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Threats in the Frog Pond: A Multilevel Analysis of College Enrollment and Completion

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Threats in the Frog Pond:

A Multilevel Analysis of College Enrollment and Completion

A dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy in Education

by

Hannah Whang Sayson

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ABSTRACT OF THE DISSERTATION

Threats in the Frog Pond:

A Multilevel Analysis of College Enrollment and Completion

by

Hannah Whang Sayson

University of California, Los Angeles, 2015

Professor Patricia M. McDonough, Co-Chair

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Recently, several education initiatives have directed national attention to substantially increasing the country's proportion of college educated individuals. However, considering that significant leaks in the education pipeline have endured despite longstanding attempts to promote access to higher education, meeting these current goals will require concerted efforts toward bridging gaps between college ambitions, enrollment, and completion. Moreover, considering the diversity of today's college aspirants, these goals cannot be met without specific attention to lower socioeconomic status and underrepresented racial minority students, who are less likely to attend four-year institutions, attend selective institutions, or attain college degrees.

This study examines race and SES-related differences in four-year college enrollment and bachelor's degree attainment. To that end, it considers students' high school and college

environments, which have been shown to influence educational outcomes beyond individual-level predictors alone. Additionally, it focuses on students' transitions *between* these environments, with respect to institutions' academic competitiveness, socioeconomic composition, and racial diversity. Guided by relative deprivation theory and stereotype threat theory, as well as by Nora's Student/Institution Engagement Model and Berger and Milem's College Impact Model, this study employed several multilevel analyses (HGLM, CCHGLM, CCHLM) of a national sample of 9,010 students followed from their sophomore year of high school over the course of 10 years. The unique longitudinal dataset drew from the Education Longitudinal Study of 2002/2012, NCES Common Core of Data and Private School Survey, IPEDS, and CIRP Freshman Survey.

Findings point to the role of high schools in determining whether and where students attend college. Schools' college-going rates and socioeconomic and racial composition predict enrollment at a four-year college above and beyond student-level measures, and demonstrate consistent effects regardless of students' own race, SES, or academic performance. Among students who begin higher education at a four-year college or university, few high school or college-level measures significantly predict bachelor's degree attainment beyond student-level effects. The study concludes with recommendations for K-12 policy and practice regarding college preparation, family engagement, school structure, and partnerships with higher education. Implications for postsecondary education speak to considerations for financial aid, institutional practices regarding diversity, admissions policies, and connectedness to K-12 education.

The dissertation of Hannah Whang Sayson is approved.

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2015

For 할머니 and 할아버지

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CHAPTER 1: INTRODUCTION

Across the United States, approximately 40 percent of 25 to 34-year olds have obtained some sort of postsecondary degree or credential (The College Board, 2008; OECD, 2013). However, multiple high-profile organizations have recently launched initiatives to increase our country's proportion of college educated individuals, citing societal benefits such as human capital and innovation, relevance in the global economy, and civically engaged citizenry. The Lumina Foundation (2009) issued a call to "increase the percentage of Americans with high-quality degrees and credentials from the longstanding rate of 39 percent to 60 percent by the year 2025"; The College Board aims to increase the prevalence of college-educated adults to 55 percent by the year 2025 (Lee, Edwards, Menson, & Rawls, 2011); The Bill and Melinda Gates Foundation (2008) has committed to help double the number of low-income students who earn a postsecondary degree or credential by age 26; and President Obama (2009) has promised that "by 2020, America will once again have the highest proportion of college graduates in the world."

In addition to the promising societal benefits highlighted as motivation for this national college completion agenda, higher education has long been associated with individual sociocognitive benefits such as leadership, critical thinking, and interpersonal skills (Astin, 1993) as well as with higher lifetime earnings and better overall health (Baum & Ma, 2007). Many students, however, are not in college long enough to realize those benefits. More than 40 percent of full-time students who enter college with the expectation of earning a four-year degree leave without one, with the largest proportion of departures taking place during the first year (Delta Cost Project, 2012; U.S. Department of Education, National Center for Education Statistics [NCES], 2012).

