The Paradox of Persistence: Explaining the Black-White Gap in Bachelor's Degree Completion

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Abstract

Bachelor's degree (BA) completion is lower among black students than among white students. In this study, we use data from the Education Longitudinal Study of 2002 and the Integrated Postsecondary Education Data System, together with regression-based analytical techniques, to identify the primary sources of the BA completion gap. We find that black students' lower academic and socioeconomic resources are the biggest drivers of the gap. However, we also find that black students are more likely to enroll in four-year colleges than are white students, given pre-college resources. We describe this dynamic as "paradoxical persistence" because it challenges Boudon's well-known assertion that the secondary effect of educational decision-making should reinforce the primary effect of resource discrepancies. Instead, our results indicate that black students' paradoxical persistence widens the race gap in BA completion while also narrowing the race gap in BA attainment, or the proportion of high school graduates to receive a BA. This narrowing effect on the BA attainment gap is as large or larger than the narrowing effect of black students' "overmatch" to high-quality colleges, facilitated in part by affirmative action. Paradoxical persistence refocuses attention on black students' individual agency as an important source of existing educational gains.

Bachelor's degrees (BAs) promote upward social mobility and lessen inequality among those who achieve them (Hauser and Logan 1992; Hout 1988; Torche 2011). Yet BA completion in the United States is stratified sharply by race and class, with white and higher-class students earning degrees more frequently than traditionally underrepresented minority and lower-class students (Bowen, Chingos, and McPherson 2009; Roksa et al. 2007). A comparison of the BA completion rates for white and black students is striking: 63 percent of white students receive a BA within six years of initial college entry, compared to just 41 percent of black students (Snyder, de Brey, and Dillow 2016: Table 326.10).[1] The size of this gap, together with its substantial contribution to racial inequality

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in the United States (Baker, Klasik, and Reardon 2016; Magnuson and Waldfogel 2008; Reardon, Robinson-Cimpian, and Weathers forthcoming), makes understanding and addressing the sources of the black-white gap in BA completion particularly important.

Research on the black-white BA completion gap (hereafter the "BA gap") often focuses on institutional policies and programs, such as affirmative action, that are designed to offset the legacy of discrimination in the United States (Alon 2015; Arcidiacono, Lovenheim, and Zhu 2015; Bowen and Bok 1998; Fischer and Massey 2007; Grodsky 2007). For example, Bowen and Bok (1998) demonstrate that affirmative action policies at selective colleges and universities have raised black students' graduation rates, earnings, and levels of civic engagement. These important findings, however, do not shed light on the mechanisms driving the BA gap at the *population* level, or among all black and white students attending all four-year colleges. Specifically, because selective colleges and universities represent less than 20 percent of all four-year institutions (Snyder et al. 2016: Table 305.4), Bowen and Bok's results are limited in scope.

In this article, we examine the relative impact of four aspects of the college-going process on the BA gap: initial entry into college given pre-college resources and experiences, the "match" between student and college, the effects of college quality, and students' academic performance and social engagement while in college. To do so, we draw on recently collected, high-quality data from the Education Longitudinal Study of 2002 (ELS 2002) and the Integrated Postsecondary Education Data System (IPEDS). Our multistage analysis suggests that discrepancies in academic resources prior to and within college are responsible for much of the gap. Yet we also find that black students have higher rates of college attendance than would be expected given their relative disadvantage in academic and economic resources. We call this dynamic "paradoxical persistence" because it challenges existing sociological

theory predicting that greater resource disadvantages will further decrease students' likelihood of upward social mobility through their decisions, even net of educational performance (Boudon 1974). We find that the paradoxically high rate of four-year-college entry among black students has the dual effect of expanding black students' relative disadvantage with respect to BA completion while lessening their disadvantage with respect to BA attainment, or the rate of BA completion among all high school graduates.

A large literature on educational inequality draws on Boudon's (1974) work describing the primary and secondary effects of social class on mobility chances. Boudon theorized that students from lower-class families endure resource deficiencies that produce poor academic performance and low preparation for higher education. Boudon called this process the "primary effect" of social class. In addition, he postulated that students from lower-class backgrounds would be comparatively less likely to make decisions aligned with achieving high levels of education. He called this decision-based process the "secondary effect" of social class. In Boudon's framework, primary and secondary effects are mutually reinforcing: lower-class students under-perform academically due to their resource deficiencies and make decisions that lead to lower educational credentials than their academic performance would predict.

Among the few scholars who have applied Boudon's theory to the U.S. case, one theme that regularly emerges is the complexity of the U.S. context (Jackson 2013; Morgan 2012; Morgan, Spiller, and Todd 2013). The U.S. educational system is highly stratified, and race and ethnicity are salient dimensions of stratification in addition to class. Specifically, the status of being black is repeatedly identified as a source of disadvantage (e.g., Blau and Duncan 1967). Translating Boudon's theory to this context, black students' lower academic and social resources (primary effects) should produce lower rates of entry into four-year college relative to white students, net of their academic preparation (secondary effects).

Yet scholars also have shown that black students tend to have equal, if not higher, educational expectations than do white students, even after controlling for socioeconomic factors (Goyette 2008; Hauser and Anderson 1991; Morgan 1996, 2005). We extend these existing insights by showing that black students are more likely than their white peers with similar risk of BA non-completion, given pre-college resources, to actually attend a four-year college. This finding solidifies the importance of individual agency and challenges the notion that primary and secondary effects necessarily reinforce one another.

We arrive at this result using more comprehensive measures of pre-college academic and social experiences than existing studies have used (e.g., Bennett and Lutz 2009; Bennett and Xie 2003; Merolla 2017; Merolla and Jackson 2014). In addition, most research on educational inequality by race compares black and white students, but Hispanic students also occupy an important minority status. Thus, we have computed supplementary analyses contrasting underrepresented minority and white students instead of black and white students. Generally speaking, our results are not very sensitive to the difference between black-white and minority-white contrasts (see Part A of the online supplement). Regardless of the focal sample, including a wider array of pre-college variables provides us with greater insight into the mechanisms underlying black and underrepresented minority students' mobility-enhancing decisions at the point of college entry. For example, black students are more likely than similar white peers to enroll in college when offered financial aid, and they are less likely to avoid four-year-college enrollment in light of blue-collar occupational expectations.

We also examine the effects of three particular aspects of students' college-going trajectories on the BA gap, including the matching process between students and colleges, college quality, and academic and social experiences during college. We find that black students are more likely than white students to overmatch to better quality colleges, likely spurred by affirmative action policies. However, only a small proportion of all black students actually attend, and therefore receive the benefits of, selective colleges. Black students' attendance at high-quality colleges reduces both the BA completion and attainment gaps. Yet we find that the protection against dropout received by the small proportion of black students who overmatch is more than offset by the overall tendency for black students to attend lower-quality colleges than their comparable white peers. In fact, our analyses demonstrate that overmatch among black students actually has an equal, if not smaller, effect on the BA attainment gap than does paradoxical persistence at the point of college entry.

In short, despite the substantial focus on institutional mechanisms to close the BA gap, we find that individual agency is an equally important driver of black students' postsecondary gains. Specifically, the process of paradoxical persistence focuses attention on three key issues. First, it demonstrates that Boudon's theory of primary and secondary effects must be rethought in the context of black-white gaps in the United States. Second, through its reduction of the BA attainment gap, paradoxical persistence challenges the frame of cumulative disadvantage that is often assumed to characterize black individuals' experience in the United States (Blau and Duncan 1967; DiPrete and Eirich 2006). Third, it serves as an indication of black students' commitment to educational advancement in spite of resource- and status-based challenges. This demonstrable resilience may allow black students to gain various advantages related to planning for and attending college, regardless of degree completion status. These benefits include enhanced self-worth and sense of moral virtue (Deterding 2015; Frye 2012; Nielsen 2015), as well as increased earnings (Bahr 2014; Pascarella and Terenzini 2005). In other words, paradoxical persistence not only raises the BA attainment rate among black students, but it also raises the possibility of improved futures for this group even net of degree completion status.

EXPLAINING THE BLACK-WHITE GAP IN COLLEGE COMPLETION

Relative to other comparable countries, rates of college completion are low in the United States (European Commission 2015: Table 4.3; Snyder et al. 2016: Table 326.10), and research points to the high levels of inequality in the country as a primary cause (Carnoy and Rothstein 2013). A large literature has interrogated these inequalities by examining various stages of the college-going process. Broadly speaking, the most relevant findings for explaining the BA completion gap emerge from four key areas: (1) the conditions and decision-making processes surrounding college entry (Alon and Tienda 2007; Bennett and Xie 2003; Merolla and Jackson 2014; Morgan 2005; Perna 2006); (2) the match between student preparation and college destination (Alon and Tienda 2005; Belasco and Trivette 2015; Black, Cortes, and Lincove 2015; Kurlaender and Grodsky 2013); (3) college quality (Alon 2015; Bowen and Bok 1998; Bowen et al. 2009; Small and Winship 2007); and (4) students' experiences while attending college, especially pertaining to academic performance and social engagement (Armstrong and Hamilton 2013; Bowen et al. 2009; Braxton, Hirschy, and McClendon 2004; Charles et al. 2009; Mullen 2010; Stuber 2012; Tinto 1993). We orient our discussion of the literature around these four main areas.

Pre-college Sources of the BA Completion Gap

The BA completion gap stems from a combination of group differences in starting resources, group differences in college-entry rates, and group differences in college completion for those who enter college. Therefore, an explanation of the BA gap must adequately detail black-white discrepancies in initial resources and account for their impact on college entry and completion. A large literature exists on the subject of race differences in education. However, and perhaps surprisingly given the importance of the topic, existing studies are typically wanting on one or more of these important conditions.

The first issue concerns the sources of group disadvantage. As abundant research demonstrates, traditionally underrepresented minority students experience comparatively poorer academic preparation for college (Deil-Amen and DeLuca 2010; Jennings et al. 2015; Perna 2006); insufficient guidance during the college admissions process (Belasco 2013; Hill 2008; Hoxby and Avery 2013; Perna et al. 2008; Roderick, Coca, and Nagaoka 2011), especially pertaining to guidance about finances (De La Rosa 2006; King 2004; Kirst and Venezia 2004); inadequate financial resources at the state and federal levels (Mumper 2003; Perna 2010; Titus 2006); and a host of social challenges stemming from inexperience with the college-going process and from unmet expectations regarding viable college options (Charles, Roscigno, and Torres 2007; Kim and Schneider 2005; Morgan 2005; Mullen 2010; Perna and Titus 2004). The distribution and experience of poverty, especially as related to neighborhood segregation, also affects students' educational outcomes (Rich and Jennings 2015), limiting the likelihood of high school completion and four-year-college entry for black students, in particular (DeLuca, Clampet-Lundquist, and Edin 2016; Rosenblatt, Edin, and Zhu 2015; Wodtke, Harding, and Elwert 2011).

Despite the multifaceted character of racial disadvantage, studies of the BA gap typically use simplified measures of resources and do not study the consequences of earlier transitions on later outcomes. Early studies using simplified specifications of resources have found that black students are more likely than white students to attend four-year colleges net of pre-college socioeconomic and academic characteristics (Alexander, Holupka, and Pallas 1987; Kane and Spizman 1994; Rivkin 1995). More recent studies support these earlier findings (Bennett and Lutz 2009; Bennett and Xie 2003; Black and Sufi 2002), but they do not consider the impact of enrollment patterns on students' college experiences or

college outcomes. Moreover, these studies use only basic socioeconomic and academic control variables to produce the net effect of race on enrollment.

Some studies do make the connection between college entry and college completion (Alon 2015; Bound, Lovenheim, and Turner 2010; Light and Strayer 2000; Merolla 2017; Venti and Wise 1983), but none of these studies estimates the sources of the BA completion gap using detailed measures of pre-college and college-level experiences, including information from student transcripts. This issue is important because transcript data are required to establish with confidence the role that academic performance plays in generating the completion gap.[2] The absence of detailed non-academic experiences is also problematic given their demonstrated importance in college-going trajectories (Bowen et al. 2009; Jennings et al. 2015; Morgan 2005). In short, we have learned a great deal from the existing literature, but the many partial views of this complicated process give an incomplete picture of the sources of the BA gap and raise many questions.

The Question of Match

Students are not solely responsible for their enrollment outcomes. Many colleges and universities serve as gatekeepers, limiting the pool of matriculants through their admissions decisions (Alon 2009; Karabel 2005; Karen 1990; Stevens 2009). When examining college destinations among minority students, the question of "match" between students' pre-college credentials and college quality often emerges (e.g., Alon 2015; Bowen and Bok 1998; Bowen et al. 2009; Hoxby and Avery 2013).[3] Bowen and colleagues (2009) use data from Maryland, North Carolina, Ohio, and Virginia and find that black students are more likely than white students to undermatch, as are low-socioeconomic status (SES) students and first-generation college students. Bowen and colleagues conclude that the "undermatch penalty" on BA completion rates is 15 percentage points, with students

who match completing a BA within six years 81 percent of the time, and those who undermatch graduating at a rate of only 66 percent.[4] Belasco and Trivette (2015) draw on nationally representative data to arrive at different findings than Bowen and colleagues, suggesting that white students are more likely than traditionally underrepresented minorities to undermatch. This discrepancy might emerge because Belasco and Trivette control for a richer array of covariates. However, their inclusion of college preferences among their covariates conflates the structure of matches with student anticipation of these matches; moreover, Belasco and Trivette do not address the implications of match quality for college completion rates.

