ways in which financial aid and subsidies can exacerbate enrollment gaps. For one, if higher-income students are more academically able, they may receive the majority of merit-based grants and scholarships and may be the primary beneficiaries of subsidizing tuition at more selective public institutions. Additionally, some policies mechanically do not benefit lower-income students, such as tax credits and deductions that only accrue to families that both pay tuition and owe income taxes, and merit grants that only reduce tuition for

[12] For example, Cameron and Heckman (1998) argue that the correlation between household income and college outcomes "is due to long-run family background effects that produce" ability and that interpretations of "the family income–schooling relationship as arising solely or mainly from liquidity constraints…are misguided" (pg. 312).

[13] See, for example, Deming and Dynarski (2010) and Page and Scott-Clayton (2016) for an introduction to the U.S. tuition and financial aid system, and the high level of price differentiation across low, middle, and high-income households.

students ineligible for Pell Grant aid (Long and Riley 2008). Further, on the intensive margin, lower-income students may be induced by reduced prices to attend lower-quality institutions that may not be beneficial in the long run.

Studies of the effect of national grant aid on college enrollment have generated mixed evidence. For example, while Dynarski (2003) finds very large effects of the generous Social Security Student Benefit Program for students with deceased fathers (a benefit discontinued in 1982), Carruthers and Welch (2019) find little effect of federal Pell Grant aid on enrollment. Likewise, there is little consensus about the effect of "Hope-style" scholarships which provide aid to in-state institutions and have relatively low eligibility standards. While some studies find evidence of large effects (Dynarski 2000; 2008; Farrell and Kienzl 2009), others find much more modest changes (Cornwell, Mustard, and Sridhar 2006; Bruce and Carruthers 2014; Sjoquist and Winters 2012). Despite mixed evidence on the extensive margin of attendance, most studies find that students are induced by state-specific aid to stay in state and, when aid is limited to public universities, to switch away from private institutions - revealing that relative prices matter. A primary consideration for "Hope-style" programs is that they tend to benefit children from middle- and upper-income households who are more likely to be academically eligible and who would not otherwise receive substantial grant aid. Similarly structured "place-based" programs offer generous aid to in-state institutions for those from specific cities, generating greater student interest in eligible institutions (Andrews, DesJardins, and Ranchhod 2010) and increasing overall college enrollment (Page et al. 2018; Bartik, Hershbein, and Lachowska 2019).

Federal programs targeting non-traditional students have also been shown to induce college enrollment. Specifically, there is consistent evidence that the GI Bill has increased enrollment among veterans (Bound and Turner 2002; Stanley 2003; Barr 2016), and that the loss of federal aid eligibility decreases enrollment among those with drug offenses (Lovenheim and Owens 2014). Gurantz (2019) finds evidence that grant eligibility in California increases for-profit college enrollment among lower-income, non-traditional students in their late twenties and early thirties.

Relative to Hope-style and place-based programs, highly selective merit scholarship and grant programs generally have no impact on the extensive margin (these students would attend regardless of aid) but instead alter the types of institutions attended. In particular, several papers have studied programs in Massachusetts and California that offer merit-based scholarships for students who attend in-state public universities, finding no impacts on college attendance but an increase in attending in-state schools (Goodman 2008; Cohodes and Goodman 2014; Bettinger et al. 2019). Similarly, national programs targeting low-income students such as the Dell Scholars Program and Gates Millennium Scholars Program provide aid for public and private institutions but have little effect on extensive margin enrollment, as nearly all applicants attend college (DesJardins and McCall 2014; Page et al. 2019). Angrist, Autor, and Pallais (2020) examine the effect of randomly assigning generous merit-based scholarships to low-income students in Tennessee, and find limited evidence on overall enrollment, but a large shift toward enrollment at four-year institutions. The attendance effects in many of these studies highlight the importance of considering the affected populations. On the opposite end of the college-attendance spectrum, programs that reduce the price of two-year community colleges have the potential to increase college attendance but may also shift students away from attending four-year institutions (Denning 2017; Gurantz 2020).