Departure rates are even more appreciable when considered in the larger context of the K-16 education pipeline. Among students who were surveyed as eighth graders as part of the National Education Longitudinal Study (NELS:1992), roughly 82 percent graduated from high school. Fifty-eight percent of these high school graduates then enrolled at a four-year college, of whom 59 percent earned bachelor's degrees by age 26. With an overall bachelor's degree attainment rate of 28 percent, this cohort of students is a prime example of the sizeable leak in the education pipeline associated with college access and persistence (Bowen, Chingos, & McPherson, 2009). Moreover, these significant college departure rates endure despite longstanding efforts to close gaps between college matriculation and completion (Terenzini, Cabrera, & Bernal, 2001). During the 1990s, student graduation rates changed little in spite of widespread attempts by many colleges and universities to raise their retention rates (Bowen & Bok, 1998). Students enrolling in four-year institutions in the 1995-96 academic year were no more likely to complete a bachelor's degree within five years than were their counterparts who entered college during the 1989-90 academic year (Horn & Berger, 2004). Thus, attaining any current national education goals will require even more concerted and innovative efforts than previously administered.

Perhaps more disconcerting than overall departure rates is that race and social class specifically continue to present challenges to the United States' goal of a college-educated population, despite decades of policy and practice efforts to promote equitable access to higher education (The White House, n.d.). Between 1972 and 2000, the share of traditional college-aged African Americans attending postsecondary institutions grew from 21 to 30 percent. Similarly, college attendance among Latino students increased from 17 to 22 percent. However, neither group significantly approached the college-going rate of white students, at 36 percent by the year

2000 (Massey, Charles, Lundy, & Fischer, 2002). More recent statistics reflect ongoing racial gaps: as of 2008, the college participation rates of blacks and Latinos reached 32 and 26 percent, respectively, while white students enrolled at the rate of 44 percent (Aud, Fox, & KewalRamani, 2010). Social class yields similar disparities: low-income and first-generation students enroll in college at significantly lower rates than higher income, non-first-generation high school graduates (Bowen et al., 2009). For example, in 2000, first-generation students constituted 28 percent of 12th-graders across the country, yet represented only 22 percent of students who ever entered postsecondary education within eight years of finishing high school (Chen, 2005).

Additionally, race and class gaps in college enrollment endure despite the fact that college aspirations are now comparable across both race and socioeconomic status (SES). In 2002, 80 percent of all 10th-graders expected to earn a bachelor's degree or higher (NCES, 2004), approximately twice the proportion of high school sophomores as in 1980. In parity with the figure for the overall sample, 77 percent of black students shared this expectation in 2002. In addition, 66 percent of low SES students expected to earn at least a bachelor's degree in 2002, as compared to only 22 percent in 1980, reflecting a dramatic increase in educational aspirations within this sub-group. Thus, it is clear that the gaps in producing college graduates across racial and SES groups are not for lack of supply of willing students.

It has been suggested that degree attainment rates have not kept up with students' aspirations in part because *enrollment*, rather than *completion*, is so often understood to be the measure of access to higher education and its associated benefits. "The traditional focus of economists and policy analysts on the paired concepts of 'enrollment' and 'access' is insufficient to insure the supply of college-educated workers needed to meet demand, to reduce income inequality, and to narrow intergenerational differences in education and earnings" (Turner, 2004,

p. 15). Across all students in U.S. higher education since 1960, the average annual increase in the college participation rate has been 1.1 percent, while the increase in college completion has been only 0.7 percent (Turner, 2004). As Turner (2004) notes, these unequal rates of growth can be observed in the growing gap between the proportions of college participants and college completers, from less than 20 percentage points for the traditional college-age cohort in 1968 (born in 1945), to 27 percentage points in 1980, and to 36 percentage points in 2000.