Scholars also have focused on "overmatch," typically in the context of affirmative action policies. Some scholars and public officials assert that affirmative action policies backfire by setting minority students up for failure in challenging academic environments (Clegg and Thompson 2012; Light and Strayer 2000; Sander and Taylor 2012; Thernstrom and Thernstrom 1997).[5] Yet numerous scholarly articles and a recent book (Alon 2015) provide evidence against this position; for example, Alon and Tienda (2005) use nationally representative data to demonstrate that selective institutions increase the likelihood of degree completion for black students by 19 percent and for Hispanic students by 12 percent. Other scholars have confirmed the positive impact of selective institutions on overmatched students using a variety of data sources (Alon 2015; Bowen and Bok 1998; Bowen et al. 2009; Espenshade and Radford 2009; Fischer and Massey 2007; Hoekstra 2009; Kurlaender and Grodsky 2013; Small and Winship 2007).

What is missing from this literature is an evaluation of the impact of matching or mismatching on the overall BA gap. This literature also has not explicated the reasons why matching or mismatching matters for the probability of graduation. Providing an adequate explanation requires that we pay attention to racial differences in the impact of

college quality for students' likelihood of BA completion.

The Role of College Quality

Elite institutions have a long history of guarding the privilege of elites (or elites-in-the-making) through their admissions practices, and their selection process substantially increases their graduation rates. For most Ivy League universities, four-year completion rates hover between 85 and 90 percent (*U.S. News and World Report* 2017). In contrast, the six-year graduation rate of first-time, full-time freshmen is 86 percent at top public universities and just 51 percent at the least selective public universities (Bowen et al. 2009).

This sharp contrast in graduation rates points to the fact that more academically prepared students typically graduate at higher rates. But it also raises the question of whether elite colleges elevate BA completion net of student inputs. Perhaps for this reason, much of the sociological research on college-level experiences and outcomes among minority and low-SES students focuses on highly selective institutions. In particular, scholars have found that such institutions increase degree completion rates, labor market earnings, and civic participation among minority and low-SES students (Alon 2015; Bowen and Bok 1998; Bowen et al. 2009; Dale and Krueger 2014; Fischer and Massey 2007; Hoekstra 2009; Kurlaender and Grodsky 2013; Small and Winship 2007).

Yet despite this strong empirical evidence, only a small proportion of minority and low-SES students actually experience the benefits of the highest quality colleges. The great majority—around 85 percent, according to our calculations—matriculate at lower-resourced institutions (Kirst and Stevens 2015). It is therefore important to use our knowledge of students' trajectories within elite and non-elite four-year colleges to understand the role of college quality on the BA gap. It is also important to study the impact of students' actual experiences within higher-education settings on degree completion outcomes.

Gaps in Academic and Social Experiences within College Settings

Students attending the same college have widely varying academic and social experiences, and this variation appears to be patterned by race, gender, and social class (Armstrong and Hamilton 2013; Gerber and Cheung 2008; Jack 2016; Pascarella and Terenzini 1991, 2005; Stevens, Armstrong, and Arum 2008; Stuber 2012). The most prominent theory of college dropout within four-year settings, devised by Vincent Tinto (1975, 1993), identifies two key axes driving college persistence: social engagement and academic integration. Tinto argues that high levels of social engagement, paired with strong academic integration and achievement, combat the possibility of dropping out. Despite the usefulness of this framework, Tinto's theory has been extensively critiqued (even by Tinto himself) due to its singular focus on traditional, mostly white college students attending residential colleges (Attinasi 1989; Bean and Metzner 1985; Braxton, Sullivan, and Johnson 1997; Pascarella, Duby, and Iverson 1983; Tierney 1991; Tinto 2000).

Charles and colleagues (2009) address this criticism by focusing on differences between white, black, Hispanic, and Asian students' experiences. In particular, Charles and colleagues (2009:226 [emphasis in original text]) argue that two parallel processes can explain student persistence: "a mostly *social process of persistence* by which students derive satisfaction and become attached to the institution, and a mostly *academic process of achievement* whereby students earn good grades and steadily accumulate course credits." Both processes contribute to persistence, but the authors conclude that social engagement is more predictive than academic achievement of students' decisions to remain in college, whether black or white. Yet Charles and colleagues arrive at this conclusion by studying only the first two years of college and only elite, four-year settings. It is therefore possible that certain aspects of the student experience, such as social engagement and satisfaction,

which matter early on in the college career or in elite colleges, are not as meaningful over a longer time window or in less selective settings.

In light of these possibilities, we turn to an alternative model proposed by Braxton and colleagues (2004) based on their examination of commuter students and settings. This model is particularly useful for our study because commuter colleges represent over 50 percent of all four-year institutions (Indiana University Center for Postsecondary Research N.d.), and a large proportion of black students attend such colleges (Alon 2015; Snyder et al. 2016: Table 306.20). Contrary to Charles and colleagues (2009), Braxton and colleagues suggest that the main driver of continued enrollment among commuter students is academic achievement, even after accounting for student entry characteristics, external factors like finances and work, the internal campus environment, and students' commitment to sustained enrollment. Braxton and colleagues also argue that social engagement is not as central to persistence due to the multiple, competing priorities that typically shape commuter students' lives—a balancing act quite familiar to students in non-selective colleges regardless of students' place of residence (Deil-Amen 2015; Kirst and Stevens 2015). Braxton and colleagues' model therefore suggests that college quality and type interact with student background to determine which college-level experiences—academic or social—matter most for black students' degree completion outcomes. The authors do not, however, provide a strong empirical basis for their assertions, which creates uncertainty about their validity.

Taking both Charles and colleagues' (2009) and Braxton and colleagues' (2004) studies into account, we evaluate the relative importance of academic achievement and social engagement in explaining the BA gap. Yet our approach differs in important ways from both of these works. Unlike Charles and colleagues, we analyze the entire distribution of college-going destinations rather than elite colleges, enabling a population-level perspective. We also define "social engagement" slightly differently, with a greater emphasis on "high impact" activities in college, and we focus on students' entire postsecondary careers rather than the first two years (we address these issues below). Distinct from Braxton and colleagues, we operationalize and empirically test assertions regarding the greater importance of academic achievement, while also extending key aspects of their model to all four-year students rather than just commuting students. In doing so, we are able to provide an account of how academic achievement and social engagement affect BA completion for black and white students across the entire range of college destinations.

Summary

Taken together, the existing literature on college enrollment and college experiences sheds light on key areas of distinction between black and white students. First, black students, on average, possess fewer academic, social, and economic resources prior to college entry. Second, black students appear more likely than white students to enroll in four-year colleges despite these resource gaps, yet they also attend lower-quality colleges than white students. Third, once they arrive in college, both black and white students must navigate the academic and social dimensions of their institutions. White students may have an easier time in doing so because of the substantial resource advantages they possess relative to black students at the point of college entry.

What remains less clear is how each of these differences contributes to the BA completion gap. We know resource gaps are enduring, but we do not know how much they continue to matter once students arrive at college. It also is unclear to what extent race differences in decision-making affect the completion gap. Additionally, we know relatively little about the aggregate effects of the differing distribution of college selectivity for black and white students, net of their precollege attributes, on the black-white BA gap. Finally, it is unclear to what extent college

experiences, either social or academic, might explain the BA gap.

Boudon's primary/secondary effects frame predicts that group differences in decision-making will compound the disadvantage that comes from group differences in resources. As we have noted, however, the status of being a black student in the United States both reinforces and offsets various forms of disadvantage and advantage. This more complex process makes understanding the sources and consequences of the BA completion gap an intellectually challenging, as well as socially important, issue.

DATA

We primarily draw our data from ELS 2002, collected by the National Center for Educational Statistics (NCES). ELS includes a nationally representative sample of more than 15,000 students through four waves of data collection: the 2002 base round, at which point all students were in 10th grade; a first follow-up in 2004, when most students were in 12th grade; a second follow-up in 2006, which traces students into either their first two years of postsecondary education or the workforce; and a third follow-up in 2012, which captures information about students' collegiate experiences and outcomes. ELS also includes postsecondary transcript data, collected in 2014, which we use to incorporate curricular information for college entrants.[6] The NCES drew the initial ELS sample from a representative distribution of 750 high schools. Because data collection began when students were in high school, we are able to gather detailed information on pre-college academics in addition to postsecondary enrollment decisions, experiences, and persistence over time.

Our focal population is all self-identified, non-Hispanic black and white students who completed a high school diploma or GED (we refer to this group as "high school graduates"); we exclude students who dropped out of high school, because they would be largely ineligible for college entry. Our pre-college sample consists of 8,980 students, 7,410 of whom

identify as white (82.5 percent) and 1,570 of whom identify as black (17.5 percent).[7] Of the 8,980 students in the high school graduate sample, 45.8 percent enrolled in a four-year college as their first institution by September 2006. This group represents 47.6 percent of white high school graduates and 37.7 percent of black high school graduates. Another 11.2 percent of white high school graduates and 7.7 percent of black high school graduates began at a two-year college and transferred to a four-year college by September 2006.

Existing literature indicates that both transferring from a two-year to a four-year college and delaying college entry can affect students' completion outcomes (Andrews, Li, and Lovenheim 2014; Bozick and DeLuca 2005; Goldrick-Rab 2006; Melguizo, Kienzl, and Alfonso 2011; Roksa and Velez 2012). Accordingly, we performed analyses of students who started postsecondary education at a four-year college as well as the entire group of four-year-college students, including those who transferred from two-year to four-year colleges. We also used two different temporal windows: an "immediate" college-entry window for students who were part of the 2002 sophomore sample and began college by September 2004 (87 percent of four-year beginners and 88 percent of transfer students), and an "extended" college-entry window for 2002 cohort students who began college by September 2006 (94 percent of four-year beginners and 98 percent of transfer students).

Our results are largely consistent across these models. However, extant literature demonstrates that two- to four-year transfer students are a qualitatively different group of students than four-year beginners, often representing a higher proportion of low-income and minority students who confront unique academic and social challenges en route to BA completion (Bowen et al. 2009; Melguizo et al. 2011; Reynolds and DesJardins 2009).[8] We therefore limit results in the main text to respondents who began their postsecondary education in a four-year college to present a more focused analysis. In Part B of the online supplement, we highlight minor differences

Table 1. Distribution of Student Departure by Year among Non-completers

	Percent of Student Dropouts
June 2005	10.8
June 2006	15.0
June 2007	10.0
June 2008	10.0
June 2009	9.5
June 2010	9.1
June 2011	7.6
June 2012	8.6
June 2013	10.4
Still Enrolled	9.0
All Non-completers	100.0

Source: ELS 2012 and postsecondary transcript data.

in results that occur when we include both four-year beginners and transfer students.

In summary, we are left with a seven- to nine-year window to evaluate whether students complete a bachelor's degree.[9] Because only 3 percent of the total college student sample remains enrolled past June 2013, we use "degree non-completion" and "dropout" synonymously in our analysis. To be clear, dropout means enrolling in a four-year program by September 2006 and not receiving a bachelor's degree by June 2013.

Of the students who started at a four-year college, 25.4 percent of white students and 50.4 percent of black students did not complete a bachelor's degree within this seven- to nine-year window. These rates indicate that 36 percent of white high school graduates and 19 percent of black high school graduates ultimately earned a BA within seven to nine years of four-year-college entry, making the overall BA attainment gap 17 percentage points. Table 1 shows a summary of the distribution of student departure by year. We use an appropriate panel weight, constructed by the NCES, to make population inferences for our focal sample. When properly weighted, the ELS data show rates of college entry and completion that are consistent with data from the NCES.[10]

We draw our independent variables from the extensive information provided by ELS regarding students' schooling experiences prior to college (descriptive statistics for all variables in our analysis and the source of each variable can be found in Appendix Tables A1, A2, and A3). The demographic and socioeconomic indicators we incorporate represent the core elements of well-known status attainment models, including the Blau-Duncan model (1967) and the Wisconsin model (Sewell, Haller, and Ohlendorf 1970; Sewell, Haller, and Portes 1969), and the academic performance variables are strongly related to both college entry and completion (Adelman 2006). We incorporate a core set of academic variables measured from student transcripts, including high school GPA and curriculum;[11] we enter high school GPA into our models as a set of categories to allow for nonlinear effects of GPA on the probability of college dropout.[12] We also include a broader set of self-reported academic variables as well as measures related to friends, work, and attitudes toward college and career. Including students' own expectations concerning whether they will graduate from college is problematic; to the extent that expectations are an expression of commitment, they affect the probability of dropout. Yet, to the extent that they are a reliable prediction of what will happen in the future, they encompass the effects of all other pre-college variables, which themselves affect the probability of dropout. We omit the variable capturing students' expectations for college graduation in order to ascertain more accurately the effects of the other pre-college variables in our analysis. As a check, we also estimate models for dropout that include this variable, and the results do not change.

