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IMPROVING COLLEGE ACCESS IN THE UNITED STATES:
BARRIERS AND POLICY RESPONSES

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Improving College Access in the United States: Barriers and Policy Responses
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ABSTRACT

Socioeconomic gaps in college enrollment and attainment have widened over time, despite increasing returns to postsecondary education and significant policy efforts to improve access. We describe the barriers that students face during the transition to college and review the evidence on potential policy solutions. We focus primarily on research that examines causal relationships using experimental or quasi-experimental methods, though we draw upon descriptive evidence to provide context. Our review is distinctive in three respects. First, in addition to the literature on financial aid, we examine the evidence on informational and behavioral interventions, academic programs, and affirmative action policies intended to improve college access. Second, we incorporate a wealth of recent research not included in prior reviews. Finally, we conceptualize college access broadly, as including not just whether but also where students attend and whether they have access to college-level courses. We conclude with a discussion of implications for policy and research.

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1. Introduction

The United States has long ranked as the world's most educated nation, leading the charge for mass elementary education in the nineteenth century and mass secondary education in the early twentieth century (Goldin & Katz, 2008). But the transition to mass postsecondary education that began after World War II has stagnated in the twenty-first century. Between 1950 and 2000, the proportion of 25-34 year olds who had at least some college nearly quadrupled, from 16 to 57 percent, but improvements have slowed and this figure has grown more modestly since then to 63 percent in 2012 (Baum, Ma, & Payea, 2013).² This slowdown is particularly puzzling given that the wage premium for a bachelor's degree is near a historically high level (Goldin & Katz, 2008). Currently, those with a bachelor's degree earn over \$800,000 more in lifetime income, on average, than their counterparts with only high school diplomas, even after subtracting out loans taken on to finance higher education (Daly & Bengali, 2014).

Perhaps even more troubling than the overall slowdown in attainment growth, gaps in college attainment by family income have actually increased over time (Bailey & Dynarski, 2011; Belley & Lochner, 2007). These gaps do not go away after controlling for other explanatory factors such as academic background: among high school students scoring in the top quartile on a standardized test, only 41 percent of those from the poorest families earn a bachelor's degree, compared to 74 percent of students from high-income families (Kena et al, 2015).

Standard theories of human capital acquisition (e.g., Becker, 1964) suggest that the equilibrium level of college enrollment reflects individuals' rational assessments that weigh the

² Similar patterns can be seen by looking at immediate college enrollment rates of recent high school graduates, which rose from about 50 percent in the late 1970s to 67 percent in 1997, but has remained stagnant since then (NCES Digest of Education Statistics 2014, Table 302.30. Retrieved from https://nces.ed.gov/programs/digest/d14/tables/dt14_302.20.asp).

expected costs of undertaking higher education against the expected benefits. Expected costs include tuition, fees, and other direct costs, the opportunity cost of foregone employment while enrolled, and the psychological cost of effort; expected benefits include both monetary and non-monetary returns to education. In a perfect market, variation in enrollment rates across geographies, socioeconomic groups, or over time simply reflect the different costs and benefits these groups face, and do not – on their own – provide justification for government intervention. In a perfect market, whether the cost of college is “high” or “low” is of little concern; subsidizing tuition would only inefficiently induce enrollments among individuals whose expected benefits would not justify the costs.

Legitimate concerns about imperfections in the market for college, however, arise from the two stylized facts with which we open this review: increases in college enrollments have not kept pace with increases in the returns to college, and, socioeconomic gaps are widening, even after accounting for academic preparation.

What types of market imperfections might be present to justify a policy response? One justification is the presence of social externalities: college enrollment may generate social benefits that exceed the private returns. For example, postsecondary education has been linked to higher levels of volunteering and voting (Dee, 2004), better birth outcomes and higher levels of school readiness in the next generation (Currie & Moretti, 2003), lower levels of criminal behavior (Lochner & Moretti, 2004), and higher levels of economic growth (Aghion, Boustan, Hoxby, & Vandenbussche, 2009). Thus, even if the market were otherwise well-functioning, policymakers may seek to encourage a higher level of academic achievement and attainment than individuals would choose on their own.

A second justification for policy intervention is the presence of credit constraints. While the benefits of college occur in the future, the costs occur in the present (and may extend decades into the future). If individuals cannot safely and sufficiently borrow against their future earnings to finance present costs, some individuals who should go to college (in the sense that their lifetime benefits exceed lifetime costs) will not do so. While upper-income students may be able to rely upon parental savings, lower-income students may face significant financial barriers to attendance.

Third, young people—particularly those from lower-income, immigrant, and/or non-college educated families—may lack good information about the costs and benefits of enrollment, as well as about the process of preparing for, applying to, and selecting a college. Informational failures are arguably increasingly important as program and financing options have multiplied over time.

Finally, recent work in psychology and behavioral economics demonstrates how human decision-making often departs from standard models of economic behavior, particularly when faced with complex options, and particularly when the decision-makers are young and inexperienced (Thaler & Mullainathan, 2008; Casey, Jones, & Somerville, 2011). Yet all along the pathway from college consideration to matriculation, students face complicated choices and may lack sufficient support and structure to navigate burdensome processes and institutional bureaucracy.

These market imperfections and behavioral realities motivate policy efforts to improve college access. Following Long and Riley (2007), barriers to access can be grouped into three broad categories: financial constraints, informational/behavioral constraints, and academic constraints. Of course, these constraints are not mutually exclusive, and for students residing in

areas of concentrated disadvantage, these challenges may be particularly acute. Students of color may face additional, distinct barriers, including both implicit and explicit discrimination (Bertrand, Chugh, & Mullainathan, 2005).

In this paper, we review the economic literature on policies to improve college access. We emphasize research that identifies and characterizes causal relationships using experimental or quasi-experimental methods, though we also draw on descriptive evidence to provide context. Our review differs from prior reviews on college access in three respects. First, while prior reviews have focused extensively on the impact of financial aid (see, e.g., Deming & Dynarski, 2009; Dynarski & Scott-Clayton, 2013), we go beyond this body of research to incorporate evidence on informational and behavioral interventions, academic programs, and affirmative action policies. Since these interventions overlap and interact, there is particular value in providing a comprehensive review. Second, we incorporate a wealth of recent research not included in prior reviews. The past few years have been particularly active in the economics of higher education, given the new accessibility of administrative datasets and a trend towards increasing experimentation both by policymakers and researchers. Finally, we conceptualize college access broadly, examining constraints on students' decisions not just of whether but also where to attend, as well as constraints on students' access to college-credit-bearing courses. This broad conceptualization reflects the growing body of evidence demonstrating the influence of institutional factors on both completion rates and later outcomes (Bowen, Chingos & McPherson, 2009; Bound, Lovenheim & Turner, 2010; Goodman, Hurwitz & Smith, 2015; Hoekstra, 2009; Howell & Pender, 2015 [this issue]).

College access and college completion, of course, are not the same thing. Only about half of all degree-seeking, first-time college entrants complete any degree within six years.³ And among recent cohorts, those who do complete are taking longer to do so (Bound, Lovenheim & Turner, 2010). Thus, attention increasingly is turning to college completion rather than college access alone. Still, improving college access remains among the most promising strategies for raising college degree attainment overall, particularly if we conceptualize access not as getting students in the door of any college, but instead as getting them off to a good start at an institution that is well aligned with their interests and capabilities. The challenges that students face during the transition to college may influence not only whether they attend at all, but also the timing of enrollment, choice of institution, method of finance, and the pace of progress towards a degree. These many factors ultimately can influence students' likelihood of graduation.

We structure our review around four types of barriers that students face in the transition to college and evidence on efforts to combat those barriers. Section 2 examines financial aid policy. In Section 3, we discuss the complexity of the college-going process itself and efforts to improve students' navigation of information and behavioral impediments. In Section 4, we consider policies responses to the academic barriers that students face in the transition to postsecondary education, and in Section 5, we highlight research on affirmative action bans and the "top X percent" admissions plans developed in response. Finally, Section 6 concludes by discussing implications for future policy and research.