Additionally, the severity of disconnect between matriculation and degree attainment varies substantially based on race and SES. While recruitment and admissions policies have aimed to capitalize on rising aspirations in order to increase the diversity of entering college students (see Aries & Seider, 2005), loss rates remain highest among non-white (Turner, 2004), and historically underrepresented, low-income, and first-generation students (Terenzini & Reason, 2005). Black and Latino students, and in particular those at more selective institutions, continue to underperform relative to their white and Asian counterparts, as measured by lower grades, longer times to degree, and higher withdrawal rates (Bowen & Bok, 1998). As a result of these persistence challenges, differences in six-year degree completion rates range from 15 to over 20 percentage points between racial minority students and their white peers (Seidman, 2005). It is evident, then, that despite some success in increasing overall college going rates, "mere recruitment into former bastions of white academic privilege [is] not enough to erase the large gap in educational attainment between [race groups]" (Glazer, 1997 as cited in Massey et al., 2002, p.3).

Enrollment-completion gaps also reflect socioeconomic disparities, with differences in college participation rates between low and high-income students remaining unimproved since the 1960s (Pathways to College Network, 2004). Between 1982 and 1992, college enrollment

rates among Americans under age 26 increased across all income quartiles, with overall rates growing from 36.7 percent to 48.0 percent. However, college completion rates for that same population increased only for the top two income quartiles, and actually *decreased* for the bottom first and second income quartiles, to 38.4 percent and 45.2 percent respectively (Bowen et al., 2009). Moreover, since the 1990s, the gaps in enrollment rates between upper and middle-income high school graduates, and between the highest and lowest-income students have remained relatively stable (Baum & Ma, 2007). With respect to parental education, enrollment-completion gaps are analogous. Among first-generation college students who participated in NELS:1992, 24 percent completed a bachelor's degree by 2000. In contrast, completion rates among students with parents who had attended at least some college, or who had obtained at least a bachelor's degree were 39 percent and 68 percent, respectively (Chen, 2005).

In addition to disparities in degree completion, inequities in higher education access are apparent in the distribution of students across different types of postsecondary institutions. That is, while postsecondary education as a whole yields positive individual and societal outcomes, those benefits tend to differ based on whether that education consists of a four-year degree, two-year degree, or other postsecondary credential, with the greatest level of benefits associated with four-year degrees (Baum & Ma, 2007). Additionally, lower income and racial minority students are overrepresented at two-year and for-profit schools, the types of institutions associated with both fewer long-term benefits and lower chances of degree attainment as compared to four-year colleges and universities (Baum & Ma, 2007; Stephan & Rosenbaum, 2013).

Finally, within the diversity of four-year institutions, there is an additional hierarchy of selectivity and—relatedly—reputation. Institutional selectivity is associated with a variety of outcomes, including educational attainment, occupation, income, and the development of social

networks (Carnevale & Strohl, 2010). Furthermore, graduates from the most elite institutions make up a disproportionate number of political and business leaders (Dye, 2002). However, the most selective institutions remain largely unaccessed by racial minority and low-income students (Douglass & Thomson, 2008). Moreover, selectivity at the most elite institutions, and thus competition for important social and economic benefits, is on the rise (Hoxby, 2009). Additionally, the differences between low and high-selectivity colleges with respect to student-oriented resources have grown dramatically since the late 1960s. Hoxby (2009) noted that low-selectivity schools spend about $12,000 per student, while high-selectivity institutions reach upwards of $92,000. Differences in resource allocations are also apparent in terms of nonmonetary metrics such as student-faculty ratio, indices of faculty scholarship, volumes in the library, and square feet of student oriented buildings. Thus, while the range of postsecondary options can help to increase the overall likelihood that students go to college, it matters increasingly *where* students go.

Purpose

The increasing diversity of today's college aspirants gives strong cause for the study of race and class—factors commonly associated with disparities in both college enrollment and completion, and thus with the benefits of higher education. Previous studies have shown that, in addition to being associated with individual factors, academic achievement and educational attainment are influenced by peer and institutional context, measured by characteristics such as average high school SES (Palardy, 2003), high school racial composition (Goldsmith, 2011), and college selectivity or average student test scores (Titus, 2004). However, they have done so by focusing primarily on a single environment (i.e., by looking at the effects of either the high school or college setting). While predictive models of college enrollment are necessarily limited

to considering K-12—namely high school—data, college completion models can consider both postsecondary and high school variables. Yet, given the limitations of the data commonly used in higher education research, many studies (e.g., Chatman, 2008; Umbach & Kuh, 2006) account for only college-level institutional characteristics. Thus, they do not consider how college environments may impact students' outcomes differently from their high school environments, or account for the types of transitions students make between their secondary and postsecondary institutional contexts.