Beyond pre-college variables, we draw on key pieces of information concerning students' postsecondary academic and social experiences and the colleges students attend. We use ELS transcript data rather than self-reported GPA and curricular measures to examine academics, which increases confidence in the validity of our estimates. We use the college

identifiers in the ELS data to merge information from the IPEDS into our student-level data, which allows us to study the effects of institution-level characteristics, such as selectivity and financial support, on dropout. Our selectivity measure draws on Barron's *Profile of American Colleges* to distinguish between the 100 most selective colleges and the more general "most selective" category used in the ELS data, which relies on the Carnegie Classification. We use the characteristics of the first institution students attended, because students' first college represents their initial encounter with postsecondary education and therefore shapes future actions.[13]

Overall, 20 percent of cases in our sample include missing values in at least one variable. We handle this missingness using multiple imputation with chained equations (Allison 2002; Peugh and Enders 2004; Rubin 1976). Multiple imputation techniques assume that data are missing at random, conditional on all other covariates in the imputation model. This assumption is rarely fully met in practice, even with as extensive a set of covariates as are included in the present study. The question thus becomes whether our results would change after accounting for missingness. In the ELS data, some variables—such as those related to students' attitudes concerning college and career—include missingness of about 15 percent. Others, such as those related to parents' education, family income, high school GPA, college GPA, and the college social experience, have a smaller proportion of missing values, around 10 percent or less. We evaluate the patterns of missingness for black and white students on the more highly missing "attitudes" variables.[14] We conclude that the net effect of excluding students with missing attitudes variables from our analysis is to introduce a larger upward bias into the college-entry rates for black students than for white students, while also biasing the dropout rate downward for both groups. These biases would cause us to observe a stronger effect of paradoxical persistence at the point of college entry while causing very little change in our observations

regarding dropout. To gain further insight into the potential consequences of missing data, we exclude all variables with high levels of missing data from our analysis (results available by request). Our conclusions do not change in light of this test.

To increase the interpretability of our results, we estimate models using a set of substantively meaningful factors obtained from polychoric factor analyses on the full set of covariates. Models using these factors yield predictions within at most .03 of those using individual variables, which suggests the factors are both statistically accurate and useful because of their interpretability. We standardize all factors so they have a mean of 0 and a standard deviation of 1. The factor groupings and the variables that constitute them are described in Appendix Tables A4 and A5.

Our parsimonious model contains five pre-college factors: family stability and SES, academic performance, curricular risk, attitudes regarding college and career, and connectedness to home. At the institution level, we have four factors, college quality, curricular experience, financial support, and location, plus variables measuring the proportion of the student body that is black and the proportion that is white.[15] We use the institutional quality factor in multiple analyses; this factor is composed of college selectivity, institution sector, total amount spent per full-time student enrollee per year, average full-time faculty salary, and average tuition.

For college experiences, we have three factors (curricular risk, academic integration, and social engagement), two transcript-based measures (field of study[16] and standardized GPA), and a variable indicating students' place of residence. As with the institutional quality factor, we use the social engagement factor in several analyses, so it is clarifying to list its components: participation in "high impact" activities such as internships, community engagement, or study abroad; participation in extracurricular activities; participation in intramural sports; number of negative life events that transpired during college; and whether students' first four-year college was

outside their state of residence. We include these latter two variables as proxies for the extent to which students have the time to engage socially; negative life events might interfere with participation in social activities, and attending college out of state, which correlates with higher SES and on-campus residence, may facilitate greater social engagement.

METHODS

Because the processes of college completion or non-completion involve multiple stages, we generally proceed with the analysis in sequential steps. One statistical approach we use across all steps, however, is Fairlie's (2005) decomposition technique. This technique uses logistic regression and counterfactual substitution of coefficient values to assess the difference in outcomes between two groups. It specifically isolates the proportion of the overall difference that is accounted for by group differences in covariates versus group differences in coefficients.[17] We use black students as our reference group for the Fairlie decomposition, as well as randomized variable inputs to ensure robustness of results, although the outcomes are similar regardless of whether we use black, white, or pooled students as the reference group and regardless of whether or not we insert variables randomly. We also compute Fairlie decompositions using the polychoric factors described in the previous section, rather than individual variables, to increase interpretability; both strategies produce comparable results.

The first step of our analysis is to assess race differences in the probability of entering a four-year college, given high school graduation. We decompose race differences in terms of pre-college characteristics, captured in the independent variables, and students' response to these characteristics, captured in coefficient values. We estimate race-specific models for four-year-college entry as a function of pre-college attributes and experiences for all high school diploma recipients.[18] We perform statistical tests to establish whether

discrepancies in entry probabilities are due to different responses to pre-college characteristics in addition to race differences in the distribution of these characteristics. These regressions take the following form:

$$
\begin{aligned}
logit\left[P(College = 1)\right] &= \alpha + \beta_1 SES \\
&+ \beta_2 HSAchievement \\
&+ \beta_3 HSCurriculum \\
&+ \beta_4 CollegeAttitudes \\
&+ \beta_5 HomeConnection
\end{aligned}
\tag{1}
$$

where the variables are the polychoric factors or the individual variables that make up these factors, depending on the model. We subsequently decompose overall race differences in college entry into those resulting from pre-college attributes (distribution) versus students' responses to those attributes (coefficients) using counterfactual analysis. The decomposition uses the variables or factors captured in Equation 1; we compute the results both ways.

In addition to analyses of college entry based on counterfactual procedures, we use the heuristic of the (black or white) "pre-college dropout risk index." This heuristic allows us to compare college-entry probabilities for black and white high school graduates as a function of their pre-college characteristics and resources, weighted by the importance of these variables for predicting college dropout. Our estimate of the pre-college dropout risk is the predicted probability of college dropout from a logistic regression on the full set of pre-college variables. We estimate this model based on all high school graduates who began their higher education in a four-year college. We then use out-of-sample prediction to compute a value for all high school graduates, whether or not they entered a four-year college.[19] At the point of college entry, we use the pre-college dropout risk index to make graphical comparisons of the college-entry probability for black and white high school graduates as a function of their estimated probability of dropping out of college if they were to enter.[20] We also use it to match black

and white students with equivalent pre-college dropout risk for the purpose of counterfactual analysis. Appendix Table A6 shows the coefficient results of the regression used to create the index.

The second and third steps in our analysis address how the matching process and college selectivity affect completion among black and white students who enter college. We first use our pre-college dropout index to examine matching between black and white students and college destinations of various levels of selectivity. We then analyze the implications of these differences by regressing dropout on dropout risk and institutional quality, first in separate models for black and white students to study within-race differences, and next in a pooled model to test for between-race differences in the estimated coefficients. We present marginal effects predictions to demonstrate the differing effect of institutional quality on college completion as a function of race and pre-college dropout risk, using the standardized linear composite described in the Data section as our measure for institutional quality.

The marginal effects illustrate the impact of institutional quality for individual students, but they do not allow us to quantify their effect on the population-level dropout rate for black and white students. We therefore calculate hypothetical dropout rates for black students under the counterfactual condition where black students attend the same quality colleges as their white peers with comparable pre-college dropout risk. On average, this intervention would raise the quality distribution among the black student population. To produce these counterfactual rates, we group black and white students together based on their pre-college dropout risk, using 590 percentile groupings to align with the total number of black college-goers. We then assign each black student the average institutional quality (drawn from the institutional quality factor) of the corresponding percentile grouping of the white college-quality distribution. Finally, we predict the probability of black college dropout using the coefficients of the black-specific regression and the new, coun-

terfactual institutional quality values substituted for actual institutional quality.

The fourth step in our analysis is to study the effect of college experiences, both curricular (e.g., GPA) and non-curricular (e.g., social engagement), on the BA gap.[21] We do this by estimating a logistic regression followed by a joint test for the interactions of race and each of the college experience variables described in the Data section. The logistic regression takes the following form:

$$
\begin{aligned}
logit\left[P\left(Dropout=1\right)\right] &= \alpha + \beta_1 Black \\
&+ \beta_2 Female + \beta_3 PreCollegeFactors \\
&+ \beta_4 InstitutionVars\&Factors \\
&+ \beta_5 CollExperienceVars\&Factors \\
&+ \beta_6 Black \times Female + \beta_7 Black \\
&\times PreCollegeFactors + \beta_8 Black \\
&\times InstitutionVars\&Factors \\
&+ \beta_9 Black \times CollExperience \\
&Vars\&Factors
\end{aligned}
\tag{2}
$$

where *PreCollegeFactors, InstitutionFactors*, and *CollExperienceVars&Factors* represent vectors containing the individual variables and factors described in the Data section. We focus on college GPA and social engagement, studying their respective contributions to the observed race gap through predicted marginal effects models, logistic regression, and counterfactual analysis.

We next focus on explaining the role of college GPA in producing the black-white BA completion gap. Specifically, we quantify the impact of differences in the black and white GPA distributions on dropout using a similar counterfactual strategy to that described earlier for the college quality analysis. First, we estimate a new race-specific dropout model for black college students on pre-college, institutional, and college experience variables, omitting the pre-college academic variables to increase the realism of the analysis. We then group black and white students together, again using 590 percentile groupings. We subsequently predict the probability

Table 2. Fairlie Decomposition of the Proportion of the Dropout Gap Explained by Pre-college Factors

	Descriptive Data
Black Dropout Rate	.50
White Dropout Rate	.25
Difference	−.25
	Amount Explained by Factors and Variables
Female	−.0001
Pre-college SES and Family Composition	−.02
Pre-college Academic Performance	−.11
Pre-college Curricular Risk	−.04
Attitudes toward College and Career	−.002
Connection to Home	−.02
Total Explained	−.19 (76%)

Source: ELS 2002, 2004, 2012, and postsecondary transcript data.
Note: The decomposition is performed using black students as the reference group and variables are inserted into the decomposition randomly to ensure robustness of results. However, results are similar regardless of which group (black, white, or pooled) serves as the reference and whether or not variables are inserted randomly. Based on NCES reporting standards, percentages must be rounded to no more than two decimal places.

of black college dropout from the coefficients of the black-specific regression with these counterfactual, white grade values substituted for the actual grades. As a robustness check, we compute a Fairlie decomposition using the regression described in Equation 2.

We conclude with one final analysis of the relationship between pre-college dropout risk and college experiences. We do so by computing a new "post-college-entry" dropout risk index by regressing dropout on pre-college factors as well as on college GPA and the institutional quality factor. We compare black students' pre-college dropout risk with this new, post-college-entry dropout risk to quantify how strongly black students' college persistence outcomes are predicted by their pre-college experiences versus the combination of their pre-college and most pertinent college experiences.

PRE-COLLEGE PREDICTORS OF COLLEGE DROPOUT

We begin by summarizing the distribution and impact of pre-college resources and experiences on college dropout for four-year-college entrants. The distribution of key variables

such as high school GPA, the intensity of high school curriculum, the number of academic risk factors, family income, and parental education differ substantially between black and white students (see Appendix Table A1). These statistics highlight black students' resource disadvantage relative to white students prior to college entry.

Table 2 reports results of a Fairlie decomposition of the BA completion gap given the pre-college polychoric factors we describe in the Data section.[22] The results indicate that the distribution of the pre-college academic performance factor has the greatest impact on the overall BA gap, accounting for 44 percent of the total (−.11/−.25). By adding the pre-college curricular risk factor and the SES/family composition factor, we are able to explain 68 percent of the total gap (−.17/−.25); with all factors included, we can explain 76 percent (−.19/−.25).[23] This latter proportion reflects the substantial contribution of race differences in the distribution of pre-college resources and experiences to the overall BA gap. Yet it also suggests that the remaining 24 percent of the BA gap emerges from black and white students' *responses* to their pre-college resources and experiences.[24]

RACE-SPECIFIC RESPONSES TO PRE-COLLEGE CHARACTERISTICS AT COLLEGE ENTRY

In general, the factors that predict whether a high school graduate enrolls in a four-year college are similar to the factors that predict dropout. Table 3 reports separate regression results for college entry for black and white students.[25] A chi-square test of race differences in the coefficients in the college-entry model rejects the hypothesis of no difference at the $p < .001$ level.

In Figure 1, we examine the impact of black and white students' differing entry decisions in relation to dropout by plotting entry as a function of students' scores on the pre-college dropout risk index. Panel A plots the differences in black and white students' pre-college dropout risk based on college-entry status; panel B shows the probability of entering college given pre-college dropout risk. Taking the figures together with the regression results in Table 3, we see that black high school graduates differ in three important ways from white high school graduates. First, the pre-college dropout risk distribution for black high school graduates and black four-year entrants is much more concentrated in the high-risk region than it is for white students. Second, black students are generally more likely than white students to enroll in four-year colleges net of their pre-college dropout risk. Third, the race gap in the probability of enrollment rises with the level of dropout risk, suggesting that black students' response to dropout risk differs from that of white students.

As panel A in Figure 1 shows, a considerable number of white high school graduates have a very low probability of four-year-college non-completion. The dropout distribution then dips through the middle probability region and rises again to reflect the sizable group of white high school graduates who have high probabilities of four-year non-completion. The self and institutional selection process reshapes this distribution for the subset of white students that actually enroll in a four-year college in our sample. These students have a unimodal, sharply peaked distribution centered at relatively low dropout probabilities, with density falling to very low levels as the risk of dropout increases.