2. College costs and financial aid

In the U.S., state and local appropriations have traditionally helped to keep tuition prices well below the full cost of providing higher education. But states are devoting a smaller

³ Authors' computations using NCES Quick Stats, BPS:2009 Survey data restricted by degree goals in first year.

proportion of their budgets to higher education in recent years, even as enrollments have increased (Mettler, 2014). As a result, public institutions that produce the majority of bachelor's degree recipients are increasingly reliant on tuition as a revenue source: at public master's and bachelor's degree granting institutions, the proportion of revenue coming from net tuition and fees increased from about 30 percent in 2000 to nearly half in 2012 (Baum, Elliott & Ma, 2014).

The result is that families increasingly face financial barriers to college access. The average net cost of attendance (including not just tuition and fees, but also costs of books, transportation, food and housing, and subtracting out grant aid) for a full-time student in 2014-15 was \$5,960 at a community college, \$12,830 at a public four-year college, and \$23,550 at a private four year institution. As family incomes have remained stagnant over the past decade and have declined in real terms at the bottom of the income distribution, these costs represent an increasing fraction of family resources (Baum & Ma, 2014). For a student at the 20th percentile of family income, attending even a community college would consume more than 20 percent of the family's income, even after accounting for financial aid. Attending a public four-year institution would consume 45 percent of the family budget on average.⁴ Moreover, even where affordable options exist for families, they are not necessarily "just as good" as institutions that are less affordable. Per-student resources have become increasingly stratified across institution type, with declines in the two-year and non-top-50 public sector. Declining resources in these sectors is associated with declining rates of degree completion (Bound, Lovenheim, & Turner, 2010). Indeed, Howell and Pender (2015 [this issue]) highlight the tradeoff between cost and institutional quality faced by most students.

⁴ We calculate these percentages using the net tuition, fees, room and board estimates provided by the College Board (2014a), on pp. 22-24, as well as family income statistics from the same report on page 33.

This is not to say that students and families are on their own when it comes to paying for college. In response to concerns about rising costs, states and institutions increasingly follow a high-tuition, high-aid pricing strategy in which rapidly rising sticker prices are ameliorated, for some students, by increases in the availability of financial aid. Seven out of 10 undergraduates now receive some form of financial aid; in 2014-15, full-time undergraduates received an average of \$8,080 each in grants, \$1,260 in tax credits and work-study assistance, and \$4,840 in federal loans (Baum, Elliott & Ma, 2014).⁵

While substantial amounts of financial aid are available, determining the net price a student is going to face requires a more individualized answer than ever before. Within a given institution, net tuition and fees can vary widely across students, even among those with similar socioeconomic profiles (Anthony, Page & Seldin, 2015). Moreover, accessing available financial aid is typically not automatic: students (and often their parents) need to be aware of what programs exist and must submit a Free Application for Federal Student Aid (FAFSA), the complexity of which is well documented (Dynarski & Scott-Clayton 2006; Dynarski, Scott-Clayton & Wiederspan, 2013; Bill & Melinda Gates Foundation, 2015). Misperceptions about college costs are widespread and are most prevalent among students from the lowest-income backgrounds, likely contributing to persistent gaps in postsecondary attainment as well as undermatch by socioeconomic status (ACSFA, 2005; Grodsky & Jones, 2007; Horn, Chen, & Chapman 2003; Hoxby & Avery, 2013; Hoxby & Turner, 2013; Radford, 2013).

As a result of the challenges present in the financial aid process, many students fail to access aid for which they would qualify. While FAFSA application rates have risen over time—from 50 percent of undergraduates in 1999-2000 to 70 percent in 2011-12—substantial numbers of eligible students still fail to apply. Estimates based on data from the 2011-12 National

⁵ Averages are calculated over all students, not just those receiving aid.

Postsecondary Student Aid Study (NPSAS) indicates that of the 30 percent of students who failed to file a FAFSA, one third would have qualified for a Pell Grant.⁶ In addition, many FAFSA filers apply after important deadlines (King, 2004), in turn decreasing the likelihood of receiving state and institutional aid for which they would otherwise be eligible.

The efficiency and equity of the American high-tuition, high-aid model of college financing rests heavily on the effectiveness of financial aid programs. Are these programs successful at reaching their intended targets—students on the margin of college access—and influencing their behavior? Or are they windfalls to individuals who would have enrolled regardless? In the remainder of this section, we review the evidence on the causal impacts of grants, loans, and other types of aid on college enrollment and attainment. We discuss interventions related to reducing the complexity of the aid application and other steps in the college transition separately in Section 3.

2.1. Traditional aid (need-based grants and subsidized tuition)

Standard models of human capital investment indicate that students will continue on to higher education if the benefits of doing so outweigh the costs (e.g., Becker, 1964). Efforts that increase grant-based financial aid directly to students may act through decreasing the cost of attendance such that students on the margin are compelled to matriculate. As predicted by economic theory, more than thirty years of empirical research has established that lowering the cost of college can increase college enrollments. In 1988, Leslie and Brinkman reviewed several dozen non-experimental studies and concluded that a \$1,000 decrease in net price was associated with a 3- to 5-percentage-point increase in college attendance. However, it is difficult to infer causal effects based on non-experimental analyses of financial aid policy, because aid recipients

⁶ Authors' calculations using computations from NCES Quick Stats online tool, NPSAS:2012 undergraduate sample.

are often systematically selected and/or self-selected based on characteristics (e.g., need, merit, motivation to enroll) that may have independent effects on outcomes of interest.

While these early studies may have suffered from selection bias, subsequent research using more rigorous empirical methods applied to data from several different time points and several different contexts has found positive effects of a similar magnitude, increasing confidence that these effects are truly causal and not just reflecting correlations. Several studies have taken advantage of discrete policy changes to compare similar students who receive dramatically different amounts of aid, including Dynarski's (2003) analysis of the Social Security Survivors Benefit, Abraham and Clark's (2006) and Kane's (2007) study of Washington, D.C.'s Tuition Assistance Grant, and two separate studies of the mid-century G.I. Bills (Bound & Turner, 2002; Stanley, 2003). All of these studies find that enrollment increases when the net price faced by students is exogenously lowered. For more detailed reviews of these studies, see Long (2008), Deming & Dynarski (2009), and Dynarski & Scott-Clayton (2013).

More recent work on traditional financial aid (need-based grants and tuition subsidies) has increasingly focused on college choice, persistence, and eventual degree completion. Castleman and Long (2013) use a regression-discontinuity (RD) design to examine the effects of a need-based program in Florida that has a strict eligibility cutoff, and find significant increases in four-year college enrollment and subsequent bachelor's degree completion. Goldrick-Rab, Harris, Kelchen, and Benson (2012) provide rigorous evidence on the effects of need-based aid on persistence conditional on initial enrollment, through their randomized evaluation of the Wisconsin Scholars Grant (WSG). WSG provided large grants to Pell-eligible first-year students already enrolled at Wisconsin four-year institutions. Perhaps surprisingly, they find only modest effects on credit accumulation and persistence that fade out over time. These results may be due

in part to the fact that students who received the WSG saw other aid reduced; however, providing the scholarship only after students initially enrolled may also have limited the impact of the program.

A set of studies exploits natural geographic variation in community college prices resulting from community college taxing districts in Texas: students who live within a given district face lower prices than similar students living just outside district boundaries (Denning, 2014; Martorell, McCall & McFarlin, 2014; McFarlin, 2007). All three studies confirm that students facing lower community college prices are more likely to enroll in college. Less evidence is available regarding effects on eventual degree receipt: McFarlin (2007) finds a worrisome pattern of students switching from four-year to two-year institutions, but Denning (2014) finds no evidence of such switching, and an overall positive impact on bachelor's degree completion.