Per Turner's (2004) argument, access to higher education's benefits should be understood to comprise both enrollment in and completion of postsecondary education. Thus, in order to address issues of inequitable access, and in light of the limitations of current research, the following study's purpose is two-fold: to explore race and class differences in students' postsecondary enrollment, and to address related disparities in college completion. To those ends, this study considers students' secondary and postsecondary experiences as well as their high school and college environments, which have been demonstrated to influence educational outcomes beyond individual-level predictors alone. Additionally, given the differing degrees of benefits associated with different institution types (Baum & Ma, 2007), this study looks specifically at outcomes associated with four-year institutions.

Research Questions

This study is guided by the following general and subsidiary research questions:

1. Controlling for background characteristics, to what extent do students' peer academic, racial, and socioeconomic contexts in high school predict matriculation at a four-year postsecondary institution?
    a) Do the effects of these peer contexts moderate student-level race or SES effects?

2. Controlling for background characteristics, to what extent do students' peer academic, racial, and socioeconomic contexts in both high school and college predict bachelor's degree attainment?
    a) What types of transition patterns (with respect to average academic performance and racial and socioeconomic diversity of institutions) do students tend to exhibit from high school to college?
    b) Do the effects of transition patterns between high school and college (e.g., from low average SES high school to high average SES college) differ for students of different racial and SES backgrounds?
    c) Do the effects of postsecondary peer contexts moderate student-level race or SES effects?

Scope of Study

This study is informed by literature highlighting the effects of students' background characteristics, school experiences, and school environments. I focus specifically on empirical research that has examined race and socioeconomic status as either individual or contextual factors influencing high school and college educational outcomes. Many of the reviewed studies utilized quantitative methods and analyses of large datasets in order to provide a broad overview of students' experiences in the education pipeline. Hence, they are also instrumental in shaping this study's methodology with respect to key variables and analytic approach.

Guiding the study are two social psychology frameworks, stereotype threat theory (Steele & Aronson, 1995) and Davis's (1966) adaptation of relative deprivation theory, supplemented by Jones and McEwen's (2000) model of college student development. Combined with findings from K-12 and higher education research, these frameworks help to make sense of how

individual and environmental characteristics might interact to influence the related outcomes of college enrollment and completion. That is, while the literature informs an understanding of which factors predict postsecondary outcomes, theory can shed light on mechanisms for *how* these factors influence students' outcomes. Importantly, these theories frame how students' high school and college experiences affect academic outcomes in ways that are specific to their background characteristics and institutional contexts—both social and structural. Taken together, the reviewed literature and theories then serve as lenses to parse effects of individual characteristics, experiences, and school environments in students' transition from high school to college, and then through bachelor's degree attainment.

It is important to note that the aforementioned theories—and stereotype threat theory in particular—were used to frame anticipated and actual outcomes within the context of U.S. higher education, a historically male, white, and upper-class institution. "Minority status," in this study, therefore refers to a position of historical underrepresentation or basis for stereotype associated with falling outside of this category of students. Thus, while current statistics show that certain non-white groups—namely, Asians/Asian Americans—are now the highest performers with respect to both academic achievement and degree attainment (NCES, 2012), they are considered here to have racial minority status because of their numerical minority status and relative lack of privilege in U.S. society, which inform stereotype threat in the academic domain. Furthermore, educational achievement and attainment statistics for Asian American students commonly rely on data in the aggregate, thus obscuring the diversity among Asian Americans and Pacific Islanders, conflating them with international students, and ignoring the very real problem of struggling students within this racial category (Teranishi, 2010). Additionally, women, who now represent the majority of college students, are considered to have gender minority status due to

their relatively new presence in higher education, and persisting underrepresentation in several academic fields and professions (see Hill, Corbett, & St. Rose, 2010).