Reduced tuition for in-state students represents one of the largest strategies governments use to make college affordable. Theoretically, tuition effects should be similar in magnitude to grants at the same colleges, as the net price a student faces is a linear function of grant aid and tuition charged. However, list or "sticker" prices may be especially important due to their salience to students and families, and the difficulty of accurately anticipating college prices net of aid (Dynarski and Scott-Clayton 2006; Grodsky and Jones 2007; Levine 2014; Levine, Ma, and Russell 2020). Several studies have highlighted the distortions created because in-state tuition reduces the price of public universities relative to private and out-of-state institutions and reduces the price of two-year relative to four-year colleges (Long 2004; 2004; Knight and Schiff 2019; Kennan 2015). In-state tuition discounts are large in magnitude and have been shown to have substantial effects on overall college attendance (Abraham and Clark 2006; Kane 2007) while deregulating in-state tuition has been shown to alter the desirability of specific programs of study

(Andrews and Stange 2019). A series of policies passed by states in the early 2000s made non-citizen immigrants eligible for in-state tuition, which were generally found to generate enrollment effects that are modest relative to other tuition and grant studies, but are large relative to the low baseline rates of attendance for these populations (Kaushal 2008; Villarraga-Orjuela and Kerr 2017; Koohi 2017). Despite the generosity of in-state tuition, Chin and Juhn (2011) find no significant effect on enrollment of non-citizens. In contrast, Cortes (2013) exploits the Immigration Reform and Control Act of 1986, which expanded citizenship to a much more established group of immigrants with much higher baseline rates of attendance, and finds very large effects.

The timing and salience of aid are important determinants of its impact on college enrollment. This is perhaps best highlighted by two extremes: early aid interventions that are paired with counseling or recruitment; and tax credits that are difficult to anticipate and are received after the enrollment decision has been made. Targeted recruiting for specific flagship institutions generate greater enrollment at the institution, and some evidence of higher overall enrollment rates (Dynarski et al. 2018; Andrews, Imberman, and Lovenheim 2020). Carruthers and Fox (2016) find evidence that the counseling component, rather than aid, is the primary driver of increased enrollment at community colleges. While these studies do not isolate the effect of college prices, they highlight the potentially crucial role of making college prices salient and the interaction of grants and counseling. The effects of these highly salient counseling-based initiatives stand in contrast to evidence from federal tax credits and deductions. While Turner (2011) finds large enrollment effects, other studies find little or no evidence of increased enrollment in response to tax benefits (Long 2004; Bulman and Hoxby 2015; Hoxby and Bulman 2016). The timing of the realization and receipt of tax benefits represent potentially fundamental flaws in program design, as students and their families are unlikely to accurately anticipate their eligibility at the time enrollment decisions are made and must pay tuition many months before receiving their tax refunds (indicating that tax benefits cannot eliminate short-run binding constraints).[14]

In contrast to the extensive literature on college price effects, there is very little research on the role of loans, despite their importance for funding postsecondary education. There is some evidence that students respond similarly to loans as they do to grants despite the fact they potentially operate through different mechanisms (Avery and Hoxby 2004; Waddell and Singell 2011; Darolia 2013; Sun and Yannelis 2016; Wiederspan 2016). However, this important area of college financing would benefit from substantially more research, especially given the complex roles of federal loans, private sector loans, the dynamics of parental support in credit markets, and interest in the effects of debt on students in the long-run.

The evidence suggests that, in general, large shocks to household resources are necessary to induce meaningful changes in college enrollment, and that a relatively modest fraction of households face binding constraints at the high school-to-college transition. However, there is stronger evidence that altering the price of college can alter student decisions, especially on the intensive margin of which institution to attend. When making comparisons across studies, it is important to note that the household resources literature is generally based on the population of affected children (regardless of their propensity to attend college), while price effects studies often focus on college-ready populations. For example, it is common for analyses to restrict attention to students who have: graduated from high school, filed a FAFSA, taken a college entrance exam, applied to college, applied for a scholarship, or attained a high GPA or test score. Within the price effects literature, certain forms of aid (such as federal grants) can be used at a wide range of institutions, while others are highly restricted and only apply to specific institutions (e.g., within-state, at public colleges or universities, or at two-year or four-year colleges). The literature reveals that these restrictions have important implications for whether enrollment effects are observed on the extensive or intensive margins.

[14] See Dynarski, Scott-Clayton, and Wiederspan (2013) and Dynarski and Scott-Clayton (2013) for discussions of the complexity of tax-based aid and potential methods for simplifying their implementation.