The research evidence regarding the impact of the nation's single largest grant program, the federal Pell Grant, has been somewhat more mixed. Hansen (1983) and Kane (1996) find little effect of the introduction of the program overall. But Seftor and Turner (2002) find positive impacts of expansions in eligibility for adult students, and Bettinger (2004) finds some evidence of positive effects of larger Pell grants on persistence for students who are already enrolled. The lack of consistent positive findings for Pell Grants may be due in part to complexity and confusion surrounding the Pell eligibility and application process, which obscure its benefits and dampen its impact among the individuals who need it most (Dynarski & Scott-Clayton, 2006; Bettinger, Long, Oreopoulos & Sanbonmatsu, 2012).

Recent work has also identified some new potential explanations for the mixed evidence on Pell Grants and the WSG. Specifically, the increasingly complex interactions between aid

programs may make it difficult to isolate the effects of any one program. For example, Turner (2014) finds that private institutions reduce institutional aid for students who receive Pell, and Goldrick-Rab and colleagues (2012) find that a \$3,500 WSG award translated into just \$1,500 in total financial aid (including loans). Marx and Turner (2015) find that students who just miss eligibility for Pell actually receive *more* in total aid from all sources on average, because students just ineligible for Pell are much more likely to receive student loans. Scott-Clayton and Park (2015) replicate these findings related to Pell eligibility and also find evidence that some community colleges use state aid to disproportionately assist students who do not qualify for Pell.

2.2. Broad-based merit aid programs

Since 1991, several states have instituted large-scale, merit-based grant programs to defray the costs of higher education among their residents who meet certain merit-defined, but not particularly elite eligibility criteria.⁷ These state merit-based programs represent the most sizeable increase in financial aid spending in the past two decades (College Board, 2012), and they are also amenable to causal analysis—typically relying on difference-in-difference or RD designs—that exploit variation in eligibility across states, cohorts, and test score eligibility thresholds. The related research base indicates that such programs have led to improvements in college readiness metrics; increases in college enrollment and performance; improved rates of degree attainment; and decreases in the loss of talented students to other states by affecting college choice (Bruce & Carruthers, 2014; Carruthers & Ozek, 2013; Cornwall, Mustard, & Sridhar, 2006; Dynarski, 2004, 2008; Pallais, 2009; Scott-Clayton, 2011; Zhang & Ness, 2010).

⁷ These states include Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Nevada, New Mexico, Oklahoma, South Carolina, Tennessee, and West Virginia, although Arkansas and Maryland have since phased out their programs. Dynarski (2004) defined “broad-based” to mean that at least 30 percent of high school seniors would qualify.

One aspect of these programs that has proved both politically appealing and potentially important for influencing behavior has been their simplicity (Dynarski & Scott-Clayton, 2006). Many of these programs fully cover tuition and fees (at least initially) at in-state, public institutions for students meeting a minimum GPA and sometimes ACT/SAT requirement, and require minimal paperwork to claim.

Nevertheless, attention has also been paid to unintended consequences associated with these efforts. For example, while Georgia HOPE improved overall rates of college enrollment in the state, it also led to a widening of college attendance gaps by race and socioeconomic status, given the strength of response among middle-income students (Dynarski, 2000).⁸ In addition, the merit-based Adams Scholarship in Massachusetts resulted in students switching to in-state public institutions away from higher quality alternatives, ultimately reducing students' likelihood of timely degree attainment (Cohodes & Goodman, 2014). Finally, a pair of recent studies using Census data to examine a broader set of merit-aid programs has called into question whether single-state, early estimates of the impact of merit aid may overstate the impacts experienced more generally (Fitzpatrick & Jones, 2012; Sjoquist & Winters, 2012).

A recent experimental evaluation of the Buffet Scholarship in Nebraska provides perhaps the most rigorous evidence on the potential impact of programs providing free in-state college to students on the basis of modest academic achievement (Angrist, Hudson & Pallais, 2014; Angrist, Autor, Hudson, & Pallais, 2015). Buffet Scholars receive up to five years of free tuition and fees, plus a \$500 book credit, if they attend a public in-state institution. The eligibility criteria include a minimum 2.5 high school GPA and maximum expected family contribution

⁸ Other states' programs, however, appear to narrow gaps in enrollment (Dynarski, 2004), perhaps because unlike Georgia HOPE, other states allowed Pell recipients to combine awards, rather than reducing merit aid dollar-for-dollar for students receiving larger Pell awards.

(EFC) to the cost of college corresponding to family incomes between \$80,000-\$100,000.⁹ Applicants are also ranked (against students listing the same target institution) on the basis of high school transcripts, essays, and letters of recommendation. For the study, a group of students who fell in the middle of the rankings were randomly assigned to receive the award or not. The authors find only a small, insignificant effect on initial enrollment (unsurprising given a 97 percent baseline enrollment rate even among the control group) but find substantial shifts from two-year to four-year institutions, and substantial impacts on enrollments in the second year (a 7 percentage point increase overall and 14 percentage point increase in four-year enrollment), with effects largest among lower achieving subgroups.

2.3. Place-based college “promise” programs

In addition to state-based merit programs, several urban settings have followed suit to implement locally-based “promise” programs of their own. In some cases, the only “merit” requirement for eligibility is to graduate from a public high school within a certain area. This place-based approach began in 2005 with the announcement of the Kalamazoo Promise, which offers full in-state college tuition to graduates of the Kalamazoo Public Schools in Michigan who had been enrolled in the district for at least four years. A difference-in-difference analysis comparing ACT score-sending behavior of students at Promise and non-Promise high schools just before and after implementation found that eligible students were more likely to send their scores to more selective in-state institutions (Andrews, DesJardins & Ranchhod, 2010). Results from a separate difference-in-difference analysis (comparing students before and after the program’s announcement, by length of enrollment in the district) suggest the program improved

⁹ The EFC maximum for the program ranged from 10,000 to 15,000. Corresponding family income range was calculated by the authors’ using NCES Quick Stats, NPSAS:2012 data on dependent undergraduates.

high school credit completion, reduced suspensions, and had substantial effects on college enrollment and graduation (Bartik & Lachowska, 2013; Bartik, Hershbein & Lachowska, 2015).

Similarly, in 2008, local business and civic leaders provided funding to establish a free community college program called “Knox Achieves” in Knox County, Tennessee. The program, which was expanded to 22 counties in 2011 and became the model for a statewide “Tennessee Promise” program expected to roll out in 2015, guarantees free community college tuition and fees to high school seniors who sign up, apply for financial aid, and meet with a mentor. Carruthers and Fox (2015) examine the impact of Knox Achieves using both difference-in-difference and propensity score matching and find large impacts on high school graduation and college enrollment, with some shift from the four-year to two-year sector. Interestingly, the program achieves these large effects with relatively little additional financial aid (\$971, on average), since most students already receive significant tuition reductions via existing federal and state programs. This points to the fact that the design and messaging of grant programs, not just the dollar value of aid provided, can be a significant factor in influencing student outcomes.

Since the launch of the Kalamazoo Promise, 31 communities (including locations such as El Dorado, AR and Pittsburgh, PA) have implemented promise programs, although with significant variation in details such as scholarship generosity and eligibility criteria. One recent notable entrant is Chicago’s Star Scholarship, created in 2014, which provides free community college to students with at least a 3.0 high school GPA who test out of remediation. While marketed as a “free college” program, critics have noted that its eligibility requirements make it more akin to merit-based aid given that only about 15 percent of the city’s high school *graduates* would qualify (Fain, 2014). In early 2015, President Obama also announced his own free community college plan, proposing to use federal funds to cover 75 percent of tuition and fees

for community college students in states that commit to cover the remainder.¹⁰ Many details of the proposal remain to be seen, however, making it difficult to extrapolate potential impacts based on the existing body of research evidence.