In designing my analyses I drew from two conceptual frameworks, Nora's (2003) Student/Institution Engagement Model, and Berger and Milem's (2000) College Impact Model. Together, these empirical frameworks inform this study's analytical approach, including the selection and ordering of variables, as well as the framing of multilevel data. Nora's (2003) model of student development addresses individual characteristics, experiences, and perceptions that may be influential in postsecondary outcomes, particularly among non-traditional, low-income, or racial minority students. Berger and Milem's (2000) framework, and in particular the structural-demographic component thereof, supplements Nora's student level model by providing a means of conceptualizing the institutional characteristics that likely shape students' experiences.

Data come from the National Center for Education Statistics (NCES) as part of the Education Longitudinal Study of 2002 (ELS:2002) baseline and follow-up surveys (NCES, n.d. b). The ELS:2002/2012 dataset includes survey and interview data for approximately 13,250 participants starting from their sophomore year of high school, over a 10-year period regardless of their educational or professional trajectories. Additional information regarding students' high school and home characteristics was obtained during that time through surveys of participants' teachers, school administrators, and families. Given the nature of its sampling and weighting methods, the ELS:2002/2012 data are designed to be representative of students attending high schools and postsecondary institutions across the U.S. over the time period studied. Additional data come from the Elementary/Secondary Information System (ElSi) (NCES, n.d. c), Integrated

Postsecondary Education Data System (IPEDS) (NCES, n.d. a), and Cooperative Institutional Research Program (CIRP).

Key to this study are two outcome measures reflecting the level of students' first-attended college and their overall time to bachelor's degree. Multiple hierarchical linear modeling analyses were used to identify the effects of individual and contextual predictors on both four-year college enrollment and bachelor's degree attainment within six years of beginning postsecondary education.

Significance

As colleges and universities commit to recruiting more racially diverse and low-income students, attention must be paid to how best to support these students' academic goals. Successfully diversifying higher education requires that institutional goals include retention through degree attainment for all students who matriculate. Furthermore, it requires a more critical analysis of the interplay of students' environmental factors and experiences, both before and during college, as they influence retention. This study offers one such comprehensive analysis, using a large-scale, longitudinal dataset that captures a wide variety of high school and college environments and student experiences, including transition from high school to college.

In addressing both high school and college predictors, an underlying additional goal of this study is to encourage better integration of the K-12 and postsecondary education sectors, whose policies and practices reflect considerable segregation, and lack of communication and information dissemination (Venezia & Kirst, 2005). High school administrators and staff and college access programming will be served by a better understanding of where and why today's diverse high school students are seeking postsecondary education as well as of the institutional characteristics that might promote or hinder degree completion. Postsecondary professionals and

researchers will benefit from analyses of a nationally representative sample that could better pinpoint race and class-related disparities in college aspirations and access, and identify both academic and non-academic factors associated with student persistence. Importantly, this study's findings will allow institutions to improve student outcomes by integrating the college environments and experiences associated with degree completion.

This study contributes theoretical nuance to the study of academic success, reflecting the diversity of today's college-going population. Importantly, it explicitly accounts for social factors—race and socioeconomic status—as *environmental* as well as individual predictors of academic outcomes. In doing so, it expands Davis's (1966) framework of relative deprivation, which traditionally relies on students' academic performance and their peer academic environment as the key predictors of academic outcomes. This study suggests that "fit" at academic institutions is predicated on multiple contextual factors rather than solely on academic factors such as preparation or relative academic success. Moreover, it proposes that race and social class, in particular, shape students' framing and perceptions of their academic environment, and thus influence both their objective and perceived academic outcomes. As a result, this study prompts future research to investigate the mechanisms by which the growing diversity of students select, navigate, and succeed across the wide array of U.S. secondary and postsecondary institutions.