6. College Admissions

Students may be prevented from making an optimal unconstrained college investment because of a limited supply of college seats and complex admissions systems. While these issues tend not to impact two-year public colleges, which have largely open admissions systems, limited funding often prevents four-year state colleges from expanding capacity and selective private institutions strategically limit enrollment.[15] To allocate limited seats to students, selective colleges implement admissions systems that require entrance exams, application deadlines and fees, and recommendation letters. Competitive admissions processes impose financial and time costs that may alter the optimal investment decision.

The limited supply of college seats at selective institutions creates competition between students. This competition can exacerbate enrollment gaps by SES and race because students from higher-income households often have stronger applications resulting from greater access to test prep materials and courses, more access to college counselors, and from having attended higher quality high schools. As detailed by Chetty et al. (2020), there is a tremendous amount of selection of children with high-income parents into the highest return colleges. Affirmative action policies attempt to counteract some of the negative effects of the limited supply of college seats and the competitive nature of admissions for minority students. While this section documents what the literature has revealed about the role of college supply and admissions systems, there is still a great deal that is unknown. An increasing number of institutions are moving away from entrance exams, and relatively little is known about the potential benefits of increasing overall capacity in selective public and private institutions.

College supply and admissions systems

Studies of the impact of college supply on enrollment outcomes have largely focused on college capacity relative to cohort size, public sector funding, and geographic proximity. Exploiting variation in cohort size, Bound and Turner (2007) find that limited capacity at selective public institutions pushes students towards lower quality options on the intensive margin, while Fu (2014) argues that capacity constraints have little impact on non-attendance overall for low-income students. Focusing on public postsecondary funding, Deming and Walters (2017) and Bound et al. (2019) find limited effects of funding on first-year attendance, but significant positive effects on total enrollment (e.g., due to greater retention). There is also evidence in the literature that the relevant supply of colleges depends on geographic proximity, with effects on the extensive and intensive margins (Card 2001; Alm and Winters 2009; Griffith and Rothstein 2009). In the two-year college sector, research indicates that greater community college funding increases enrollment and draws students away from for-profit institutions (Cellini 2009; Goodman and Volz 2020). That is, the literature finds an important role for public sector capacity and funding primarily on the intensive margins of college quality and persistence, rather than initial college enrollment.

In the presence of limited capacity, especially at selective institutions, the U.S. market has a decentralized system of college entrance exams (SAT and ACT) and applications to help allocate seats in colleges. Over time, the process has become increasingly selective and characterized by greater levels of exam prep and larger numbers of applications (Bound, Hershbein, and Long 2009; Klasik 2012). Increased access to entrance exams, through proximity to testing centers and district and state policies that make the exam free have been shown to induce some college-ready students to attend college (Bulman 2015; Hurwitz et al. 2015; Goodman 2016; Hyman 2017a). These effects appear to be driven primarily by ensuring that a key step in the application process has been made in a timely fashion, as there is only modest evidence that performance on the exams, and the college-readiness it reveals, causes students to update college preferences or to attend at higher rates (Foote, Schulkind, and Shapiro 2015; Bond et al. 2018). These studies suggest that entrance exams pose a barrier to less-informed students, and there is further evidence that taking multiple entrance exams creates an additional advantage for students from higher-income

[15] Howell and Pender (2016) argue that under-matched low-income students would benefit from attending better colleges, and that college and universities could enroll these additional students with no loss of selectivity or performance.

households (Thomas 2004; Goodman, Gurantz, and Smith 2020). With respect to gender, there is evidence across a number of countries that women tend to underperform on high-stakes entrance exams relative to other measures of academic aptitude and college-readiness (Jurajda and Münich 2011; Pekkarinen 2015; Azmat, Calsamiglia, and Iriberri 2016).[16] However, female student scores (and subsequent college enrollment) increased more in response to performance incentives in Israel (Angrist and Lavy 2009). Looking beyond entrance exams, fees and other requirements may deter college applications and thus subsequent attendance (Smith, Hurwitz, and Howell 2015; Pallais 2015).