The dropout risk distribution for black high school graduates looks quite different from that for white high school graduates. The curve for black high school graduates is sharply peaked in the high-dropout risk portion of the distribution, qualitatively resembling the mirror opposite of the distribution for white college entrants. The process of self- and institutional-selection transforms the shape of the black four-year-college student distribution, but the result appears even more distinct from the white distribution. Rather than being peaked in the region of low dropout risk, the black college student distribution is flatter across the entire range of dropout probabilities. In sharp contrast to the white college student population, black students with high dropout probabilities are as common among four-year college-goers as are black students with low dropout probabilities.[26]

Panel B of Figure 1 shows an important reason why the filtering process from high school graduates to four-year beginners is different for black and white students. For both groups of students, the probability of enrolling in four-year college declines as the probability of dropout rises. However, the probability of college entry declines more steeply with dropout risk for white students than for black students. Consequently, the process of selection into college produces a larger at-risk pool of black students than would be the case if decisions about college entry were similar for both groups of students.[27]

In summary, there are two reasons why black college students have a higher risk of dropout than white college students. First, the population of black high school graduates has a higher average risk of dropout than does the population of white graduates, largely due to black students' greater resource disadvantage expressed in the distribution of pre-college variables. This finding aligns with the logic of

Table 3. Four-Year-College Entry Model by Race

	Black (*n* = 1,570)		White (*n* = 7,410)	
	Coef.	Std. Err.	Coef.	Std. Err.
Female	−.30*	.148	−.25***	.065
Age	−.48**	.149	−.20***	.055
Income $35 to $50K	.37	.196	.04	.107
Income $50 to $75K	.41*	.218	.14	.103
Income $75 to $100K	1.09**	.269	.24*	.115
Income > $100K	.79*	.323	.37**	.119
Parents Married	.17	.228	.10	.138
Dad Present	−.35	.244	−.47**	.144
Mother's Ed.: College or More	.02	.156	.04	.068
Father's Ed.: College or More	.19	.154	.17**	.070
HS GPA: 3.0 to 3.5	−.02	.177	.31**	.097
HS GPA: 3.5+	.31	.201	.53***	.093
HS Curriculum: Intense	.44	.278	−.18	.106
HS Curriculum: Less Intense	−.003	.221	−.26**	.082
HS Curriculum: Least Intense	−.50*	.242	−.60***	.103
Academic Risk: One Risk Factor	.07	.201	−.17*	.073
Academic Risk: Two or More Risk Factors	.01	.243	−.27*	.018
Talk to Parents about Courses: Sometimes	−.06	.187	−.002	.090
Talk to Parents about Courses: Often	−.17	.208	−.008	.101
Hours per Week on Homework	.06	.041	.03	.019
Hours per Week on Extracurriculars	−.004	.041	.04*	.018
College Financial Aid Offered	1.30***	.147	.75***	.065
Highest Selectivity of College Acceptance: Moderate	1.51***	.169	1.69***	.079
Highest Selectivity of College Acceptance: Most	1.67***	.230	1.94***	.095
Expects Blue-Collar Job	.08	.214	−.31**	.089
Expects White-Collar Job	.27	.178	.06	.073
Importance of Getting Away: Somewhat	−.15	.161	−.06	.070
Importance of Getting Away: Very	−.24	.183	−.11	.089
Importance of Making Money: Somewhat	.19	.305	.11	.093
Importance of Making Money: Very	.31	.303	.21*	.106
Importance of College Reputation: Somewhat	.39	.283	.58***	.118
Importance of College Reputation: Very	.53	.273	.64***	.117
Importance of College Racial Comp.: Somewhat	.23	.173	.06	.071
Importance of College Racial Comp.: Very	.17	.192	.11	.126
Importance of Easy Admission Policy: Somewhat	−.40*	.190	−.06	.073
Importance of Easy Admission Policy: Very	−.74***	.208	−.21*	.106
Importance of Living at Home: Somewhat	−.36*	.173	−.37***	.083
Importance of Living at Home: Very	−.34	.189	−.35***	.094
Hours Worked per Week in HS: 25 Hours or Fewer	.12	.157	−.06	.068
Hours Worked per Week in HS: More Than 25 Hours	.06	.191	−.34**	.099
Frequency of Hanging Out with Friends: Most Days	.22	.189	.29*	.118
Frequency of Hanging Out with Friends: Everyday	.09	.192	.18	.117
Number of Friends Dropped Out of High School	−.11	.103	−.11*	.052
Constant	−2.16***	.596	−1.94***	.270
Actual Predicted Entry Rate (percentage)	.38***	.011	.48***	.005
Counterfactual Predicted Entry Rate (percentage)	.33***	.007	.52***	.017

Source: ELS 2002, 2004, 2012, and postsecondary transcript data.
*Note:* Coefficients reported as effects on log odds save for entry rates, which are reported as percentages; standard errors reported for two-tailed tests. Based on NCES reporting standards, coefficients must be rounded to no more than two decimal places and standard errors must be rounded to one decimal place more.
*z < .05; **z < .01; ***z < .001.
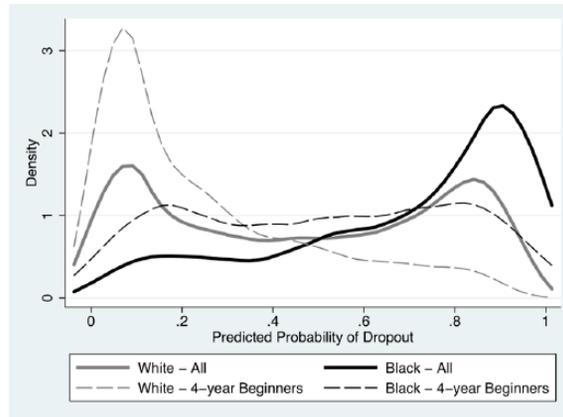
A. The Distribution of Dropout Risk for High School
   Graduates and College Beginners
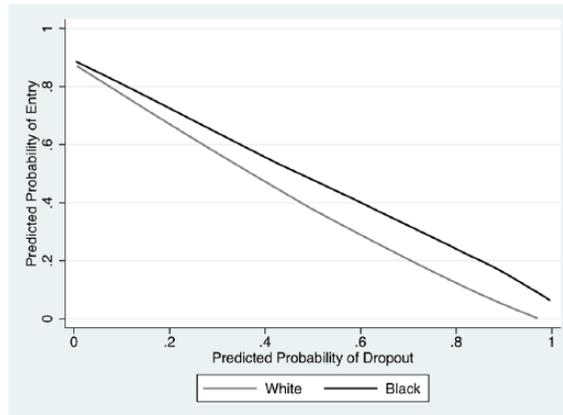
B. Entry Probability by Dropout Risk for Black and White
   High School Graduates

Figure 1. Dropout Risk and College Entry
Source: ELS 2002, 2004, 2012, and postsecondary transcript data.

primary effects: black high school graduates are, in the aggregate, less prepared than white high school graduates to complete a BA. Second, racial differences in students' responses to their resources during the application, selection, and enrollment processes amplify racial discrepancies in those initial resources. The result is a larger and more at-risk group of black students attending four-year college than would be the case if black students entered four-year college according to the same pattern that we observe for white students. This finding challenges the standard expectation concerning secondary effects by demonstrating black students' *greater* willingness than white students to make mobility-enhancing decisions (i.e., to enroll in four-year college).

However, we have yet to quantify the impact of these mobility-enhancing decisions on the BA completion gap. To do so, we give black students the same probability of entering four-year college as white students with the same pre-college dropout risk, as described in the Methods section. We then use these counterfactual entry probabilities to calculate black students' counterfactual dropout rates. Using white students' entry coefficients, the four-year-college entry rate among black four-year beginners would decline from 37.7 percent to 33.1 percent; the dropout rate would decrease slightly from 50.4 percent to 48.4 percent. These adjustments would reduce the proportion of BA recipients among black high school graduates by 9 percent, from 18.7 to 17.1 percent. Thus, black

students' greater mobility-enhancing decisions slightly elevate the dropout rate, but they also increase the number of black high school graduates that receive a BA.

We next consider the impact of counterfactually shifting the dropout risk distribution of entering black students so that it more closely resembles the distribution for white students. To maximize the number of black students maintained in the pool of college-goers, we retain all black students with a risk of .5 standard deviations above average and lower.[28] Employing this criterion, the overall number of black entrants would need to fall by at least 53 percent to create a distribution of black four-year college-goers that closely resembles the distribution for white students in terms of pre-college dropout risk. Such a shift would dramatically diminish dropout among black students, achieving white students' rate of 25.4 percent. Yet it also would cause the overall number of college degrees awarded to black students to fall by 30 percent, from about 200,000 to 140,000. The overall proportion of black four-year beginners with BAs would fall by nearly 40 percent, from 18.7 percent to 11.3 percent.

This exercise reveals the core of paradoxical persistence: although the dropout rate of black students at four-year colleges is far higher than that of white students, reducing it under the current institutional context of higher education would require a significant decrease in the proportion of black high school graduates earning bachelor's degrees. Simply put, *decreasing* the BA completion gap by making black students' entry decisions or their dropout risk distribution the same as white students' would have the detrimental effect of *increasing* the BA attainment gap, or the proportion of all high school graduates that earn bachelor's degrees.

THE ROLE OF COLLEGE MATCH AND COLLEGE QUALITY

How do postsecondary institutions affect the BA completion gap? Many of the most

talented black students often do not apply to, or match with, the most selective colleges (Black et al. 2015; Bowen et al. 2009). But there is little clarity about race differences in matching across the entire college-quality distribution or how much matching matters for the BA completion gap. To address these issues, we examine black and white students' college destinations as a function of college quality and pre-college dropout risk. Figure 2 depicts the selectivity of black and white students' college destinations as a function of their dropout risk, as well as the overall distribution of college destinations by race.

Panel A in Figure 2 suggests that pre-college dropout risk is a stronger predictor of the quality of postsecondary destination for white students than for black students. The lowest-risk white students cluster in the selective and most selective schools, the mid-risk students attend mid-selective colleges, and the high-risk students enroll in non-selective colleges. In contrast, the relationship between black students' pre-college dropout risk and the selectivity of their college destination is weaker. Panel A in Figure 2 shows substantially more overlap in the interquartile ranges of dropout risk for black students attending selective and mid-selective colleges, in particular, compared with white students. Black students who attend the most selective colleges have considerably higher pre-college dropout risk than do white students enrolling in these colleges. Taken together, these results indicate that pre-college dropout risk has a smaller impact on black students' college-entry decisions than it does for white students. In fact, given their pre-college risk, and compared to white students, a higher proportion of black students appear to overmatch to the highest quality colleges, perhaps due in part to affirmative action policies.

However, this tendency of black students to overmatch must be situated within the wider distribution of college destinations by race. Panel B in Figure 2 shows a large difference in the placement of black and white students across college selectivity tiers. Fifteen percent of black students attend the most selective or selective four-year institutions,
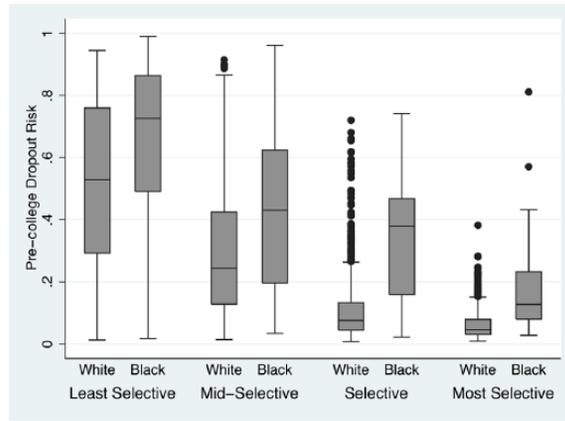
A. College Entry by Pre-college Dropout Risk and Selectivity
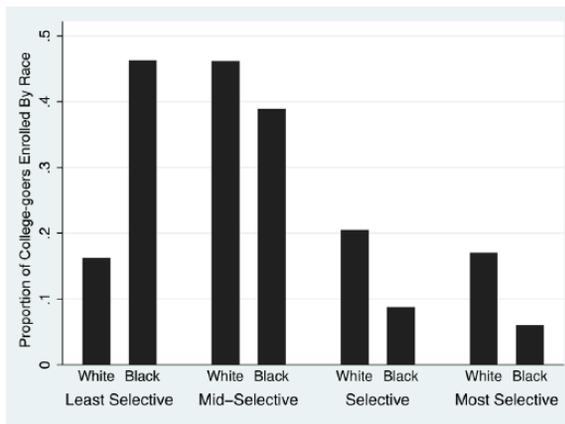
B. Percent of College-goers Enrolled in College Selectivity
    Categories, by Race

Figure 2. Entry Decisions and College Selectivity
Sources: ELS 2002, 2004, 2012, and postsecondary transcript data; Barron's *Profile of American Colleges*
2016.
Note: The box graphs demonstrate the interquartile range of black and white students' respective pre-
college dropout risk in light of the selectivity of their college destinations.

compared to nearly 38 percent of white stu-
dents. Perhaps most striking is the difference
in students attending the least selective col-
leges: 46 percent of black students enroll in
these colleges, compared to 16 percent of
white students. In short, the vast majority of
black students do not enroll in selective col-
leges despite institutional supports.

We examine the consequences of these
distributional and decision-based dynamics
first by evaluating the results of a regression
of dropout on college quality, pre-college
dropout risk, and the interaction of these two
variables (see Table 4).[29] We find that the

effects of institutional quality on dropout do
not differ across the dropout risk distribution
for white or black students. However, we do
find a statistically significant three-way inter-
action between race, institutional quality, and
pre-college dropout risk in the combined
model, as reported in Table 4, Columns 8 and
9. This significant interaction effect provides
evidence that higher-quality institutions
reduce dropout rates for at-risk black students
more than for at-risk white students.