CHAPTER 2: REVIEW OF LITERATURE AND THEORETICAL FRAMEWORKS

This chapter presents a review of the literature on both individual and institution-level factors in educational achievement and attainment. In particular, the chapter highlights race and socioeconomic status as key predictors. It then identifies theoretical perspectives—Davis's (1966) metaphor of the campus as a frog pond, stereotype threat theory (Steele & Aronson, 1995), and Jones and McEwen's (2000) Model of Multiple Dimensions of Identity (MMDI)—that can serve to illustrate the mechanisms by which race and socioeconomic status might influence the outcomes of focus: matriculation at a four-year institution and six-year completion of a bachelor's degree.

Individual-Level Factors in Education Outcomes

Race

Although racial minority students now enter college at a higher rate than in previous years, they continue to leave college without a degree at higher rates than their white peers (Seidman, 2005). Degree attainment rates vary by race, with racial gaps widening as students move up the degree ladder: white students starting at two-year institutions have about the same likelihood as black students of earning a certificate, are 60 percent more likely to earn an associate's degree, and are more than twice as likely to earn a bachelor's degree (Carey, 2010). Among bachelor's degree aspirants, six-year graduation rates among all first-time students have remained stable over the past two decades (58.3 percent for the 2006 entering cohort). However, so too have racial disparities in graduation rates among these students: white and Asian students continue to outpace their Latino, black, and Native American peers in six-year bachelor's degree completion (NCES, 2012).

Standardized test scores, commonly used as a measure of students' achievement and intellectual ability, are a key predictor of postsecondary outcomes. Yet differences between racial groups with regard to test scores persist even after controlling for socioeconomic status and other background characteristics (Bowen & Bok, 1998). Rather than directly predicting disparate scores, race may play a role in students' access to academic experiences that are associated with achievement and ability measures. For example, research points to high school curricular rigor (The College Board, 2008) and academic intensity (Adelman, 2006) as the most important predictors of college success. However, the College Board (2008) notes specifically that racial minority families have the least access to the academically intensive curricula that would prepare students for standardized tests and for college. Latino students, for example, are considerably less likely to attend high schools that offer advanced math courses than their white or Asian peers (Adelman, 2006). Similarly, first-generation students, who are more likely to come from a racial minority background than are their peers with college-educated parents, are less likely to take higher level mathematics courses while in high school and more likely to require remedial or developmental courses in college (Chen, 2005).

Charles, Fischer, Mooney, and Massey (2009) posited that disparities in academic outcomes are partly explainable by the school and neighborhood segregation that tend to be associated with certain racial backgrounds across the U.S. As part of their detailed study (2009) the authors explored the intersection of racial segregation and concentration of poverty—and thus concentration of crime, violence, drug use, etc.—by linking school and neighborhood segregation to students' likelihood of experiencing "disorder and violence," which would subsequently increase students' allostatic loads and detract from academic behaviors. For example, students in segregated neighborhoods have a higher likelihood of experiencing the

death of a friend or family member (p. 160). And in dealing with such stressful life events, these students would likely be less able to dedicate cognitive energy toward schoolwork. Indeed, Charles and colleagues' findings support this hypothesis: racial segregation, defined as the average proportion of racial minority schoolmates and neighborhood residents, had a strong negative effect on students' SAT scores, even after controlling for parental education, socioeconomic status, and academic preparation. In addition, each point increase in students' experiences of "disorder and violence" predicted a one half-point decrease in SAT performance, as well as lower grades during the first two years of college.

Race may also impact academic outcomes through moderating or mediating processes associated with sociocognitive success factors such as self-confidence, degree aspirations, and college satisfaction (antonio, 2004; Smedley, Myers, & Harrell, 1993), and the availability of time that could be allocated toward scholarly achievement (Charles et al., 2009). Huo, Binning, and Molina (2009), for instance, determined that African American and Latino high school students' perceptions of status (regarding how their overall school community felt about them) and how well liked they were at school were both associated with self-esteem and general mental health. In contrast, among these two factors, only perceived liking predicted the same measures of personal well-being for Asian American and white students. Based on these findings, the authors suggested that the effect of students' concerns with status within their school community may differ based on whether their social group status (race) is uncertain or under threat in society at large.