The literature has also found that decentralized, selective admissions systems create perverse incentives for colleges and universities that result in inefficient outcomes (Chen and Kao 2014; Che and Koh 2016).[17] In addition, there is evidence that colleges and universities may not offer admissions in a way that optimizes student outcomes. For example, Bettinger, Evans, and Pope (2013) and Bulman (2017) find evidence that admissions based on aggregate, rather than disaggregated, ACT scores and GPAs do not result in enrollment of students with the highest likelihood of success. Further, despite females being overrepresented in colleges, there is no evidence of male preference in admissions and some evidence of female preference among college admissions counselors (Baum and Goodstein 2005; Hanson 2017). Given that the U.S. admissions system based on college entrance exams and decentralized applications seems to perpetuate inequality by SES, further research into the impact of SAT-optional admissions, common applications, and more centralized systems seems worthwhile (Conlin and Dickert-Conlin 2017; Knight and Schiff 2019).[18]

An extensive literature has documented the potential of two-year institutions as an alternative pathway to four-year colleges. These studies highlight the competing effects of "democratization," increasing overall college enrollment, and "diversion", which may draw students away from attending four-year institutions initially. There is clear evidence that, all else equal, starting at a two-year college rather than a four-year college reduces overall educational attainment and the probability of attaining a four-year degree (Doyle 2009; Reynolds 2012; Goodman, Hurwitz, and Smith 2017). However, this does not imply that, overall, community colleges reduce educational attainment or four-year college enrollment (Leigh and Gill 2003; Gonzalez and Hilmer 2006).[19] Kurlaender, Carrell, and Jackson (2016) and Carrell and Kurlaender (2016) document significant heterogeneity across community colleges in the extent to which students successfully transfer to four-year universities, while Boatman and Soliz (2018) find evidence that transfer credit agreements promote the transition between two- and four-year institutions.

Affirmative action

Some of the most controversial policies in higher education involve actions which "affirmatively" favor students of particular demographic backgrounds, such as race or SES. Affirmative action policies are explicit in their intention to promote college attendance within the target group, but the limited supply of college seats implies that these policies may negatively impact the non-targeted groups. The literature has leveraged both bans on race-based admission policies (including those in California, Texas, Florida, and Washington) and newly implemented policies (such as Brazil's affirmative action for public school students and Blacks and India's for scheduled castes and tribes). Studies largely focus on four outcomes of interest:

1) the overall impact of AA on the admissions and enrollment rates of targeted students;

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[16] Likewise, Saygin (2016) finds evidence that women in Turkey apply less aggressively to selective colleges and majors.

[17] However, having open admissions has also been shown to generate inefficient outcomes relative to moderate selectivity (Declercq and Verboven 2018).

[18] It is important to note that these policies will not necessarily increase access for lower-income students. For example, increasing the geographic mobility of students through centralized application systems could cause students from higher-income households to more systematically occupy seats at selective institutions (Mello 2019).

[19] Mountjoy (2019) finds evidence that students who would have attended four-year colleges experienced reduced future earnings, while those who are induced to attend two-year college instead of no college experience significant earnings gains.

2) the deterrent or chilling effects of AA bans on the behavior of targeted students;
3) inefficiencies created when colleges implement workarounds to AA bans; and
4) the impact of AA on the match quality of targeted groups to institutions and majors.

First, the empirical and theoretical literature uniformly concludes that AA has a significant positive impact on the college attendance patterns of targeted students and that these effects are primarily concentrated at selective institutions (e.g., Long 2004; Arcidiacono 2005; Howell 2010; Hinrichs 2012; Bodoh-Creed and Hickman 2018). In particular, the empirical literature has typically studied bans on AA in U.S. states and finds that bans shift minority enrollment away from the most selective public institutions while having little negative effect on overall enrollment rates for targeted groups.[20]

Affirmative action in India and Brazil have also received a great deal of research interest. Caste- and tribe-based AA at Indian engineering programs generates significant changes in student representation (Bertrand, Hanna, and Mullainathan 2010; Bagde, Epple, and Taylor 2016; Frisancho and Krishna 2016). In Brazil, AA has been extended alternatively to students attending public high schools or students who are Black. As in the U.S., the effects of AA in Brazil result in effects on enrollment that are almost entirely concentrated at selective institutions and programs (Francis and Tannuri-Pianto 2012; Estevan, Gall, and Morin 2019; Vieira and Arends-Kuenning 2019). In general, these studies report little evidence that students admitted through AA underperform or are otherwise hurt by the academic mismatch.[21]

In contrast to the consensus about enrollment effects, there is mixed evidence regarding the potential deterrent or chilling effects of banning affirmative action on the choices of minority students. Card and Krueger (2005) find little evidence of changes in minority application choices and Antonovics and Sander (2013) find no reduction in minority yields (conditional on admission), while Dickson (2006) finds reduced applications in TX among Blacks and Hispanics and Antonovics and Backes (2013) document changes in application behavior at elite public institutions (UC Berkeley and UCLA).[22] Cotton, Hickman, and Price (2014) present experimental evidence that AA can increase human capital investment before the college transition, and that bans may result in a "discouragement effect." Likewise, the literature is decidedly mixed with respect to the net impact on minority graduation rates and the likelihood of pursuing high-return majors due to the competing effects of attending higher quality institutions and potential mismatch (Cortes 2010; Arcidiacono et al. 2014; Hinrichs 2014; Hill 2017).