2.4. Tax credits and deductions

The federal government's tax expenditures on higher-education-related tax credits and deductions were valued at nearly \$19 billion dollars in 2014-15, making it as big a source of aid for college as the Pell Grant program was just a few years ago (e.g., in 2008-09, just prior to a dramatic Pell expansion during the Great Recession). The Hope Tax Credit (HTC) and Lifetime Learning Tax Credit (LLTC) were enacted in 1997, while the more generous American Opportunity Tax Credit (AOTC) has been available since 2009. For families who do not qualify for a tax credit, tuition and fees may be deducted from income. Early work examining the introduction of the credits using survey data and difference-in-difference analysis generated conflicting findings regarding the HTC and LLTC, with Long (2004) finding no effects on college enrollment and Turner (2011) finding positive effects (using the October Current Population Survey and Survey of Income and Program Participation, respectively). Recent work by Bulman and Hoxby (2015) and Hoxby and Bulman (2015 [this issue]) utilizing de-identified data from the full population of tax returns provides the cleanest quasi-experimental identification of the impact of these tax benefits, including the more generous AOTC. They make use of non-linearities in the relationship between income and eligibility to identify effects (using regression discontinuity, regression kink, and simulated instruments approaches) that are difficult to pin down without administrative data. They provide compelling and precise evidence that

¹⁰ For more information, see <https://www.whitehouse.gov/the-press-office/2015/01/09/fact-sheet-white-house-unveils-america-s-college-promise-proposal-tuition>

neither tax credits nor deductions influence college enrollment, perhaps because the tax benefits are not realized until months after the enrollment decision has been made.

2.5 Student loans

Compared to the volume of research on grant aid and tuition discounts, relatively few studies have examined how student loans affect college enrollment, performance, or completion. There is strong evidence of the value of student loan access outside the U.S., in countries where student loans have been the most prominent form of government aid for college. In Chile, access to student loans is determined by both income quintile and test score. Using an RD design, Solis (2014) finds that college enrollment is 16 percentage points higher for those who barely qualify for loans compared to those who barely miss the test score cutoff (from a baseline college enrollment rate around 30 percent); he also finds that the program virtually eliminates the income gradient in college enrollment for students above the cutoff. Examining college applicants just above and below a credit score cutoff for loan access in South Africa, Gurgand, Lorenceau, and Mélonio (2011) find a similarly large, 20 percentage point increase in college enrollment for students with access to loans (from a baseline enrollment rate of about 50 percent).

It is difficult to extrapolate from these studies to the U.S., in which loans are growing, but still only one component of a broader aid system. Heller (2008) reviews the non-experimental literature on whether loans increase college access and concludes that college enrollments are not as sensitive to loans as to grants, but cannot conclude whether or not they may still be cost-effective (given they cost the government only a few cents on the dollar to provide). Dynarski (2005) finds suggestive, but ultimately inconclusive evidence that student loan expansions in the United States in the early 1990s led to increased college attendance. Two recent studies utilize institution-year level variation in whether or not community colleges offer access to federal loans

and find higher levels of enrollment intensity and persistence for students who have access to loans (Dunlop, 2013; Wiederspan, 2015 [this issue]).

3. Navigating complexity: Informational and behavioral interventions

Given the growing complexity of college pricing and financial aid, information and procedural barriers present an increasingly important challenge to the effectiveness of the U.S. system of college finance. Importantly, financial aid is not the only aspect of the college-going process in which such barriers arise. There are many other decisions and steps that “add up” to postsecondary access, and throughout the process from college consideration to enrollment, low-income students fall behind their better-off peers in completing these steps (Avery & Kane, 2004). For example, although SAT / ACT taking is a key step in the college-going process, dramatic socioeconomic differences exist in students meeting this milestone. An estimated 30 percent of students in the bottom income quartile take the SAT, while 70 percent of students in the top income quartile do so (Goodman, 2013). Keeping students on track from early in the process is critical, however, given the momentum that students build as they proceed (Klasik, 2012). At first blush, high rates of failure to navigate college-going processes effectively may seem surprising, given the substantial returns to a college degree. Yet, a closer look reveals many factors that can hinder students from realizing their college aspirations.

While informational and procedural barriers are increasingly included in discussions of college access (particularly as they relate to financial aid applications), recognition of their intersection with broader behavioral barriers has begun to emerge over the past several years. Behavioral economics provides a framework for understanding departures from standard models of economic behavior, which do not account for facets of human behavior including limits to

rationality and willpower (Thaler & Mullainathan, 2008). The field is especially relevant for studying students' college decisions, given the need to weigh costs in the present against benefits in the future (Lavecchia, Liu & Oreopoulos, 2014), and given that young adults are particularly present-focused, impulsive and inexperienced in handling complex tasks (Casey, Jones, & Somerville, 2011; Castleman, 2015; Steinberg, 2008; Steinberg, Cauffman, Woolard, Graham, & Banich, 2009).

To begin, students may fail to engage optimally in the process of identifying and applying to postsecondary institutions (Avery, Howell & Page, 2014). Even among college-aspiring students, a surprising share fails to complete an application to any college (Roderick, Nagaoka, Coca, & Moeller, 2009), and among those who do apply to four-year institutions, many students fail to apply to an appropriate number and range of institutions, even though it would benefit them to do so (Smith, 2013).

What barriers keep students from engaging optimally in the college selection and application process? Some students may lack access to information; others may be overwhelmed by the process of parsing information on the volume of potential postsecondary options. Either circumstance may drive students to make important choices that are haphazard (Radford, 2013); based on simple rules of thumb (Pallais, 2015); or based on other factors that are not a good basis for decision making, such as the desire to avoid onerous applications or attend an institution with certain residential amenities (Smith, Hurwitz & Howell, 2015; Thaler & Sunstein, 2008; Ross, White, Wright & Knapp, 2013). For high-achieving, low-income students who are geographically isolated from other high-achieving peers, college application choice sets mirror those of peers who are socioeconomically rather than academically similar (Hoxby & Avery, 2013). Students cuing their college application choices off of the decisions of preceding cohorts

of students from their own high school also may relate to issues of social belonging and students' overemphasis on aspects of their own identity other than academic success (Walton & Cohen, 2007). Taken together, students can struggle with the sheer volume of options that they have, and are more likely to make mistakes when their decision making is poorly informed (Milkman, Beshears, Choi, Laibson, & Madrian, 2012; Ross et al, 2013).

Decision making at the stages of college application and college selection have contributed to postsecondary "undermatch" where students matriculate to institutions that are not well-aligned to their academic and other credentials (Bowen, Chingos & McPherson, 2011; Dillon & Smith, 2013; Smith, Pender & Howell, 2013). Descriptive evidence indicates college match as important to ultimate college success, given that students are more likely to persist to degree attainment if they attend a well-matched institution (Light & Strayer, 2000). More generally, both descriptive (Howell & Pender, 2015 [this issue]) and quasi-experimental evidence (Goodman, Hurwitz and Smith, 2015) suggests that attending a higher quality institution has substantial impacts on college completion.¹¹

Even among recent high school graduates who have been admitted to college and successfully navigated the financial aid application process, the summer transition to college also involves a number of hurdles to timely matriculation including: voluminous institutional paperwork, sometimes exacerbated by a lack of regular internet access; delays in financial aid packaging due to income verification requirements; challenges in financing the cost of actually traveling to campus; and unanticipated charges and fees present on a student's tuition bill (Castleman & Page, 2014a,b). While navigating such tasks without institutional support poses challenges, this summer is unique in that students are no longer members of their high school but

¹¹ In this study, in particular, the relevant comparison is primarily between state four-year institutions and two-year community colleges.

have yet to join their college. As a result, a surprisingly large share fail to transition successfully to college in the fall after high school graduation (Arnold, Fleming, De Anda, Castleman & Wartman, 2009; Castleman & Page, 2014a,b; Daugherty, 2012; Matthews, Schooley & Vosler, 2011; Roderick et al, 2008; Stephan & Rosenbaum, 2013).