The estimated effect of institutional qual-
ity on dropout for high-risk black students is
large. For black students with a dropout risk

Table 4. Effects of College Quality on Dropout Given Race and Pre-college Dropout Risk

	Model 1. White Students (*n*=3,520)		Model 2. Black Students (*n*=590)		Model 3. Combined (*n*=4,110)		Model 4. Combined, Including Interactions (*n*=4,110)	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Black					.05	.137	.11	.296
Female	−.04	.114	−.02	.239	−.04	.103	−.04	.103
Dropout Risk	4.87***	.298	4.45***	.563	4.80***	.264	4.88***	.302
College Quality	−.61***	.124	−.07	.290	−.53***	.111	−.61***	.124
College Quality × Dropout Risk	.61	.351	−1.08	.595	.27	.293	.61	.350
Black × Dropout Risk							−.42	.638
Black × College Quality							.55	.315
Black × Dropout Risk × College Quality							−1.68**	.690
Constant	−2.55***	.123	−2.44***	.311	−2.38***	.106	−2.55***	.118

Sources: ELS 2002, 2004, 2012, and postsecondary transcript data; Barron's *Profile of American Colleges* 2016; IPEDS 2004 to 2009.
Note: Results reported as effects on log odds; standard errors reported for two-tailed tests. Based on NCES reporting standards, coefficients must be rounded to no more than two decimal places and standard errors must be rounded to one decimal place more.
$^{*}z < .05;$ $^{**}z < .01;$ $^{***}z < .001.$

at the combined black and white population average (roughly the top quartile of black college entrants), the impact of a one standard deviation improvement in college quality is about 7 percentage points, which decreases the predicted marginal dropout rate from 25 to 18 percent. However, for black students with higher dropout risk—one standard deviation above the population average or roughly the middle of the dropout risk distribution for black students—the same increase in college quality decreases the dropout rate by 16 percentage points, from 51 to 35 percent. It therefore becomes clear, in line with Alon (2015), Small and Winship (2007), and others, that improved institutional quality positively affects black students' outcomes, especially among black students with relatively high dropout risk.[30]

These results indicate that higher institutional quality is beneficial for black students, but they do not allow us to quantify the effect of institutional quality on the population-level

dropout rate for this group. We therefore undertake a counterfactual analysis based on the entire college-quality distribution, assigning black students to the same level of college quality as white students with comparable pre-college dropout risk. We first assess the impact of this counterfactual quality assignment on the dropout rates of black students attending the selective and most selective institutions. Comparing the actual dropout rate with the counterfactual dropout rate for this subset of black college students demonstrates the net impact of black students' overmatch to selective institutions on BA completion, given their pre-college dropout risk. We find that black students' current level of overmatching to selective and highly selective colleges lowers the dropout rate of the overall black student population by only .4 percent. However, we find a larger effect of college quality on the overall black dropout rate when we analyze the consequences of race differences in matching for the entire population of black college-goers.

Using the counterfactual quality variable for all black college students, we find their dropout rate would decline from 50.4 percent to 47.5 percent. In this scenario, the BA attainment rate would increase slightly from 18.7 to 19.8 percent (a 5.5 percent gain, compared to the 9 percent gain produced by paradoxical persistence).

These results confirm that despite some black students' tendency to overmatch to high-quality colleges, black students on average undermatch to colleges relative to white students. They also indicate that even if an institutional intervention occurred to equalize match quality among all black students, compared with white students, the effect of such an intervention on BA attainment would be about as large as paradoxical persistence. In contrast, black students' tendency to overmatch to the highest quality colleges, relative to white students with similar dropout risk, which likely occurs in part because of affirmative action, has a much smaller effect than paradoxical persistence on the BA attainment rate. Black students' overmatching yields an actual attainment rate of 18.7 percent, compared with the counterfactual rate of 18.6 percent that would occur without overmatching, a difference of just .5 percent. In short, although institutional structures geared toward increasing black students' attendance at higher-quality colleges have lessened the BA completion and attainment gaps, their effects are equal, if not smaller, in magnitude than those driven by black students' decision-making at the point of college entry.

ACADEMIC AND SOCIAL EXPERIENCES IN COLLEGE

Thus far, we have shown that paradoxical persistence at the point of college entry, motivated by individual agency, increases the BA completion gap while decreasing the BA attainment gap. We also have found that the matching process, together with the college quality distribution, increases the BA completion and attainment gaps. However, our account has not yet explained how students' experiences within four-year colleges affect these gaps. We therefore examine black-white differences in college experiences to disentangle which aspects contribute most to the BA completion gap, and in turn, BA attainment.

We first determine whether college experiences have different effects on black and white students, after holding pre-college and college institution-level variables constant. Table 5 presents these results.[31] A number of variables significantly affect the likelihood of dropout. Declaring a college major in any of our field groupings (compared with remaining undeclared), living on campus rather than at home or at another off-campus residence, and pursuing above-average social engagement all decrease students' likelihood of dropout. In contrast, high levels of remedial courses, course withdrawals, and incomplete courses, captured in the "curricular risk" factor, heighten the odds of dropout for both black and white students. We also find a significant interaction effect related to college GPA: high grades are more protective for black students than for white students. However, a joint test for the interactions of race and each of the college experience variables does not yield strong evidence that college experiences differently affect the probability of dropout for black and white students ($p < .07$).

Our results also demonstrate that college GPA affects dropout more powerfully than social engagement: a chi-square test to evaluate the equality of the two coefficients allows us to reject the hypothesis of equality ($p < .000$). To further examine this result, Figure 3 plots the predicted dropout rate given various levels of social engagement and college GPA for black and white students.[32]

Figure 3 clearly illustrates that college GPA decreases the dropout rate more powerfully than does social engagement for both black and white students. This finding certainly appears to contradict Charles and colleagues' (2009) conclusion that social engagement is more important than college GPA for student persistence, which they drew out of their analysis of student experiences in the first two years of attending elite colleges.

Table 5. Four-Year Dropout Given Pre-college, Institution-Level, and College Experience Factors and Variables (n = 4,110)

	Coef.	Std. Err.
Demographics		
Black	−.12	.579
Female	.31*	.143
Black × Female	−.17	.352
Pre-college Variables		
Pre-college Academic Performance Factor	−.31***	.098
Pre-college Curricular Risk Factor	.22***	.081
Pre-college Family Structure and SES Factor	−.12	.079
Pre-college Connection to Home	.16*	.079
Pre-college Attitudes toward College and Career	−.07	.077
Black × Pre-college Academic Performance	.03	.198
Black × Pre-college Curricular Risk	−.48*	.214
Black × Pre-college Family SES	−.22	.160
Black × Pre-college Connection to Home	.21	.197
Black × Pre-college Attitudes toward College and Career	−.03	.159
Institutional Variables		
College Quality Factor	−.69***	.109
College Curricular Experience Factor	.02	.104
College Financial Support Factor	.11	.095
College Location Factor	−.01	.083
Percent White	−.68	.126
Percent Black	−.51***	.178
Black × College Quality	−.11	.289
Black × College Curricular Experience	.36	.270
Black × College Financial Support	−.27	.182
Black × College Location	−.14	.193
Black × Percent White	.45	.275
Black × Percent Black	.86***	.263
College Experience Variables		
College GPA	−1.22***	.115
College Curricular Risk Factor	.45***	.083
College Academic Integration Factor	−.13	.078
College Social Engagement Factor	−.61***	.090
STEM	−.83***	.199
Arts, Humanities, and Social Science	−.83***	.205
Business, Education, and Trades	−.61***	.090
Live at Home with Parents	.37*	.173
Live on Campus	−.10	.175
Black × College GPA	−.53*	.248
Black × College Curricular Risk	−.30	.156
Black × Academic Integration	.15	.174
Black × Social Engagement	.18	.208
Black × STEM	.36	.459
Black × Arts, Humanities, and Soc. Sci.	−.80	.574
Black × Business, Education, and Trades	−.01	.448
Black × Live with Parents	.42	.471
Black × Live on Campus	−.55	.425
Constant	−1.10***	.183

Sources: ELS 2002, 2004, 2006, 2012, and postsecondary transcript data; Barron's *Profile of American Colleges* 2016; IPEDS 2004 to 2009.
Note: Results reported as effects on log odds; standard errors reported for two-tailed tests. Based on NCES reporting standards, coefficients must be rounded to no more than two decimal places and standard errors must be rounded to one decimal place more.
*z < .05; **z < .01; ***z < .001.

A. Social Engagement
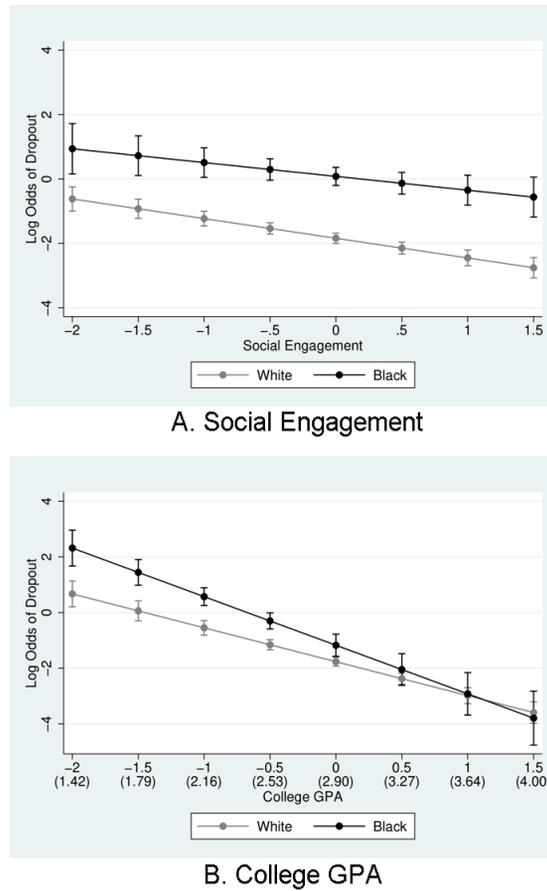
B. College GPA

**Figure 3.** Predicted Black and White Dropout Rates Given Social Engagement and College GPA
Sources: ELS 2002, 2004, 2006, 2012, and postsecondary transcript data; Barron's *Profile of American Colleges* 2016; IPEDS 2004 to 2009.
Note: Social engagement and college GPA are measured in terms of standard deviations in the combined black and white student population. The values of other variables are allowed to remain as they actually are found in the student samples.

We further explore the discrepancy between our own results and Charles and colleagues' in Part C of the online supplement, evaluating the possibility that the contradiction emerges due to (1) differences in our respective samples; (2) differences in our definition of "social engagement"; and (3) differences in the window of time in which we evaluate dropout. We conclude that the difference in the time window used to assess dropout is the likely source of the discrepancy, as we find that achieving a high GPA becomes increasingly important for student persistence as students progress through their college years,

whereas the effects of high social engagement remain more stable.

Understanding that GPA is a critical driver of the race gap in BA completion when examining the entire distribution of students and schools, we quantify its effect using counterfactual analysis. As displayed in Figure 4, black college students' average grades are considerably lower than those of white college students. High GPA protects black students from dropout, but only about 26 percent of black students have a GPA higher than the mean of 2.9 for the combined black and white student population. An even larger proportion
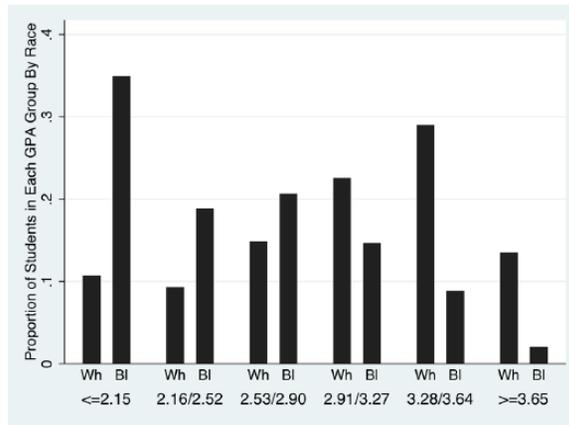
Figure 4. Distribution of College GPA for Black and White Students
Source: ELS 2006, 2012, and postsecondary transcript data.

of black students, about 35 percent, have GPAs 1.5 or more standard deviations below the pooled mean.

To evaluate the overall effect of college GPA differences on the BA completion gap, we first substitute the white GPA distribution for the black distribution, as described in the Methods section. We find that the black dropout rate decreases by 14.5 percentage points, from 50.4 to 35.9 percent, compared to the 25.4 percent rate for white students. Results from a Fairlie decomposition using all pre-college, institutional, and college experience factors and variables similarly indicate that college GPA drives the black-white completion gap (see Appendix Table A8), accounting by itself for 48 percent of the gap. In contrast, the combination of the "connection to home" factor, social engagement, and college living arrangements accounts for 12 percent of the BA gap. The new BA completion rate produced by an equalized black-white GPA distribution would increase the black BA attainment rate to 24.1 percent from 18.7 percent: a larger gain than that produced either by paradoxical persistence or the combination of matching and college quality. These analyses provide clear evidence that college GPA dominates social engagement, as well as other mechanisms, as an explanation for the BA completion and attainment gaps.[33]

Our analysis has shown that the academic performance deficit in college can be traced to academic deficits that existed before

students entered college (see the Pre-college Predictors of College Dropout section, as well as Appendix Table A9 for regression results confirming that pre-college academic performance strongly predicts college GPA). This finding raises the question of whether students are able to modify their chances of college graduation net of their pre-college dropout risk once they enter college. We address this question by calculating a new dropout risk index that incorporates the dimensions of college experience that most affect students' likelihood of completion: college quality and college grades. We then compare students' pre-college and post-college-entry dropout risk values. As Figure 5 demonstrates, the inclusion of college quality and college GPA leads to a fanning of the black dropout risk distribution. Although the college-enhanced dropout risk index for most black students remains similar to their risk computed with pre-college variables, nearly 40 percent of black students modify their risk by 10 percentage points or more. This result shows that pre-college dropout is not perfectly predictive of post-college-entry dropout; in other words, college experiences modify students' pre-college risk of dropout both upward and downward. Some students do worse than predicted by pre-college variables; their college quality and college grades lessen their completion chances and heighten their risk of dropout. Others benefit from the combination of college quality and their own
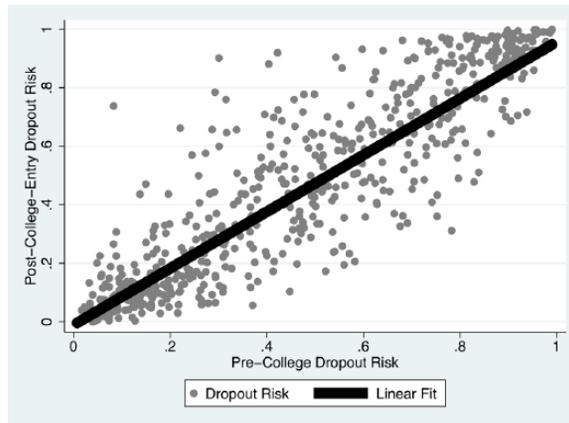
Figure 5. Pre-college versus Post-College-Entry Dropout Risk Distributions
Sources: ELS 2002, 2004, 2006, 2012, and postsecondary transcript data; Barron's *Profile of American Colleges* 2016; IPEDS 2004 to 2009.

performance in college to reduce their dropout risk relative to predictions based on high school characteristics alone.