An area of consensus in the literature is that policies which attempt to achieve affirmative action without explicitly considering student race lead to potential inefficiencies (e.g., admitting weaker cohorts to achieve a given level of diversity). For example, there is evidence that race-neutral workarounds to AA bans, rather than separate applicant pools for minority and non-minority candidates, results in lower quality cohorts (Chan and Eyster 2003; Fu 2006; Long 2015). Further, efforts to achieve similar levels of diversity by shifting weight away from academic qualifications such as high school GPAs and SAT scores and towards proxies for SES do not achieve the same levels of racial diversity as affirmative action (Antonovics and Backes 2014; Reardon et al. 2018).[23]

In response to affirmative action bans, several states have adopted "X percent plans" that guarantee admission to public universities for students in the top "x percent" of their high school based on GPA ranking. The hope is that guaranteeing admission to a fixed percentage of students at high schools serving

[20] Arcidiacono and Lovenheim (2016) provide a detailed examination of the literature on affirmative action, focusing on whether the positive college "quality effect" is strong enough to offset any negative "match effect." More generally, Dillon and Smith (2017) posit that the complementarity of ability and college quality may undo some of the benefit of inducing lower-ability students to attend higher-quality colleges.

[21] Likewise, Alon and Malamud (2014) find that class-based AA at elite schools in Israel promotes enrollment without negative effects on academic performance, even in the most selective majors.

[22] Chade, Lewis, and Smith (2014) model the application process and argue that under AA, minorities apply more aggressively, suggesting the AA bans should change application behavior.

[23] Similarly, Grau (2018) finds that, in Chile, shifting weight in the admissions process away from test scores and toward high school GPA does not achieve the same level of diversity as considering SES explicitly.

lower-income and minority students will increase the diversity of admitted students. Research on these plans has largely focused on Texas, where the top 10% of graduates are guaranteed admission to any Texas public university. Evidence indicates that this plan has increased applications and enrollment of low-income and minority students at the flagship institutions (Niu and Tienda 2010; Cortes and Lincove 2016; 2019; Black, Cortes, and Lincove 2020; Black, Denning, and Rothstein 2020). However, there is evidence that many minority students eligible for guaranteed enrollment still do not apply, and that the net effect of the policy is not strong enough to offset the elimination of affirmative action (Fletcher and Mayer 2014; Black, Cortes, and Lincove 2015).[24] There is also evidence that, because female students tend to have relatively higher high school GPAs than entrance exam scores, the X percent plans increased the enrollment of women.

7. College Counseling and Information Interventions

Students face costs associated with the college application, admission, and enrollment process. Direct costs payable to colleges are often small (e.g. application fees) and waived for low-income students, but the costs to acquire accurate and timely information about the set of available colleges, financial aid, and the application and enrollment process may be more substantial. While these costs may be large enough from a student's myopic point of view to deter an otherwise beneficial educational investment, it is unlikely they are larger than the return to a college education. This, along with the fact that costs are likely higher for historically underserved students, has prompted researchers and policymakers to develop a variety of counseling and information interventions during the end of high school which hold the promise of increasing college enrollment among marginal students.

Interventions studied in the literature involve the use of counselors (traditional high school employees, third-party professionals, or near-peer students) or information disseminated via in-person contact, phone calls, emails, letters, or text messages. These interventions are appealing because they are often inexpensive and simple to implement, but may be limited in their effectiveness because they do not alter the more fundamental factors shaping enrollment, such as student ability and the cost of college. For example, Avery and Kane (2004) argue that attending college is determined primarily by academic preparation and interest, that a modest number of students are deterred by the complexity of the admissions process and transitions, and that there is little evidence that low-income students underestimate their admissions chances or returns relative to other students, all of which limits the potential of information interventions.