In sum, the complexity of the college-going process itself may hinder students from achieving greater rates of college access and success. Given the challenges that this context presents, there is an opportunity to improve student postsecondary access and success by adding structure to students' college exploration and application processes, providing additional guidance and support, and facilitating decision making (Ross et al., 2013). In recognition, education practitioners and researchers have implemented and evaluated a number of potential solutions. These efforts range in intensity from high- to low-touch initiatives and include solutions that are comprehensive (e.g., working with students through all steps in the college-going process) to those that are focused on providing information and/or support to address single barriers, such as applying for financial aid or taking the SAT. We organize our summary of related evidence along these dimensions.

3.1 Comprehensive college-going support

When considering who can (or should) shepherd students through the college process, one obvious possibility is high school counselors. Indeed, Hurwitz and Howell (2014) provide evidence on the positive impact of counselors on college-going outcomes. In reality, however, current student-to-counselor ratios together with counselors' many other responsibilities translate to counselors having little time to provide high quality and personalized college-going support. The average U.S. public school counselor today manages a caseload that is almost double the American School Counseling Association recommended 250:1 (ASCA, 2012; Planty et al.,

2009), and many counselors lack training and expertise in key college-going processes, such as applying for financial aid (Civic Enterprises, 2011). When compared to their higher-income peers, lower income students have less access to school-based college counseling (Clinedinst & Hawkins, 2009).

A set of efforts have focused on reaching first-generation and low-income students with the types of high-touch personalized supports more often enjoyed by students from higher-income backgrounds (Avery, Howell & Page, 2014b). Programs such as College Possible and Bottom Line deliver comprehensive advising services to students through the processes of college search and completing college and financial aid applications. Bottom Line is unique in that it purposefully directs students to selected institutions that have both higher graduation rates and low levels of student debt. Experimental evidence on College Possible and quasi-experimental evidence on Bottom Line based on an RD design reveal that support from these organizations has led to increased enrollment in four-year institutions (Avery, 2013; Castleman & Goodman, 2014). In the case of Bottom Line, supported students were more likely to enroll in those institutions specifically endorsed by the program (Castleman & Goodman, 2014). Bos, Berman, Kane, and Tseng (2012) provide experimental evidence that similar advising provided by near-aged peers led to significant improvements in enrollment in four-year public institutions in California, and Carrell and Sacerdote (2013) found through a randomized controlled trial that late-stage college advising offered to students who were college-ready but behind in the application process significantly improved college enrollment for female high school graduates in New Hampshire. An MDRC led experimental study finds that the College MATCH program in Chicago, which provides college-going support to students through a combination of classroom activities and support from a young adult or near-peer advisor, is successful in

meeting its programmatic goal of improving the selectivity of the institutions to which college-intending students apply (Sherwin, 2012).

While these efforts are all geographically limited, other federally-funded programs with broader reach have also sought to improve college counseling both in and out of school. For example, a quasi-experimental study of Talent Search revealed positive impacts of the in-school counseling it provided on completion of college-going tasks, such as applying for financial aid, and direct-to-college enrollment (Constantine, Seftor, Martin, Silva & Myers, 2006). Finally, a large-scale randomized trial of the College Advising Corps (CAC), reveals that the placement of CAC counselors in high schools led to modest but significant improvements in SAT and AP course taking and FAFSA filing (Bettinger, Antonio, Evans, Foster, Holzman, Santikian & Hornig, 2012; Hornig et al., 2013), and led to positive effects on first-year college enrollment, particularly for Hispanic students and student from low-income backgrounds (Bettinger & Evans, 2015).

3.2 Targeted support

Other efforts have focused more narrowly on specific tasks, such as FAFSA filing. Through a collaborative, experimental effort with H&R Block, Bettinger, Long, Oreopoulos, and Sanbonmatsu (2012) find that coupling tax preparation with FAFSA completion together with providing families with estimates of likely levels of financial aid and tuition costs at nearby colleges led to substantial increases in rates of FAFSA submission as well as financial aid receipt, college attendance, and persistence. For example, students whose parents received FAFSA assistance were 8 percentage points more likely to have completed at least two years of college. Notably, they did not detect any improvements among families who received aid information but not direct FAFSA assistance. This finding highlights the potential limits of

information-only interventions, particularly in helping students and families with complex processes. In another intervention also focused on financial aid applications, Owen (2012) evaluated the impact of increased school counselor outreach on FAFSA completion and college enrollment in the Albuquerque Public Schools (Albuquerque, NM). Covariate controlled year-to-year differences revealed a 10 percentage point increase in FAFSA completion and an associated 12 percentage point increase in on-time college enrollment.

Another step in the college-going process that has received attention is the taking of college entrance exams. Several states, districts and schools have implemented universal, school-day testing policies that work to substantially mitigate many of the barriers to timely SAT or ACT taking.¹² Such strategies help to alleviate the burdens of test taking and also help to overcome students' perceptions that taking these assessments is incongruent with their own identity. Studies that capitalize on the exogenous shock of these policies being introduced in certain geographies and at certain points in time show that, as would be expected, these policies have a sizeable impact on rates of test taking (Goodman, 2013; Hurwitz, Smith, Howell & Niu, 2014; Hyman, 2014; Klasik, 2013).

Further, these testing policies can have important impacts on both whether and where students enroll in college. Analyzing data from multiple states, Klasik (2013) reports significant impacts of universal testing on overall college enrollment in Illinois and positive although insignificant effects in Colorado and Maine. Capitalizing on student-level data held by the College Board, Hurwitz and colleagues (2014) find that the universal policy in Maine did increase four-year college enrollment rates by 2 – 3 percentage points (4 – 6 percent) overall, and

¹² States implementing school-day ACT policies include: Arkansas, Colorado, Illinois, Kentucky, Louisiana, Michigan, Montana, North Carolina, Tennessee, Utah and Wyoming (<http://www.act.org/stateservices/>) and states implementing school-day ACT policies are States implementing school-day SAT policies are Delaware, Idaho and Maine, as well as certain districts and schools in Florida, Indiana, Maryland, New Jersey and Texas (<http://professionals.collegeboard.com/higher-ed/recruitment/sat-test/school-day>)

that this impact was driven particularly by changes for students from high schools in small towns and rural areas in Maine. Further, the Maine policy increased by 10 percentage points college enrollment among those students who would not sit for the SAT absent the policy. Of those students induced into testing by virtue of these universal policies, large shares (many of whom were from disadvantaged backgrounds), perform well enough on the exam to qualify for competitive admissions schools (Goodman, 2013). While data limitations prohibit Goodman from disaggregating impacts by salient student characteristics, she nevertheless finds that as a result of these policies, selective college enrollment rose by approximately 20 percent, with no effect on overall college enrollment.

A second strategy for improving rates of SAT / ACT taking is the establishment of a testing center on a high school campus. This allows students to take the relevant exam in their own high schools on a given test administration day rather than having to travel to an alternate location. Capitalizing again on geographic and time variation, Bulman (forthcoming) estimates that in schools that establish new centers, students are 8 percent more likely to take a college entrance exam, with particularly strong impacts at low-income schools (where the impact was approximately a 15 percent increase in test taking).¹³ Further analyses indicate that alleviating barriers to SAT taking may be particularly beneficial for low-income, high-achieving students.

Taken together, several mechanisms may be at play in the impacts discussed here. SAT/ACT test taking itself is an important milestone in the college-going process (Klasik, 2012). The school day policies and the introduction of local test centers both increase awareness of and reduce travel and other hassle costs associated with test taking itself. Further, these policies underscore an implicit recommendation that students should be taking college entrance exams. In

¹³ Bulman defines a low-income school one where at least 30 percent of students qualify for free or reduced price lunch.

addition, after taking the test and learning their own score, students may receive important feedback regarding their own competitiveness as candidates for selective colleges and universities and may, in turn, revise their perceptions regarding the benefits of college as well as their own college potential. In sum, for a surprising number of students, the decision to take a college entrance exam is sensitive to small barriers. Overcoming these barriers leads to changes in enrollment decisions.