DISCUSSION

In this article, we have examined four important aspects of the college-going process—selection into college, college match, college quality, and social and academic experiences during college—to identify the primary sources of the black-white gap in BA completion in the United States. At the point of college entry, we find that the large discrepancy in academic and socioeconomic resources between black and white high school graduates is the most important contributor to the BA gap, accounting for 68 percent of the total. However, black students' average tendency to enroll in four-year colleges at higher rates than similar white peers, despite fewer pre-college resources, demonstrates resilient, mobility-enhancing behavior. According to our calculations, this heightened rate of enrollment increases the overall BA attainment rate among black high school graduates from about 17 to about 19 percent, even as it also increases black students' rate of dropout from the counterfactual rate of 48.4 percent to the actual rate of 50.4 percent.

Mobility-enhancing behavior is also present for black students during the process of

matching to colleges, as black students with higher pre-college dropout risk are more likely to overmatch to higher-quality colleges than are white students with comparable dropout risk. That said, the relatively small proportion of black students that attend the selective and most selective colleges—only 15 percent—mean the population-level gains in degree completion enabled by higher-quality colleges are diluted by black students' greater enrollment in lower-quality colleges. As a result, college match and quality play only about an equal role in explaining the BA completion gap as paradoxical persistence: if black students matched to colleges in the same way as white students with similar backgrounds, their dropout rate would decrease from 50.4 to 47.5 percent, and the BA attainment rate would increase from about 19 to 20 percent.

Once students arrive at college, academic performance is the most significant driver of the BA completion gap, contributing more to students' persistence than social engagement at all levels of college quality. Specifically, distributional differences in college GPA explain most of the discrepancy in black and white students' completion rates after college entry. Yet we also find evidence that some black students achieve high enough grades to modify their pre-college dropout risk, in turn elevating the BA attainment rate among black high school graduates.

Taken together, our findings reveal a pattern of "paradoxical persistence" among black students against a context of the racial gap in academic preparation in high school. Across a wide range of national (and recent) historical contexts, scholars have confirmed Boudon's theory of primary and secondary effects, finding that educational choices among lower-SES students widen the educational gap stemming from academic performance. This process is well documented in many developed countries, but it does not apply to the situation of black students in the contemporary United States without important modification. Black students have higher educational aspirations than do comparable white students. Black students also more often decide to persist in pursuing higher education, both at the point of college entry and in response to college experiences, despite having fewer academic and social resources than white students, on average.

This resilience challenges findings suggesting that the secondary effect of disadvantage exacerbates gaps established due to its primary effect. It instead demonstrates that among black students in the United States, college-entry decisions actually dampen the mobility-inhibiting properties of primary effects at certain junctures of the college-going process. We attribute this dampening behavior to black students' individual agency, which drives mobility-enhancing decisions and mitigates accumulated disadvantage among black students. Given the large racial gap in socioeconomic and high school academic resources, however, these mobility-enhancing behaviors only modestly reduce the race gap in educational attainment.

Institutional structures such as affirmative action also play a role in raising black students' BA attainment at the population level. As important scholarship has demonstrated (e.g., Alon 2015; Bowen and Bok 1998; Charles et al. 2009), affirmative action powerfully influences individual students' trajectories for the better. Our own results confirm that higher-quality colleges facilitate higher levels of BA completion among black students, especially among students with higher

pre-college dropout risk; this finding aligns with existing scholarship demonstrating that overmatch in no way harms black students' academic trajectories or overall success (Alon 2015; Alon and Tienda 2005; Bowen et al. 2009; Small and Winship 2007). Additionally, there is persuasive evidence that students who attend selective colleges receive benefits in terms of access to elite jobs and higher wages (Rivera 2015), and that the effects of elite colleges are particularly strong for minority students (Dale and Krueger 2014). Accordingly, affirmative action arguably plays an important role in reducing racial inequality in the long term, despite evidence of persisting discrimination against black elite-college graduates (Gaddis 2014). However, only a relatively small proportion of black students benefit from affirmative action, and black students' existing overmatch produces only a small decrease in the overall black dropout rate. We therefore conclude that institutional mechanisms have a similar effect as black students' individual agency in facilitating increased BA attainment rates.

A dominant finding of this article is the centrality of academic achievement to the black-white BA completion gap. The resource most essential to college persistence is high grades, both prior to college entry and during college. Although black students within the top quartile of the college GPA distribution persist at equal or higher rates than white students with comparable grades, the mobility-enhancing behavior that we labeled paradoxical persistence cannot offset the mobility-dampening effects of black students' lower overall academic performance. Neither individual agency pertaining to the decision to go to college, nor institutional agency at the admissions stage, nor greater efforts at social integration while in college are by themselves likely to attenuate the resource differences between black and white students that exist prior to college.

That said, the commitment to higher education that black students demonstrate at the point of college entry is a clear resource that existing institutional programs and policies do not always harness as they could. Given

black students' strong desire to attend college and complete bachelor's degrees, targeted programs geared toward identifying and addressing these students' specific academic needs may have a substantial, positive effect on the BA completion rate; emerging evidence from major universities across the country supports this hypothesis (e.g., Alvarado, Connerat, and Smith 2018; Nichols, Eberle-Sudré, and Welch 2016).

Our study provides detailed insights into the respective impact of four critical aspects of the college-going process on the BA completion gap, but there are some limitations in what we can know even from data as rich as the ELS. The ELS does not provide a large enough sample size for black students to examine the effect of student characteristics on enrollment in specific universities. This limitation means our results concerning college match and quality may lack individual-level granularity. However, as our results convey, we still have ample cases to examine the impact of student characteristics on college quality destinations as measured by IPEDS and college selectivity data. The results we produce confirm other studies' conclusion that college quality has a strong association with college graduation, and college quality predicts the probability of college graduation even when high school characteristics are controlled. Our findings also show that increased college quality affects the BA gap relatively little at the population level.

A second limitation of the ELS data is that they do not include as wide an array of social engagement variables as other datasets, such as the National Longitudinal Survey of Freshmen (NLSF) upon which Charles and colleagues (2009) rely, or the National Survey of Student Engagement (NSSE). This limitation means some of the qualitative effects of social processes on student persistence may not be captured in our study. However, our ability to use social engagement measures that align closely with Charles and colleagues' (see Part C of the online supplement) gives us confidence that our results are robust.

Our findings have implications for scholars and policymakers focused on the BA completion gap. First, the gap must be contextualized not only in terms of BA completion, which applies to all students who begin at four-year colleges, but in terms of BA attainment, or the BA completion rate among all high school graduates. Doing so reveals the importance of black students' individual agency; it also suggests that lessening the BA completion gap by decreasing the proportion of black high school graduates that attend four-year colleges is likely to have the adverse consequence of widening the BA attainment gap. Second, our findings indicate that black students' resilience and commitment to educational advancement at the point of college entry drive notable gains in BA attainment for this group. Accordingly, lack of motivation and insufficient effort prior to college entry do not appear to be drivers of the BA completion or attainment gaps, contrary to arguments based on the "culture of poverty" hypothesis (Lewis 1959). Third, our findings indicate that solutions that move beyond elite colleges to enact systematic change within the broader landscape of higher education—and especially within mid- and non-selective colleges—would more effectively address the BA completion gap. Fourth, social engagement is important, but the most important interventions within college settings will occur in the area of academic achievement. One cannot, however, expect such late interventions to offset deficits that accumulated across 18 years of pre-college experiences.

Future research should continue to analyze the effects of selection and college experience on the BA completion gap, paying increased attention to within-race variation. It also is critical to examine the role of gender at all junctures of the college-going process, which space and sample size limitations prevented in our current analysis. It is clear that large discrepancies exist in the trajectories of black men and women (Bowen et al. 2009; DiPrete and Buchmann 2013); understanding the effects of such differences on the BA completion gap is an essential next step. Additionally, substantial work remains in exploring the different experiences of black and white students once they enter college, especially

related to interactions between pre-college dropout risk, major field of study, and college quality, as well as other college-level variables such as colleges' racial and ethnic composition and focal curriculum (vocational versus liberal arts). Finally, we have restricted our analysis to four-year colleges, but this work could be expanded by exploring similar aspects of college-going trajectories within two-year settings. Considering that a large proportion of traditionally underrepresented students undertake college journeys within two-year colleges, we view this latter project as particularly important.

APPENDIX

Table A1. Descriptive Statistics for Outcome and Pre-college Variables

	Mean	SD	Black Mean	White Mean	Source
Outcome Variables					
Four-Year-College Entry	.46		.38	.48	ELS F2
Four-Year-College Dropout	.29		.50	.25	ELS F3/T
Demographic, Socioeconomic, and Academic Transcript Variables					
Age: 19 or Above	.41		.43	.41	ELS B
Female	.51		.52	.51	ELS B
Black	.18		1	0	ELS B
Family Structure and SES					
Income $35,000 or less	.28		.51	.23	ELS B
Income $35,001 to $50,000	.20		.20	.19	ELS B
Income $50,001 to $75,000	.23		.15	.25	ELS B
Income $75,001 to $100,000	.15		.08	.17	ELS B
Income Greater than $100,000	.14		.06	.17	ELS B
Parents Married	.78		.57	.82	ELS B
Dad Present	.78		.53	.84	ELS B
Mother's Education (some college or greater)	.40		.33	.41	ELS B
Father's Education (some college or greater)	.41		.31	.43	ELS B
High School GPA (from transcripts) – Low (<3.0)	.34		.60	.28	ELS F1
High School GPA (from transcripts) – Average (3.0 to 3.5)	.22		.22	.23	ELS F1
High School GPA (from transcripts) – High (>3.5)	.44		.18	.49	ELS F1
Intensity of High School Curriculum – Low	.29		.36	.28	ELS F1
Intensity of High School Curriculum – Low/Moderate	.40		.40	.40	ELS F1
Intensity of High School Curriculum – Moderate/High	.11		.11	.11	ELS F1
Intensity of High School Curriculum – High	.20		.13	.21	ELS F1
Number of Academic Risk Factors in High School – None	.44		.19	.50	ELS F1
Number of Academic Risk Factors in High School – One	.32		.32	.32	ELS F1
Number of Academic Risk Factors in High School – Two or More	.24		.49	.18	ELS F1
Academic Measures Not from Transcripts					
Hours Spent on Homework/Week	4.08	1.797	3.94	4.12	ELS F1
Hours Spent on Extracurriculars/Week	3.13	1.880	3.06	3.15	ELS F1
Financial Aid Offered during College Admissions	.45		.45	.46	ELS F2
Highest Selectivity of College to Which Admitted – Low	.53		.68	.49	ELS F2
Highest Selectivity of College to Which Admitted – Moderate	.24		.22	.25	ELS F2

Table A1. (continued)

	Mean	SD	Black Mean	White Mean	Source
Highest Selectivity of College to Which Admitted – High	.23		.11	.26	ELS F2
Talk with Parents about Academics – Never	.19		.22	.19	ELS F1
Talk with Parents about Academics – Sometimes	.54		.50	.55	ELS F1
Talk with Parents about Academics – Always	.27		.28	.26	ELS F1
Work and Friends					
Hours Worked/Week – 10 Hours or Fewer	.39		.43	.38	ELS F1
Hours Worked/Week – 11 to 25 Hours	.43		.36	.45	ELS F1
Hours Worked/Week – More than 25 Hours	.18		.21	.17	ELS F1
Frequency of Hanging Out with Friends/Week – Never	.11		.21	.09	ELS F1
Frequency of Hanging Out with Friends/Week – Sometimes	.37		.38	.37	ELS F1
Frequency of Hanging Out with Friends/Week – Often	.52		.41	.54	ELS F1
Number of Friends Dropped Out of High School	1.56	.679	1.69	1.53	ELS F1
Attitudes toward College and Career					
Living at Home during College – Not Important	.56		.42	.59	ELS F1
Living at Home during College – Somewhat Important	.23		.29	.22	ELS F1
Living at Home during College – Very Important	.21		.29	.19	ELS F1
Career Direction – Don't Know	.29		.25	.30	ELS F1
Career Direction – Blue Collar	.24		.23	.24	ELS F1
Career Direction – White Collar	.47		.52	.46	ELS F1
Getting Away in the Future – Not Important	.48		.37	.51	ELS F1
Getting Away in the Future – Somewhat Important	.33		.37	.32	ELS F1
Getting Away in the Future – Very Important	.19		.26	.17	ELS F1
Making Money – Not Important	.12		.06	.13	ELS F1
Making Money – Somewhat Important	.55		.40	.59	ELS F1
Making Money – Very Important	.33		.54	.28	ELS F1
Academic Reputation of Future College – Not Important	.16		.13	.16	ELS F1
Academic Reputation of Future College – Somewhat Important	.31		.25	.32	ELS F1
Academic Reputation of Future College – Very Important	.53		.62	.51	ELS F1
Racial Composition of College – Not Important	.58		.37	.63	ELS F1
Racial Composition of College – Somewhat Important	.30		.36	.29	ELS F1
Racial Composition of College – Very Important	.12		.28	.08	ELS F1
Easy College Admissions Policy – Not Important	.39		.25	.42	ELS F1
Easy College Admissions Policy – Somewhat Important	.41		.37	.32	ELS F1
Easy College Admissions Policy – Very Important	.20		.28	.16	ELS F1

Sources: ELS 2002, 2004, 2006, 2012, and postsecondary transcript data.
Note: For data sources, "B" signifies the "base round," "F" signifies "follow up," and "T" signifies transcript data; standard deviations are omitted for binary variables. Based on NCES reporting standards, values must be rounded to no more than two decimal places and standard deviations must be rounded to one decimal place more.