In-person counseling and assistance

Several studies have shown that access to professional counseling programs (e.g., Upward Bound, College Possible, or Bottom Line) shift enrollment towards more selective four-year colleges and those colleges which are actively promoted by counselors (Avery 2010; 2013; Castleman and Goodman 2018; Barr and Castleman 2018). These programs are often intensive, involving ten or more hours of admissions and aid counseling (and in some cases entrance exam preparation). Pathways to Education in Canada represents one of the most intensive, multi-faceted interventions targeting the long-run college outcomes of low-income students, providing professional guidance multiple times per month throughout high school, weekly tutoring, group mentoring, a scholarship, and college transition assistance. Oreopoulos, Brown, and Lavecchia (2017) document remarkably large effects of the Pathways program on college enrollment, revealing the potential of an intervention that replicates several of the roles that might otherwise be filled by a college-educated parent. Studying a similar multi-faceted program in the U.S., Rodríguez-Planas (2012) also documents positive impacts on enrollment. The importance of an intensive treatment is also evident in interventions that target information about financial aid. For example, Bettinger et al. (2012) find

[24] Further, Black, Cortes, and Lincove (2016) argue that adding college entrance exams to rank-based admissions would further reduce enrollment of low-income and minority students, but with minimal improvement in average college outcomes for matriculants.

little evidence that providing information about aid and college costs is effective, but find large effects when there is direct assistance with completing the FAFSA.

As an alternative to professional counselors, several studies have examined the impact of "near-peer" advisors, often current undergraduates or college-going high-school seniors, who may seem more accessible and relatable to high school students (as well as being less costly to employ). Cunha, Miller, and Weisburst (2018) and Bettinger and Evans (2019) study two separate near-peer advising programs in Texas high schools and find they induced modest increases in college enrollment among populations with the lowest historical college-going rates. Carrell and Sacerdote (2017) find no effect of light-touch information and financial incentive interventions, but a very large effect of intensive near-peer counseling in conjunction with paying application fees and providing a financial incentive to apply. The different impacts found by Carrell and Sacerdote (2017) likely stems from differences in the intensity and multifaceted nature of the treatment: applying to and enrolling in college involves multiple steps, and it may be crucial to initiate and provide substantial assistance at each stage of the process in order to generate significant changes in student outcomes.

Finally, traditional high school counselors are uniquely placed to provide guidance on the college-going process; however, they are often overburdened with other duties, and the ratio of counselors to students is typically quite high. Hurwitz and Howell (2014) exploit variation in the distribution of students per counselor introduced by state minimum ratios (between 250-500 students per counselor) and find sizable impacts of counselors on college-going.

Information interventions

Evidence from mail-based interventions is consistent with the importance of customized, multi-faceted treatments. Hoxby and Turner (2015) found that providing high-ability, low-income students with application fee waivers and customized mailings about the net prices of college options and historic graduation rates induced them to attend higher quality institutions. In contrast, mailing students a letter encouraging them to apply and referencing a website with more information resulted in little effect on either the intensive or extensive margins (Hyman 2020). In a non-traditional context, Barr and Turner (2018) study unemployment insurance recipients during the Great Recession and find large enrollment effects of a mailed letter containing information about the costs and benefits of post-secondary education, information about Pell grants, and contact information for support from state agencies.

There has been increasing interest in the use of virtual college advising, owing to its low relative cost and potential to scale. However, studies of several recent interventions have found little evidence of significant benefits. Phillips and Reber (2019) found that a virtual advising program that provided access to a comprehensive website, access to a personal advisor, and frequent emails and text messages increased the number of applications sent per student, but did not impact enrollment; the authors conclude that a more "hands-on" and intensive - and therefore more expensive - intervention is necessary. Likewise, Avery et al. (2020), studying national and district-level text message interventions, and Gurantz et al. (2020), studying a multi-faceted virtual advising program, find no impacts on college enrollment rates. Oreopoulos and Ford (2019) find somewhat more promising evidence from a hybrid virtual/in-person intervention in which students completed admissions and aid applications during school hours using an online platform, resulting in significant increases in two-year, but not four-year enrollment.

Bird et al. (2019) find no impact of text reminders to fill out the FAFSA in a national experiment, despite evidence of significant impacts of four-year enrollment for a smaller, local version of the experiment (Page, Castleman, and Meyer 2020). Narayan (2019) finds that simplifying the FAFSA form (via the IRS Data Retrieval Tool) had no impact on college enrollment. Likewise, Bergman, Denning, and Manoli (2019) document that there was no impact of emails and letters about post-secondary tax benefits on college outcomes. In sum, the evidence suggests that "light touch" interventions about the FAFSA and college aid tend to have modest or no effect on college outcomes, while direct assistance filling out forms is a more

promising approach.[25] Providing early information may also be important, as in the Dinkelman and Martínez (2014) study, which finds that providing information about college aid to Chilean students while still in high school affects schooling investment.