3.3 Low-touch information and nudges

Much of the evidence on SAT/ACT test taking policies find particularly strong impacts among high-achieving, low-income students. Hoxby and Turner (2013) provide experimental evidence on a student-outreach effort to provide this subgroup of students with semi-customized packets of information about college net costs and application processes as well as no-paperwork application fee waivers. The intervention – Expanding College Opportunity – was inexpensive (approximately \$6 / student) and led to increases in the rates with which the focal students applied, were accepted to, and attended high quality colleges and universities. It did not, however, lead to increases in college enrollment overall. The intervention did not impact freshman year grades, implying that focal students were able to be equally competitive academically, even at higher-quality postsecondary institutions.

In a much less comprehensive information-based intervention, the College Board recently collaborated in the development of a “College Is Affordable” brochure that was then distributed to lower-income families with middle school students in North Carolina. In particular, the goal of the brochure was to educate families about college net price. Treatment and comparison families were then surveyed regarding their knowledge of postsecondary financing. Families receiving the brochure were more likely to report knowing the cost of attending college in North Carolina;

agreeing that most students pay less than colleges' list prices; and agreeing that students from low-income families could attend college at low to no cost (College Board, 2012). Similarly, Oreopoulos and Dunn (2013) report that high school students are much more likely to aspire to postsecondary education after receiving information about the costs and benefits of college. These efforts, taken together, indicate that students and their families likely stand to benefit from improved access to college-related information focused on college financing as well as other aspects of the college-going process.

Indeed, the past few years have also seen a proliferation of tools intended to provide students and families with better information about important metrics related to college cost and quality. These include tools such as the White House College Scorecard, the FAFSA4Caster, net price calculators (NPCs), and the financial aid package shopping sheet. Given their recent development, we have limited evidence on these tools' potential for impact on college-related decisions and outcomes. Rosinger (2014) finds through a randomized controlled trial that use of the shopping sheet has little impact on students' enrollment and borrowing decisions. Anthony, Page and Seldin (2015) provide descriptive evidence that estimates provided by the federal template NPC can vary substantially from actual financial aid awards, potentially limiting its promise for putting meaningful information in the hands of students as they making decisions about the postsecondary institutions to which to apply. As noted above, in their H&R Block FAFSA experiment, Bettinger and colleagues (2012) found no impact on FAFSA or college enrollment outcomes of simply providing information about FAFSA and financial aid at the time of tax filing. This limited set of evidence suggests that it may be too optimistic to expect that these tools, in isolation, will have a meaningful impact of students' college-going outcomes. In fact, it may be reasonable to expect that such tools aiming to making information about college

cost and quality more transparent will have more impact on the behavior of postsecondary institutions compared to the behavior of individual students and families (Loewenstein, Sunstein & Golman, 2014). This is an area of future research.

Finally, simple reminders and well-framed encouragements or “nudges” also have been shown to be effective in a variety of settings for improving follow-through with desirable actions (Armstrong et al, 2009; Dale & Strauss, 2009; Karlan et al, 2010; Thaler & Sunstein, 2008). In educational contexts, providing students with nudges can help reduce inertia and students’ tendency to procrastinate and can help students to make positive changes to their daily activities to contribute to more success as a student (Lavecchia et al., 2014). Nudging initiatives have shown several early successes in the educational context (Bergman, 2013; Kraft & Rogers, 2014; York & Loeb, 2015). For example, a number of experimental interventions show that summer outreach and the offer of support delivered by counselors, near-aged peers, or by automated text messaging serve to significantly summer mitigate attrition from the college-going pipeline and improve college success (Castleman, Arnold & Wartman, 2012; Arnold, Castleman, Chewing & Page, 2015; Castleman, Owen & Page, 2015 [this issue]; Castleman, Page & Schooley, 2014; Castleman & Page, 2014a, 2015, forthcoming).

Nudges can help students overcome their attentional failure by providing reminders that are well-timed to correspond to the windows of opportunity during which students would optimally focus on particular tasks. Well-timed nudges may actually serve to capitalize on students’ relative impulsivity, encouraging them to make progress with a particular task in the moment rather than putting it off to an unspecified future time (Castleman & Page, 2014b). Thus, there may be promise in low-touch nudges and reminders to support students throughout the college-going process.

4. Interventions aimed at easing the academic transition to college

Not all students who successfully enroll in college enter academically ready. With increased rates of college enrollment have come increased rates of students unprepared for college-level coursework. Estimates suggest that among recent cohorts of high school students, only one of every three to four students is academically prepared as defined by successfully graduating from high schools, engaging in a college-preparatory high school curriculum and meeting a minimum threshold of skill in basic literacy (Chen, Wu, & Tasoff, 2010; Greene & Forster, 2003).

Of course, academic preparation for college is a long process that starts well before the end of high school, and a comprehensive examination of human capital production from infancy onward is beyond the scope of this review. Nevertheless, there are academic challenges specific to the transition to college that are distinct from concerns about student achievement more broadly. In particular, high school graduation requirements are generally poorly aligned with requirements for college-level coursework although students are not aware of this (Kirst & Venezia, 2004; Rosenbaum, Deil-Amen, & Person, 2006). Moreover, access to college-preparatory coursework and college counseling are not equally available at all high schools: low-income and minority students have both fewer opportunities to obtain the academic preparation required for college and less “college knowledge” regarding what is expected in the first place (see review by Goldrick-Rab, 2010). In this section we review the evidence on interventions to address the disconnect between high school and college academics, grouping them by whether the intervention is primarily based at the postsecondary institution, or at the high school, though in some interventions this distinction is intentionally blurred.

4.1 Remedial coursework

Remedial coursework is perhaps the most widespread and costly intervention aimed at addressing perceived skill deficiencies among incoming college students. Remedial or “developmental” courses provide basic instruction in reading, writing, and mathematics, but do not bear college credit. Most two-year colleges and many non-selective four-year colleges require incoming students to be screened for possible remedial placement prior to their initial course registration. Typically, placement is based upon whether students exceed a cutoff on a placement exam; those scoring below the college-level cutoff may be required to take and pass one or more remedial courses before enrolling in college-level courses in the given subject. Half of all undergraduates will take at least one remedial course; among those who take any, the average is 2.6 remedial courses (Scott-Clayton, Crosta, & Belfield, 2014). Scott-Clayton et al. (2014) estimate that with over three million new students entering college each year, this implies a national cost of nearly \$7 billion dollars annually. Relatively few students who enter remediation ever even attempt college-level coursework (Bailey, Jeong, & Cho, 2010). But because students entering remediation are disadvantaged to begin with, this fact alone is not informative about the causal effect of remediation.

Several studies using RD analysis to compare students just above and below remedial test score cutoffs have generally found null to negative impacts of remediation. For example, Martorell and McFarlin (2011) examine administrative records for over 250,000 students in Texas public two- and four-year colleges: those just below the test score threshold had significantly lower rates of persistence and college credit accumulation, with no impact on degree attainment and future labor market earnings. Studies in Florida and in a large urban community college system using analogous data and methods found similarly null to negative effects on academic outcomes (Calcagno & Long, 2008; Scott-Clayton & Rodriguez, 2015).

A typical caveat in RD studies is that they identify average treatment effects local to students scoring near the cutoff—that is, the highest scoring remediated students and the lowest scoring non-remediated student—and thus one interpretation of the RD evidence may be that the existing remedial cutoffs are set too high. Evidence regarding impact heterogeneity by ability does in fact suggest that the negative effects of remediation may be largest for higher-ability or lower-academic-risk students (Martorell & McFarlin, 2011; Scott-Clayton & Rodriguez, 2015). Conversely, several RD studies examining very low-scoring students—who are at the margin between higher and lower levels of remediation—have found some positive effects of being assigned to the more intensive remedial treatment (Boatman & Long, 2010; Dadgar, 2012; Hodara, 2012).