Table A2. Descriptive Statistics for Institutional Variables

	Mean	SD	Black Mean	White Mean	Source
College Quality					
Selectivity – Least Selective	.21		.46	.16	ELS F2
Selectivity – Mid-selective	.45		.39	.46	ELS F2
Selectivity – Selective	.19		.09	.21	ELS F2
Selectivity – Most Selective	.15		.06	.17	Barron's
Sector – Public	.67		.71	.66	IPEDS
Sector – Private	.33		.29	.34	IPEDS
Average Total Spent per Full-Time Student ($)	14,815	10,612	13,381	15,070	IPEDS
Tuition – $2,500 or Below	.07		.09	.07	IPEDS
Tuition – Between $2,501 and $5,000	.33		.43	.31	IPEDS
Tuition – $5,000 and Above	.60		.38	.62	IPEDS
Average Full-Time Faculty Salary ($)	63,855	14,728	58,276	64,844	IPEDS
Curricular Experience					
Average Student-Faculty Ratio	17.32	4.820	17.87	17.23	IPEDS
Curricular Focus – Vocational	.44		.54	.42	IPEDS
Curricular Focus – Arts and Humanities	.18		.11	.19	IPEDS
Curricular Focus – Balanced	.38		.35	.39	IPEDS
Predict College-Level Persistence from Major Composition	−.16	.746	.003	−.19	IPEDS
Financial Support					
Proportion of Students Receiving Financial Aid	.79	.152	.83	.77	IPEDS
Proportion of Students with Loans	.50	.207	.54	.50	IPEDS
College Location					
Urbanization – Small Town	.17		.15	.18	IPEDS
Urbanization – Urban Fringe	.27		.23	.28	IPEDS
Urbanization – City	.56		.62	.54	IPEDS
Geographic Region – New England	.24		.20	.25	IPEDS
Geographic Region – Southeast	.32		.57	.28	IPEDS
Geographic Region – Great Lakes and Midwest	.26		.11	.28	IPEDS
Geographic Region – Southwest and West Coast	.18		.12	.19	IPEDS
Racial Composition					
Average Percent White	.66	.214	.41	.70	IPEDS
Average Percent Black	.13	.195	.40	.08	IPEDS

Sources: ELS 2006, Barron's *Profile of American Colleges* 2016, and IPEDS 2004 to 2009.
Note: For data sources, "F" signifies "follow up"; standard deviations are omitted for binary variables. Based on NCES reporting standards, values must be rounded to no more than two decimal places and standard deviations must be rounded to one decimal place more.

Table A3. Descriptive Statistics for College Experience Variables

	Mean	SD	Black Mean	White Mean	Source
Academic Performance					
Grade-Point Average (four-point scale, from transcripts)	2.90	.743	2.34	3.00	ELS T
College Major					
Arts and Humanities	.21		.15	.21	ELS F2/T
Business, Education, and Trades	.28		.25	.29	ELS F2/T
STEM	.22		.27	.22	ELS F2/T
Undeclared	.29		.33	.18	ELS F2/T
Curricular Risk					
Total Number of Course Withdrawals	2.07	3.417	3.24	1.86	ELS T
Remedial Courses – Zero	.72		.50	.76	ELS T
Remedial Courses – One	.21		.28	.19	ELS T
Remedial Courses – Two or More	.08		.22	.05	ELS T
Proportion of Credits Completed – 0 to .75	.17		.38	.13	ELS T
Proportion of Credits Completed – .75 to .9	.46		.50	.46	ELS T
Proportion of Credits Completed – .9 to 1	.37		.12	.41	ELS T
Academic Integration					
Use Library and Internet for Homework – Never	.10		.12	.10	ELS F2
Use Library and Internet for Homework – Sometimes	.36		.33	.37	ELS F2
Use Library and Internet for Homework – Often	.54		.55	.53	ELS F2
Time Spent in Library – Never	.16		.14	.16	ELS F2
Time Spent in Library – Sometimes	.44		.39	.45	ELS F2
Time Spent in Library – Often	.40		.47	.39	ELS F2
Talk with Academic Advisor – Never or Sometimes	.73		.42	.76	ELS F2
Talk with Academic Advisor – Often	.27		.58	.24	ELS F2
Talk with Professors Outside of Class – Never	.14		.15	.13	ELS F2
Talk with Professors Outside of Class – Sometimes	.61		.52	.63	ELS F2
Talk with Professors Outside of Class – Often	.25		.33	.24	ELS F2
Social Engagement					
"High Impact" Activities – Zero	.30		.40	.28	ELS F3
"High Impact" Activities – One	.24		.21	.25	ELS F3
"High Impact" Activities – Two or More	.46		.39	.47	ELS F3
Extracurricular Involvement – Never	.28		.36	.27	ELS F2
Extracurricular Involvement – Sometimes	.38		.27	.38	ELS F2
Extracurricular Involvement – Often	.34		.27	.35	ELS F2
Intramural Sport Participation – Never	.56		.36	.55	ELS F2
Intramural Sport Participation – Sometimes	.23		.19	.24	ELS F2
Intramural Sport Participation – Often	.20		.18	.21	ELS F2
Negative Life Events – Zero	.44		.37	.45	ELS F2
Negative Life Events – One	.35		.35	.35	ELS F2
Negative Life Events – Two or More	.21		.28	.20	ELS F2
First College Out of State	.26		.24	.26	ELS F2
Live at Home	.24		.32	.23	ELS F2
Live on Campus	.43		.43	.43	ELS F2
Live Elsewhere	.33		.25	.34	ELS F2

(continued)

Table A3. (continued)

	Mean	SD	Black Mean	White Mean	Source
Alternative Social Engagement					
Participate in Varsity Sports – Never/Sometimes	.82		.78	.83	ELS F2
Participate in Varsity Sports – Often	.18		.22	.17	ELS F2
Participate in Career Events – Never/Sometimes	.48		.58	.46	ELS F2
Participate in Career Events – Often	.52		.42	.54	ELS F2
Volunteer in Religious Group – Never/Sometimes	.25		.71	.76	ELS F2
Volunteer in Religious Group – Often	.75		.29	.24	ELS F2
Volunteer in Environmental Group – Never/ Sometimes	.94		.97	.94	ELS F2
Volunteer in Environmental Group – Often	.06		.03	.06	ELS F2
Volunteer in Political Group – Never/Sometimes	.91		.89	.91	ELS F2
Volunteer in Political Group – Often	.09		.11	.09	ELS F2
Volunteer in Community Organization – Never/ Sometimes	.79		.80	.79	ELS F2
Volunteer in Community Organization – Often	.21		.20	.21	ELS F2

Sources: ELS 2006, 2012, and postsecondary transcript data.
Note: For data sources, "F" signifies "follow up" and "T" signifies transcript data; standard deviations are omitted for binary variables. Based on NCES reporting standards, values must be rounded to no more than two decimal places and standard deviations must be rounded to one decimal place more.

Table A4. Groupings of Pre-college Variables into Factors

Academic Performance	Curricular Risk	Family Structure and SES	Connection to Home	Attitudes toward College and Career
High School GPA	Intensity of Academic Curriculum	Age	Hours Worked per Week	Professional Expectations: White vs. Blue Collar
Hours Spent on Homework / Week	Number of Academic Risk Factors in High School	Family Income	Frequency of Hanging Out with Friends / Week	Importance of Leaving Home
Hours Spent on Extracurriculars / Week	Frequency of Talking with Parents About Academics	Parents Married	Number of Friends Who Dropped Out of High School	Importance of Making a Lot of Money
Financial Aid Offered During College Application Process		Father in Household	Importance of Living at Home while Attending College	Importance of the Academic Reputation of a College
Highest Selectivity of College to Which Admitted		Mother's Education		Importance of the Racial Composition of a College
		Father's Education		Importance of an Easy Admissions Policy at a College

Table A5. Groupings of Institutional and College Experience Variables into Factors

College Quality	College Curricular Experience	College Financial Support	College Location	Curricular Risk	Academic Integration	Social Engagement
Selectivity	Student-Faculty Ratio	Proportion of Students Receiving Financial Aid	Extent of Urbanization	Total Number of Remedial Courses	Frequency of Using Library and Internet for Homework	Participation in "High Impact" Activities: Internships, Study Abroad, Community Engagement, etc.
Institution Sector	Vocational vs. A&S Focus	Proportion of Students with Loans	Geographic Region	Total Number of Course Withdrawals	Amount of Time Spent in Library	Extent of Extracurricular Participation
Total Amount Spent per Student	Extent to Which College-Level Persistence Predicted by Major Composition			Proportion of Credits Completed Given All Attempted Credits	Frequency of Talking with Academic Advisor about Courses	Extent of Intramural Sport Participation
Average Tuition					Frequency of Talking with Faculty Members Outside of Class	Number of Negative Life Events Occurring during College
Average Full-Time Faculty Salary						Whether First College Is Out of State

Table A6. Four-Year College Dropout Model Using Pre-college Predictors, by Race

	Black (*n* = 590)		White (*n* = 3,520)	
	Coef.	Std. Err.	Coef.	Std. Err.
Female	−.05	.274	−.08	.120
Age	.10	.258	.08	.119
Income $35 to $50K	.18	.346	−.23	.197
Income $50 to $75K	−.68	.408	−.07	.187
Income $75 to $100K	−.69	.502	−.69**	.210
Income > $100K	.14	.487	−.70**	.212
Parents Married	−.59	.383	.14	.262
Dad Present	−.17	.403	.24	.266
Mother's Ed.: College or More	−.13	.249	−.21	.126
Father's Ed.: College or More	−.80**	.272	−.26*	.129
HS GPA: Mid-group	−.78**	.302	−.38	.205
HS GPA: Highest Group	−1.33***	.338	−1.33***	.190
HS Curric.: Intense	.28	.408	.37*	.183
HS Curric.: Less Intense	−.55	.357	.48**	.148
HS Curric.: Least Intense	.13	.419	.56**	.196
HS Curric. Risk: One Risk Factor	.19	.319	.26	.136
HS Curric. Risk: Two or More Risk Factors	−.41	.418	.32	.229
Talk to Parents about Courses: Sometimes	−.08	.343	−.03	.164
Talk to Parents about Courses: Often	.20	.380	−.22	.181
Hours per Week on Homework	−.06	.074	−.04	.036
Hours per Week on Extracurriculars	−.02	.072	−.10**	.032
College Financial Aid Offered	−.23	.287	−.18	.130
Highest Selectivity of College Acceptance: Moderate	−.74**	.278	−.43**	.156
Highest Selectivity of College Acceptance: Most	−1.11**	.378	−1.44***	.187
Expects Blue-Collar Job	.64	.392	.06	.173
Expects White-Collar Job	.62*	.304	−.13	.140
Importance of Getting Away: Somewhat	.03	.272	.11	.133
Importance of Getting Away: Very	−.61	.338	.31	.165
Importance of Making Money: Somewhat	.28	.504	.22	.195
Importance of Making Money: Very	.08	.505	.21	.220
Importance of College Reputation: Somewhat	−.02	.693	−.20	.265
Importance of College Reputation: Very	−.58	.662	−.15	.261
Importance of College Racial Comp.: Somewhat	−.05	.292	−.39**	.132
Importance of College Racial Comp.: Very	−.23	.328	−.54*	.219
Importance of Easy Admission Policy: Somewhat	.47	.297	.13	.132
Importance of Easy Admission Policy: Very	.86*	.350	.34	.203
Importance of Living at Home: Somewhat	.36	.312	.20	.168
Importance of Living at Home: Very	.83*	.341	.27	.177
Hours Worked per Week in HS: 25 Hours or Fewer	−.58*	.271	.27*	.125
Hours Worked per Week in HS: More Than 25 Hours	.20	.387	.40*	.188
Frequency of Hanging Out with Friends: Most days	.68	.356	−.03	.233
Frequency of Hanging Out with Friends: Everyday	.81*	.364	.05	.230
Number of Friends Dropped Out of High School	.59**	.207	.25*	.097
Constant	1.05	1.090	.50	.571

Source: ELS 2002, 2004, 2012, and postsecondary transcript data.
Note: Coefficients reported as effects on log odds; standard errors reported for two-tailed tests. Based on NCES reporting standards, coefficients must be rounded to no more than two decimal places and standard errors must be rounded to one decimal place more.
*z < .05; **z < .01; ***z < .001.