At the postsecondary level, Hurtado and colleagues (2006) found that, among underrepresented minority (URM) undergraduates in the sciences, high school GPA, overall degree aspirations, and perceptions of academic competition among their peers were negatively

associated with perceived success at managing the academic environment during the first year of college, a key predictor of institutional commitment (Spady, 1971). In contrast, none of these variables significantly predicted perceived academic adjustment for their white or Asian peers. Additionally, Charles and colleagues (2009) identified racial differences in college satisfaction—another factor associated with student persistence (Aitken, 1982; Cabrera, Nora, & Castaneda, 1993)—even after controlling for academic performance and social interactions.

Socioeconomic Status

In addition to race, socioeconomic status (SES) plays a significant role in longstanding disparities in educational achievement. Students from the top quartile of the income distribution in the United States and with college-educated parents are nearly five times more likely to earn a bachelor's degree than low-income, would-be first-generation students (Bowen, Chingos, & McPherson, 2009). Such disparities might be attributable to SES-based neighborhood and school composition, which affect the availability of academic supports (McDonough, 1997) and students' likelihood of experiencing life events that detract from academic behaviors (Charles et al., 2009). And, similarly to race, SES plays a role in widening outcome gaps up the degree ladder. Compared to students from families in the top income quartile in the United States, students in the lowest quartile have high school graduation rates that are 23 percentage points lower, college enrollment rates that are 38 points lower, and college graduation rates that are 32 points lower (Bowen et al., 2009).

Operationalizing socioeconomic status as wealth, "the Volvo effect" (Sacks, 2001) has commonly described how students' standardized test scores can be predicted by the type of car their parents drive. Explanations for the mechanisms behind this relationship have evolved from heredity (Herrnstein & Murray, 1994) to the influence of environments or resources on innate

ability: poor students tend to underperform relative to their higher income peers due to their cognitive development being mitigated by material deprivation and substandard schooling (Duncan & Brooks-Gunn, 2000). However, these explanations have also relied on the assumption that test scores actually serve as a valid measure of students' intelligence (see Croizet & Millet, 2011). In another view, the relationship between social class and test scores may be a reflection of the test itself rather than of attributes of test takers. That is, rather than intelligence or academic ability, standardized tests measure students' familiarity with white upper middle-class culture, and scores predict academic outcomes to the extent that schools rely on measures of culture as achievement benchmarks (Eells, Fais, Havighurst, Herrich & Tyler, 1951 as cited in Croizet & Millet, 2011).

Socioeconomic status, as measured by income, has also been held as a determinant of degree attainment. Among 1999 entrants at public flagship universities, 83 percent of students from the highest-income families graduated with a four-year degree within six years, as compared to 70 percent of students from the lowest-income families (Muraskin, Lee, Wilner, & Swail, 2004). Yet it has also been argued that income may not necessarily determine how well students do in college, so much as it determines where they attend college, which then affects their likelihood of degree completion. Hoxby and Avery (2012) determined that, controlling for grades and test scores, low-income students at selective institutions do as well as their high-income peers on outcomes including matriculation, persistence, and on-time graduation. The striking attainment disparities between the two income groups at large might then be attributable to their differences in college choice. Unlike higher income peers, the large majority of high-achieving, low-income high school students do not apply to selective colleges or universities—

the types of institutions that would offer the instructional, social, and financial resources that typically enhance student persistence and later life outcomes.

Parental education, another measure of socioeconomic status, yields similar attainment disparities. Commonly defined as those students whose parents have not attended any college, first-generation college students constitute a sizable sub-group of the college-going population across the United States—approximately 30 percent of entering freshman (Chen, 2005). Public institutions have typically had higher proportions of first-generation college students compared to private institutions; however, the differences between institution types have narrowed over the course of research on this population (Sáenz, Hurtado, Barrera, Wolf, & Yeung, 2007). This narrowing is owed in part to the effort of elite private institutions, which, with an eye toward increasing student diversity, have made strong efforts toward recruiting low income and first-generation students (see Aries & Seider, 2005). Conservative estimates of differences in degree attainment rates range from 10 to 14 percentage points between students with at least one parent with a bachelor's degree and their first-generation peers (The College Board, 2013b; DeAngelo, Franke, Hurtado, Pryor, & Tran, 2011).