Two studies take advantage of seemingly arbitrary variation in placement test cutoff policies across public institutions within a given state, using distance to college as an instrument for students' probability of remediation. The first of these, by Bettinger and Long (2009), also is one of the only studies to find positive effects of remedial (versus college-level) assignment. Their analysis strategy requires limiting the sample to students who took the ACT, making this one of the few studies to examine predominantly four-year enrollees. They find some important positive impacts, including an increase in bachelor's degree completion within four years. On the other hand, even this study finds some negative impacts. For example, in both English and math, remediated students completed significantly fewer total credits, while those remediated in math were more likely to drop out in their first year. A more recent study, by Clotfelter, Ladd, Muschkin, and Vigdor (2015) uses a similar distance-based instrument to examine community college enrollees in North Carolina. They find strong negative effects on the likelihood of ever passing a college-level course in the relevant subject, as well as on "college success," broadly

defined to include degree or diploma completion, or completion of at least 10 transferable courses within four years of entry.

Across studies, this overall negative (or at best mixed) set of findings is consistent with possible heterogeneity of effects across students with different characteristics and/or preparation. A related explanation is that the tests used to determine who should be remediated appear to be poor predictors of who would do well in college-level courses. Scott-Clayton, Crosta, and Belfield (2014) predict, based on both test scores and detailed measures of high school course taking and grades, that approximately one-quarter of students remediated in math and one-third of students remediated in English could have earned a B or better in the relevant college-level course, had they been placed there directly.

In light of this body of evidence, policy efforts have shifted recently in two directions: first, towards reducing remedial placement rates through the use of early awareness and alternative placement measures; and second, towards delivering remedial course content more efficiently to limit the diversion of students from college-level coursework. An example of the first strategy is the Early Assessment Program (EAP) in California, in which high school juniors took the college placement exams. This gave students time to address academic gaps during the senior year of high school. Evidence capitalizing on changes over time in students' exposure to EAP indicates that this testing and feedback strategy reduced remediation rates in college without discouraging those who were underprepared from continuing on (Howell, Kurlaender, & Grodsky, 2010). Another example comes from Long Beach City College (LBCC), which switched from a test-based placement tool to a high-school transcript based process in 2012. While the policy change was not formally evaluated, LBCC reports that the percentage of students taking and successfully completing college-level math and English courses tripled and

quadrupled, respectively, the year the new policy was introduced (Oakley, 2014). Emerging experimental evidence from Evans and Henry (2015) finds that use of computer-adaptive placement testing, together with targeted feedback and the opportunity to retest resulted in a 7 – 9 percentage point increase in college-level math placement, without leading to a reduction in college course success.

Rigorous causal evidence on the impact of alternative remedial instruction is more limited. Descriptive evidence suggests the potential promise of technology-based strategies, including online and other self-directed learning tools (Edgecombe, 2011; Epper & Baker, 2009; Jenkins, Speroni, Belfield, Jaggars, & Edgecombe, 2010; Zachry & Schneider, 2008). Boatman (2012) utilizes an RD design to evaluate such strategies and finds positive impacts of revised remedial programs, at least on short-run outcomes such as early college persistence and credits attempted.

4.2 Dual enrollment and other high-school based interventions

While remediation may be conceptualized as bringing high school work into college, another approach to smoothing the academic transition from high school to college is to expose students to college-level work while they are still in high school. Importantly, some of the interventions in this domain are crafted not only to address academic barriers, but also to mitigate informational and financial barriers as well. The oldest initiatives in this vein are the Advanced Placement (AP) and International Baccalaureate (IB) programs. Both programs offer rigorous courses in various subjects, are taught by high school teachers, and culminate in external exams through which (depending upon the score received) students may earn college credit at some institutions. Non-experimental evaluations of these programs have consistently found that participation is positively correlated with academic outcomes including high school

graduation, college enrollment, and college performance (e.g., Chajewski, Mattern & Shaw, 2011; Saavedra, 2011).

Of course, even careful non-experimental analyses with rich observable control variables may overstate effects if the students who participate in these programs are unobservably more motivated or more interested in college. The most rigorous available evidence also finds positive effects, albeit of a somewhat more modest magnitude. Jackson (2010) uses administrative data from Texas to examine the expansion of the AP Incentive Program (APIP), which provided monetary incentives to students (and their teachers) for passing scores on AP exams. Using a difference-in-difference design that exploited variation in the timing of schools' entry into the program, Jackson finds that school-level participation in the program led to more AP test taking, higher scores on college entrance exams (SAT and ACT), and a five percent increase in the share of students enrolling in college. Capitalizing on millions of student records and a continuous raw score that underlies reported integer AP scores, Smith, Hurwitz and Avery (2015) utilize an RD design to examine the impact of just passing Advanced Placement exams. Local to the passing threshold, students who earn a college-credit bearing score are one to two percentage points (per exam) more likely to earn a bachelor's degree within four years, with more modest impacts on six-year degree attainment rates. Together, these results suggest that at the margin of passing, earning AP credit primarily influences time to degree but not ultimate degree attainment.

Dual enrollment programs are similar to AP or IB in that they enable students to earn both college and high school credit simultaneously, but unlike AP or IB the credit comes from the course itself rather than from an external exam. A further important distinction, highlighted by Karp (2015) is that beyond simply offering more rigorous courses, dual enrollment creates a mechanism for better collaboration and coordination between the secondary and postsecondary

sectors. As with AP and IB, rigorous research on dual enrollment is limited. Non-experimental analyses have found some positive effects on postsecondary enrollment, persistence, and completion (CCRC, 2012). While the validity of results from non-experimental comparisons may be threatened by unobserved confounding variables, a careful propensity score analysis by An (2013) finds that the strong positive relationship between dual enrollment and BA completion is robust to the omission of even large potential confounders. The most rigorous quasi-experimental study compares high school students in Florida just above and below a test score cutoff for program eligibility (Speroni, 2011). Using a regression-discontinuity design, the author finds no effect of dual enrollment on high school or college outcomes in general. However, students just barely eligible for college algebra were substantially more likely to enroll and graduate from college than those just below the cutoff.

Perhaps the most intensive strategy to “bring the college experience into high schools” is to restructure the high school as an “early college.” Indeed, about 280 early and middle college high schools (E-MCHSs) exist across the country, often located on college campuses, enabling students to take college courses and, in some cases, to earn an associate’s degree during high school. These high schools offer college exposure to a wider range of students than either traditional dual enrollment or AP/IB programs, which are more academically selective (Barnett, Maclutsky, & Wagonlander, 2015).

Berger, Turk-Bicakci, Garet, Knudson, & Hoshen (2014) use a randomized-lottery design to evaluate student outcomes at 10 early colleges across the country that had more applicants than they had seats. Students randomly offered ECHS admission were significantly more likely to earn college credits and complete a two-year college degree than those who lost the lottery. While these differences emerged before the end of high school, they persisted to the end of the

follow-up period (with a 17 percentage point difference in associate’s degree completion seven years after students entered 9th grade). A second study in progress uses a similar research design with oversubscribed schools in North Carolina (Edmunds, 2010). Results to date indicate that enrollment in an ECHS had significant, positive effects on several student outcomes, including student attendance and suspension rates, remaining academically on-track for college, accumulation of college credit while in high school, and academic performance and persistence in college (Edmunds et al, 2012; Unlu, Yamaguchi, Bernstein & Edmunds, 2010). While highly compelling, the effects for oversubscribed schools may not generalize to early colleges more broadly.

5. Affirmative action and “Top X%” plans

The barriers to college access that we discuss above—financial, informational and behavioral, and academic—are obviously not mutually exclusive. For low-income, minority, and first-generation college students—often concentrated in under-resourced high schools—these barriers may compound. It is also important to acknowledge that underrepresented minorities face additional, distinct barriers—including highly segregated schools and neighborhoods (Rothstein, 2015) as well as both implicit and explicit discrimination (Bertrand, Chugh, & Mullainathan, 2005).¹⁴ While we do not survey the full depth of research on affirmative action in college admissions, we highlight key findings from this literature below. For more detailed reviews, see Arcidiacono and Lovenheim (2015), Hinrichs (2012, 2014), or Holzer and Neumark (2006).

¹⁴ See Arcidiacono & Lovenheim (2015) for a recent review of the justifications for and empirical evidence on affirmative action policies and “percent plans.”