Table A7. Fairlie Decomposition of the Proportion of the Dropout Gap Explained by Pre-college Variables

	Descriptive Data
Black Dropout Rate	.50
White Dropout Rate	.25
Difference	.25
	Amount Explained by Variables
Female	−.00006
Age	.0002
Family Income	−.03
Parents Married	.005
Dad Present	.01
Mom's Education	−.002
Dad's Education	−.008
HS GPA	−.10
HS Curricular Intensity	−.01
HS Curricular Risk	−.02
Talk to Parents about Courses	−.0009
Hours per Week Spent on Homework	−.0007
Hours per Week Spent on Extracurriculars	−.003
Financial Aid Offered for College	.001
Highest Selectivity of College Where Admitted	−.05
Career Expectations	.001
Importance of Getting Away	−.004
Importance of Making Money	−.004
Importance of College Reputation	.0004
Importance of College Racial Composition	.03
Importance of Easy College Admissions Policy	−.01
Importance of Living at Home While Attending College	−.006
Hours Worked per Week in HS	−.006
Frequency of Hanging Out with Friends	.003
Number of Friends Who Have Dropped Out from HS	−.008
Total Explained	.21 (84%)

Source: ELS 2002, 2004, 2012, and postsecondary transcript data.
Note: The decomposition is performed using black students as the reference group and variables are inserted into the decomposition randomly to ensure robustness of results. However, results are similar regardless of which group (black, white, or pooled) serves as the reference and whether or not variables are inserted randomly. Based on NCES reporting standards, percentages must be rounded to no more than two decimal places.

Table A8. Fairlie Decomposition of the Proportion of the Dropout Gap Explained by Pre-college, College-Level, and College Experience Factors and Variables

	Descriptive Data
Black Dropout Rate	.50
White Dropout Rate	.25
Difference	−.25
	Amount Explained by Factors and Variables
Female	.0004
Pre-college SES and Family Composition	−.01
Pre-college Academic Performance	−.02
Pre-college Curricular Risk	−.02
Attitudes toward College and Career	−.01
Connection to Home	−.005
College Quality	−.02
College Curricular Experience	−.0003
College Financial Support	−.002
College Location	.0003
College Percent Black	.09
College Percent White	−.01
College GPA	−.12
College Curricular Risk	−.04
College Academic Integration	.003
College Social Engagement	−.02
STEM Major	.01
Arts and Humanities Major	−.01
Business Major	−.01
Living at Home	−.004
Living on Campus	.0001
Total Explained	−.18 (72%)

Sources: ELS 2002, 2004, 2012, and postsecondary transcript data; Barron's *Profile of American Colleges* 2016; IPEDS 2004 to 2009.
Note: The decomposition is performed using black students as the reference group and variables are inserted into the decomposition randomly to ensure robustness of results. However, results are similar regardless of which group (black, white, or pooled) serves as the reference and whether or not variables are inserted randomly. Based on NCES reporting standards, percentages must be rounded to no more than two decimal places.

Table A9. The Effect of Race, Pre-college Factors, and College Quality on College GPA ($n = 4,110$)

	Coef.	Std. Err.
Black	−.52***	.059
Female	.29***	.025
Pre-college Academic Performance Factor	.32***	.025
Pre-college Curricular Risk Factor	−.07**	.019
Pre-college Family Structure and SES Factor	.04	.018
Pre-college Connection to Home	−.06**	.019
Pre-college Attitudes toward College and Career	−.07***	.019
College Quality	.04*	.016
Constant	−.14***	.027

Sources: ELS 2002, 2004, 2006, 2012, and postsecondary transcript data; Barron's *Profile of American Colleges* 2016; IPEDS 2004 to 2009.
Note: Standard errors reported for two-tailed tests. Based on NCES reporting standards, coefficients must be rounded to no more than two decimal places and standard errors must be rounded to one decimal place more.
*$p < .05$; **$p < .01$; ***$p < .001$.

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Notes

1. These statistics are reported for the fall 2007 entering cohort within the 2016 Digest of Education Statistics, published by the National Center for Education Statistics (NCES). They apply to first-time, four-year entrants who finish a BA at the same four-year college in which they started. However, recent work has drawn attention to the gradual lengthening of typical time to degree (Shapiro et al. 2014), potentially allowing degree completion gaps between black and white students to abate beyond the six-year time frame reported by the NCES. On-time degree completion lengthens the window during which young people can convert their degrees to monetary and other gains in adult life while also laying the groundwork for structured transitions from higher education into the labor market. We therefore believe the NCES statistics are useful indicators of unequal opportunity in the four-year college context and beyond.

2. Existing studies also fail to address that there are two standard routes to a BA: directly from high school to four-year college or indirectly through first attending a community college. Our results in Part B of the online supplement address this issue; we find that the results reported in the main text are very similar to those we obtain for the broader sample that includes transfer students.

3. Academic fit is said to be a "match" if students choose a college with admissions criteria that aligns with their academic qualifications, usually measured in the form of average high school grades or national aptitude test scores. It is therefore possible for students to undermatch or overmatch.

4. Bowen and colleagues (2009) found a total undermatch rate in these states of 40 percent.

5. The late Supreme Court justice Antonin Scalia (2015) perfectly summarized this perspective in his oral argument for the *Fisher v. University of Texas*

affirmative action case: "There are those who contend that it does not benefit African-Americans to get them into the University of Texas where they do not do well, as opposed to having them go to a less-advanced school, a less—a slower-track school where they do well."

6. Of the 12,550 students eligible for transcript collection within the ELS sample, at least one transcript was received for 77.2 percent. When we compare our estimates that rely on postsecondary transcript information against sensitivity analyses that do not, the main results hold. Thus, although transcript data are not available for all students, the additional robustness of results makes the trade-off worthwhile in our minds.

7. We follow NCES guidelines and round sample counts to the nearest 10.

8. Although not the focus of this article, we also compare results for four-year college starters and transfers in Part B of the online supplement.

9. A recent report from the National Student Clearinghouse indicates that about 20 percent of students who earn a BA complete their degree seven years or more following college entry, and about 15 percent of a smaller group of "potential completers"—those with two or more terms of college credit—may be enrolled seven years or more after entry (Shapiro et al. 2014). These statistics do not make a distinction between two-year and four-year beginners, but it is fair to say that our window of analysis captures the great majority, although not the totality, of completion outcomes within the four-year context. We decided this tradeoff would be worthwhile due to the extremely detailed information provided by the ELS data regarding pre-college experiences, the college selection process, and college endeavors, with the caveat that our results might differ slightly if our window of analysis increased. To our knowledge, no data source exists with the level of detail provided by the ELS, the more contemporary understanding of college-going behavior, and a window of analysis longer than nine years.

10. The NCES does not disaggregate first-time college-entry rates into two- and four-year components; instead, it reports a combined rate for the two groups. For the 2004 cohort, 68.8 percent of white high school graduates and 62.5 percent of black high school graduates began college the following fall. In our data, those figures are 72.2 and 58.7 percent, respectively. The completion rates we report in this paragraph are higher than the ones we quoted from the NCES at the start of this article, principally because our rates include students who finish at a different four-year college than the one at which they started and because they cover a longer (seven- to nine-year) window of time. Our sample is also limited to students who were high school sophomores in 2002 and who enrolled in a four-year college by September 2006 (the NCES statistic

is based on full-time college entrants regardless of their age at entry). Our sample includes all starting students, regardless of whether they start as part-time or full-time (although very few students begin four-year college as part-time students). Both our sample and the population on which the NCES rate is computed include students who became part-time subsequent to entry.

To provide a more exact comparison, the NCES reports the six-year college completion rate for the entering class of 2004 as 61.6 percent for white students and 39.6 percent for black students among students who stayed at their first, four-year institution (Snyder et al. 2016: Table 326.10). These data come from the Integrated Postsecondary Education Data System (IPEDS). Restricting the ELS sample to four-year students who began four-year colleges in the fall of 2004, we report completion rates over six years with the ELS data as 65.8 percent for white students and 42.2 percent for black students. Even though the metrics reported by NCES and in our data are not perfectly comparable, our rates appear to be in line with NCES reporting.

11. Most ELS variables that comprise our initial regressions are coded in a straightforward manner, but we constructed the curriculum intensity variable using raw data on students' course-taking patterns. It follows the scheme developed in a prior education dataset, the National Education Longitudinal Survey (NELS:88), and subsequently used by Adelman (2006), to generate 30 levels of curricular intensity. We condensed these to five levels in our model to improve statistical power.

12. We also produced our models using a linear GPA term and our results are stable.

13. About 20 percent of all four-year students attend more than one four-year college.

14. Among students with missing values on the more highly missing "attitudes" variables, we find that black students are slightly more likely than white students to have missing values (about 18 percent of the total black sample versus about 12 percent of the total white sample). For the group of students with missing values, only a small proportion—about 25 percent of both black and white students—enter four-year colleges. For white students with missing values who do enter college, the dropout rate is about 40 percent; the rate is closer to 60 percent for black students with missing data. Thus, although we would observe a stronger effect of paradoxical persistence at the point of college entry, our observations regarding dropout would be quite comparable due to the much higher dropout rate of black versus white students with missing values. Because this pattern mirrors the results we observe for the full sample, our conclusions would be similar.

15. The race proportions are standardized to match the scale of the college-level factors. Our models include racial composition rather than the combination of racial composition and whether the college is classified as a historically black college or university (HBCU) because the HBCU variable is correlated at over .80 with the percentage of black students at each college and its inclusion does not change our results.

16. The field of study measure contains four categories: undeclared, STEM, arts and humanities, and vocational, which includes business, education, and more technical paths such as construction and machinery. The use of more elaborate categorizations creates convergence difficulties in the multiple imputation process.

17. The Fairlie decomposition is similar to the Binder-Oaxaca decomposition, but it appropriately handles the nonlinearity of the logistic distribution. It provides more accurate estimates of the relative importance of covariate differences and coefficients in accounting for race differences in the mean of the outcome variable.

18. The dependent variable is a binary indicator of whether a student has started a four-year college by September 2006. Thus, four-year-college students who first begin after September 2006, two-year-college entrants, certificate entrants, and students who do not enter college at all are scored zero on the dependent variable.

19. The dropout risk index complements the analyses we perform that use the full set of predictors and the polychoric factors. It certainly might be the case that the estimated coefficients in the persistence model would change if all high school graduates entered a four-year college and were therefore all at risk of college dropout. The coefficients of a model estimated on the sample in this counterfactual situation are unknowable. Yet the ELS data are unusually rich not only with objective measures of family background and high school academic achievement, but also with variables measuring plans and attitudes toward the future. This richness gives us more confidence that the dropout risk index may describe the risk for college dropout of the non-college-goers rather well.

20. We do not call the dropout index a propensity score because that term generally refers to the estimated probability of assignment to a treatment variable, which is then typically used to match treated and control cases to estimate a causal effect. We do not use the dropout index to assign students to treatment and so it is not formally a propensity score.

21. Most non-curricular measures are drawn from the 2006 ELS wave, which asks students to reflect on their current institution. As a result, this information is often missing for students who depart college prior to the summer of 2006 (about 8 percent of the full college sample and 25 percent of students classified as "dropouts"). To address this issue, we take several approaches: running college-level analyses including only curricular variables, restricting college-level analyses to students without missing

non-curricular information, and using multiple imputation to assign values to all students with missing data. Regardless of the strategy, our results do not change substantively.

22. The full specification including all variables can be found in Appendix Table A7.

23. The total effect of SES and family is, of course, much larger than the direct effect reported in Table 2. The difference between the total and the direct effects is the indirect effect of SES/family composition that is mediated by high school academic performance and experiences.

24. Appendix Table A7 indicates that the inclusion of individual variables rather than factors increases the amount of the BA gap explained by the distribution of pre-college resources and experiences, especially pertaining to academic performance. However, according to these models, a notable proportion of the gap still can be explained by coefficient differences.

25. We also computed these models using pre-college polychoric factors. The race differences in coefficients hold.

26. We also examined these results broken out by gender (available by request). For white students, female college entrants are more concentrated in the low-risk portion of the distribution than are male students. For black students, female college entrants are more concentrated than their male peers in the middle range of the distribution, but both black females and black males demonstrate more notable density in the high-risk portion of the distribution than do white students.

27. The enrollment curves for black and white female students look quite similar in the low dropout risk portion of the distribution, but they diverge as dropout risk increases, because black women demonstrate a higher probability of entry at this higher level of risk. Black men are more likely than white women to enroll in four-year college at all points along the dropout probability curve, although the margin increases substantially as the risk of departure increases (results available by request).

28. It is possible to complete this analysis using less inclusive scenarios; for example, retaining only the lowest three dropout risk categories or the lowest two. We chose to report this most inclusive scenario because it is more aligned with the goal of maximizing the number of black students attending four-year college.

29. The results are stable whether we use the pre-college dropout risk index as an independent variable or all of the individual variables that comprise the dropout risk index.

30. Bowen and colleagues (2009) pursued a similar analysis, arriving at comparable findings regarding the interaction effects between college quality and disadvantage for black students. However, their pre-college controls were limited to the combination of high school grades and SES. Our more comprehensive risk model demonstrates that the positive effects of college quality for black students is not an artifact of the authors' inability to control for high school characteristics, which together have a large effect on the probability of college completion.

31. We also computed this regression model using race-specific standardization of factors as a sensitivity check, because the means and standard deviations vary whether we examine the black or the white distribution. Regardless of the standardization we use, we observe comparable results.

32. We also computed these models using race-specific standard deviations as a sensitivity check; the approach yields comparable results.

33. To quantify the overall consequences of race differences in students' responses to their grades for the BA gap, we counterfactually assign the black students the white students' coefficients on college GPA and compute the statistical implications for dropout. This counterfactual scenario decreases the black student dropout rate from 50.4 to 44.6 percent, revealing that black students' actual responses to their grades lead to a higher rate of college dropout than if they were to respond to their grades in the same way as white students.

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