A series of papers have documented the success of interventions intended to reduce the incidence of "summer melt," whereby admitted and accepted students do not matriculate the following fall (Castleman, Page, and Schooley 2014; Castleman, Owen, and Page 2015; Castleman and Page 2015; 2017). The interventions employed various methods, ranging from text messages reminding students to complete college-going tasks (e.g., filing the FAFSA, registering for orientation) to outreach by trained counselors. The consistently positive effects of these studies may stem in part from their focus on lower-income students who are most likely to struggle with the college transition, but who signaled their intent to enroll.

Colleges can also directly recruit students, which both provides information and signals that the school is interested in the student. The evidence, however, is mixed, with some papers finding that direct recruitment by colleges increases application rates and enrollment (Andrews, Ranchhod, and Sathy 2010; Gurantz, Hurwitz, and Smith 2017) and others finding no impact (Miller and Skimmyhorn 2018; Rizzica 2020). There is also evidence that colleges and universities tend to recruit more heavily in higher-income communities, potentially perpetuating inequality (Hill and Winston 2010). A small literature documents the role of technology for shaping students' (and parents') ability to navigate the process, revealing that better internet access and the availability of specific internet sites can affect where students apply (Dettling, Goodman, and Smith 2018; Mulhern 2020).

In summary, the literature reveals a wide range of estimates of the effects of counseling on college attendance, and we see three salient patterns emerging from the evidence. First, the intensity and quality of the guidance are important. Carrell and Sacerdote (2017) conclude that counseling acts as a substitute for "skilled" parental guidance and encouragement, which is often frequent, customized, and of high quality. As such, "light touch" interventions are unlikely to act as an adequate substitute for parental support (although they may be nonetheless efficient if the cost is low enough). Second, as seen with financial interventions, it is generally much easier to impact students on the intensive margin (which college to attend) than on the extensive margin (whether or not to attend college). Finally, the details of the intervention matter. Seemingly similar interventions generate very different results, suggesting that factors such as the target population, timing, customization, and the specific nature of the information may be crucial for generating positive enrollment effects.

8. Conclusion

Attending college is one of the most important investments that an individual can make. Unfortunately, it is often an extremely complex decision, and one of the first major investment decisions in young adults' lives. Policymakers and researchers remain concerned that students are systematically underinvesting in college, and that there are large differences in college enrollment rates by socioeconomic status.

In this chapter, we examined the rich and growing literatures studying the underlying factors that influence the college-going decision. An understanding of these factors is crucial for developing specific policies and interventions aimed at increasing college enrollment and reducing inequality.

Across the literature, the fundamental role of parents is evident. Parents shape early investments in children's academic ability and influence children's preferences for a college education. At the time of the college transition, parents can provide financial resources as well as information and assistance in the college-going process. The importance of these early and late-stage investments, in conjunction with wide differences across parents in terms of income, wealth, and experience and knowledge about higher education, can translate into substantial enrollment gaps by SES.

[25] Also, Booij, Leuven, and Oosterbeek (2012) find no effect of information about aid on loan take-up in the Netherlands, Herber (2018) finds evidence that information increases applications for scholarships in Germany for children whose parents did not attend college, and Loyalka et al. (2013) find that information about college costs and aid increases college attendance in low-income regions of China.

Fortunately, there is growing evidence that well-designed public interventions can mitigate the lack of parental involvement and support in both early childhood and at the time of the college-going decision. It is also clear that as children from lower-income households often face multiple barriers to college attendance, and so altering one factor may not be sufficient to generate sizable enrollment gains. Instead, intensive, multifaceted policies and interventions that eliminate real barriers are most likely to replicate parental inputs.

Despite the advances made in our understanding of the determinants of college-going over the past decade, numerous areas are still ripe for further research. For example, more empirical evidence is needed on the impact of government and private loans on student decision making; a better understanding of heterogeneity in parent-child dynamics for financing education could help improve aid policies; more evidence on the costs and benefits of early childhood investments could alter the public debate about long-term interventions; and a better understanding of the role that college entrance exams and selective admissions systems play in propagating inequality can inform optimal laws and policies.

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