Early studies document sharp declines in minority enrollment at selective public institutions after affirmative action bans are enacted (Tienda, Leicht, Sullivan, Maltese, & Lloyd, 2003; Kain, O'Brien, & Jargowsky, 2005). But one key finding from the subsequent literature is that such bans primarily affect *where* students enroll and complete degrees, rather than *whether* they do so at all (an important caveat however, is that there are many more studies of the application/enrollment margins than the completion margin). Several recent studies have identified the effects of affirmative action by comparing changes in minority student enrollment (or other outcomes) within states that implemented affirmative action bans (California, Texas, Washington, and Florida) to changes in states that did not implement such bans. For example, Hinrichs (2012, 2014) utilizes a difference-in-difference approach with data from a national, institution-level database (IPEDS) as well as data from the Current Population Survey and American Community Survey. His results suggest that such bans have little effect on minority enrollments or bachelor's degree completions overall, but substantially reduce the likelihood that minorities enroll in or complete a bachelor's degree at a selective four-year institution. Other studies with similar findings include Backes (2012), who examines enrollment and completion using IPEDS with a difference-in-difference approach; Long (2004), who uses a triple-difference to examine SAT score-sending behavior in California and Texas among those who took the test (over time, across states, and across minority status); and Dickson (2006), who examines SAT test-taking in Texas within the same high schools, before and after the ban.

A complication faced by many of these studies is that states and institutions in many cases actively developed new policies and programs intended to counter the effects of the affirmative action bans, so difference-in-difference estimates will capture the combined effect of eliminating affirmative action and implementing new programs in response, rather than the

isolated effect of instituting a ban. Texas’s “Top 10%” plan, which guarantees admission to any in-state public institution to students who rank in the top 10% of their high school class, is the most notable example of an alternative policy.¹⁵ If high schools were fully segregated by race, such a policy would ensure admission for 10% of students within each racial group. But as Hinrichs (2012) notes, the reality is that high schools are not completely segregated, and “fewer than x% of minorities are in the top x% of their high school class” (p. 715). This may explain why such alternatives do not appear to completely undo the effects of affirmative action bans for minorities. Cortes (2010) examines how the switch from affirmative action to the top 10% policy in Texas affected the post-enrollment outcomes of minority students differentially by high school class ranking.¹⁶ She finds that persistence and graduation were flat or declining for minority students below the top decile, while the same outcomes were increasing for minority students in the top 10% (as well as for non-minority students throughout the distribution). Daugherty, Martorell, & McFarlin (2014) use a regression discontinuity strategy around school-level eligibility cutoffs and find that students who just barely qualified were much more likely to attend a state flagship institution. But this came at the expense of private college enrollments, such that there were no effects on enrollment in general or on quality of college attended.

One critique of both affirmative action and top X% plans—and possible explanation of limited effects on enrollment—is that they may be of limited use to students facing additional barriers like the ones described elsewhere in this review. To counter these multiple barriers, the University of Texas at Austin implemented the Longhorn Opportunity Scholarship program. The

¹⁵ In 2009, UT-Austin was allowed to limit the proportion of students admitted under the Top 10% plan to 75 percent of the incoming class, meaning that students who just barely make the top 10% still may not meet the effective cutoff for UT-Austin. Florida and California also have so called “percent plans” but they only guarantee admission to some public four year institution, not to the institution of the student’s choice as in Texas (Cortes, 2010).

¹⁶ Her analysis uses administrative data from the Texas Higher Education Opportunity Project (THEOP) and as such is conditional on enrolling in some public institution in the state; however, given other evidence that the enrollment margin is unaffected, this is a reasonable limitation.

program targeted low-income, underrepresented high schools (which serve disproportionately minority student populations) for additional outreach, and provided generous financial assistance and enhanced academic supports to graduates of these high schools if admitted to UT-Austin (Andrews, Ranchhod, & Sathy, 2010). The first cohort eligible for the program completed high school in 1999, one year after the Top 10% plan went into effect and two years after Texas's affirmative action ban. Dickson (2006), using a high school fixed-effects approach, finds evidence that the program significantly increased SAT-taking at targeted high schools. Andrews et al. (2010) use a difference-in-difference approach with matched comparison schools and find that the program substantially increased applications to UT-Austin. They additionally find the largest effects for students in the top decile of class rank, who were guaranteed admission, consistent with the notion that for low-income or underrepresented populations, college application decisions “are subject to multiple constraints” (p. 113).¹⁷

6. Discussion

In this review we have isolated and discussed various barriers to college access. Yet these barriers can interact, and successful transition to college requires navigating all or at least some combination of them. Indeed, from this rich and growing literature on barriers to college access and prospective solutions, a dominant theme that emerges is the overall complexity of the college transition. Given this complexity, policy solutions that focus on just one type of barrier—such as college affordability—may lead to improved access, but may not be the most effective use of resources if other challenges still stand in students' way. For example, additional grants funds that allow students to enroll in college may not be well invested if students use these funds

¹⁷ Andrews et al. (2010) perform the same analysis for the Century Scholars program, a similar program operated by Texas A&M, and also find positive results, although the magnitudes are smaller and not statistically significant for as many deciles.

to attend institutions that do not maximize their chances of persistence and success. Similarly, the potential benefits to helping students select and apply to a set of well-matched colleges may not be fully realized if students and families have actual or perceived financial barriers that keep them from investing in higher education. Thus, the most effective solutions may be ones that seek to address multiple barriers to college access together, rather than in isolation.

Finally, we have set aside, with limited exceptions, the question of what happens with students once they get through the door of college. While many of the policy interventions that we examined may support both access and completion, it is also possible for these two goals to come into conflict, particularly in the context of limited resources. When institutional resources are constrained, higher education systems may face a tradeoff: serve more students with lower quality, or fewer students with higher quality academic opportunities and other services (Barr, 2010). At the extreme, if resources are spread too thin, it is conceivable that an institution could increase its number of graduates by decreasing the number of students admitted.

Consider the implications, for example, of a comprehensive community college intervention established by the City University of New York, called ASAP (Accelerated Study in Associate Programs). The program not only waives tuition and fees, but also requires full-time enrollment, provides free transportation, intensive advising, career services, special seminars and other supports. After three years, students randomly assigned to the program were nearly twice as likely to have earned an associate's degree compared to the control group (40 percent versus 22 percent (Scrivener et al., 2015). But the program is not cheap: at least in its initial implementation, ASAP represented a 60 percent increase in per-student expenditure. Importantly, however, it cost less per graduate than business-as-usual (Levin & Garcia, 2013). A social cost-benefit analysis easily justifies spending the resources needed to expand the number

of students served, if those resources exist. On the other hand, if resources are held fixed, the results suggest the system would produce more graduates by serving fewer students with ASAP-like intensity.¹⁸

Unfortunately, in the U.S., resources for higher education have not expanded as fast as enrollments. In fact, at the state level, expenditures are falling in real terms. In the face of competing priorities, the share of state budgets devoted to higher education fell from 8 percent in 1980 to 4 percent in 2010 (Mettler, 2014). On a per-student basis, state funding has fallen 30 percent since its peak in 1987-88, from \$10,176 to \$7,161 per student (Baum & Ma, 2014). Thus, the tension between quantity served and quality of service is not a hypothetical one. A key implication is that improving college access is not, on its own, likely to be sufficient to eliminate socioeconomic gaps in educational attainment: the “marginal” students induced into college by virtue of the programs and policies discussed above disproportionately enter the public institutions at which resource constraints are most acute. Given current trends in per-student funding, the tension between promoting access and maintaining quality is likely only to increase in the coming years.

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¹⁸ To see this, assume a fixed budget \$10,000, a cost of \$100 per student for the baseline service and \$160 for the intervention, and a graduation rate of 22 percent for the control group and 40 percent for the treated group. Serving 100 students with the cheaper baseline intensity produces 22 graduates, while serving 63 students with the more expensive program produces 25 graduates.

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