Though "first-generation" and "low-income" are not necessarily interchangeable (Douglass & Thomson, 2008), both characteristics are associated with important intermediate outcomes along the path to degree attainment. In their analysis of students across the University of California campuses, Douglass and Thomson (2008) found significant GPA differences between first-generation and "second+ generation" college students: on average, GPAs differed by 0.33 points (out of a 4-point scale) among lower division students, and 0.29 points among upper division students. Low and high-income students' GPAs differed by 0.20 to 0.23 points. They also found income-related differences with respect to students' ratings of satisfaction with

their GPA, college social experience and academic experience, and sense of belonging. Scores were consistently highest among high-income students (those not receiving any aid, and with annual family income of $125,000 or more) and lowest among Pell Grant recipients.

Much research points to students' socioeconomic status—specifically low SES—as a practical hurdle in degree attainment, highlighting the challenges of financing an increasingly costly degree (The College Board, 2011). An estimated 22 percent of low-income, academically qualified students do not attend college after high school at least in part due to concerns regarding the cost of college (St. John, 2002). And for those who do enroll, institutions and student support staff may not be sufficiently financially resourced, accommodating, or cognizant of students' "debt dilemma" to address their financial obstacles to persistence (Burdman, 2005). Perhaps more germane to this study's theoretical framing, though, research highlighting the salience of context has suggested that low-SES and first-generation students face particular emotional and psychological challenges at more elite institutions, where they encounter "cultural mismatch" (Stephens, Townsend, Markus, & Phillips, 2012) as well as heightened awareness of their social class status and subsequent negative self-beliefs (Aries & Seider, 2005). Moreover, both students' subjective and researchers' objective measures of class background significantly relate to perceived belonging and adjustment to college (Ostrove & Long, 2007). For low SES students in particular, then, college completion hinges on successful cultural as well as academic transition.

High School-Level Factors in Education Outcomes

In addition to students' own demographic characteristics and academic performance, the school environment itself has been posited as a key predictor of college outcomes. And while college preparation may ideally begin as early as preschool (Carnevale & Desrochers, 2003), the

high school setting is perhaps most commonly associated with the college choice processes, supports, and resources that predict if and where students enroll (see McDonough, 2004 for an overview of relevant findings).

Among scholars, there is some consensus that consideration of the high school environment as a predictive factor of college achievement should account for measures of "quality" such as years of teacher experience, per pupil funding, and availability of college preparatory coursework and testing (Black, Lincove, Cullinane, & Veron, 2015; The College Board, 2008). Black and colleagues (2015) found that such observable high school characteristics explain approximately 20 percent of the variation in students' first-year college GPA. Similarly, Fletcher and Tienda (2009) demonstrated that controlling for high school fixed effects—that is, capturing the school-specific variability of such factors as curricula and teacher quality—fully explained certain racial achievement gaps, with racial minority students at some institutions actually achieving higher average first semester grades than their white counterparts.

An essential, though perhaps less easily quantifiable, precondition for college attendance is a high school environment "in which students are expected to achieve academically, and are encouraged and supported to do so" (McDonough, 2004, p.9). Based on her qualitative study of social class and high schools, McDonough (1997) explained that students at more elite schools were more likely to attend more selective colleges because of the parental and high school supports that positioned them for that outcome. And as she later asserted, college preparatory curriculum, college culture, staff who are committed to students' college goals, and counseling and advising resources are the four high school features that are key to impacting students' college attendance (McDonough, 2005). Quantitative analyses suggest that increasing merely the availability of counseling staff increases the likelihood of well-qualified but lower SES students

attending a four-year college (Pham & Keenan, 2011). However, an even more effective environment would be one that ensures a large presence of knowledgeable and well-resourced advisors, considering that many high school students—particularly racial minority and low SES students—are unfamiliar with curricular requirements and admissions standards and misinformed about the financial aid policies that can help them to match their college trajectories to their aspirations (Venezia & Kirst, 2005).

Espenshade, Hale, and Chung (2005) found that the academic performance of high school peers, operationalized as the school's average SAT score and number of AP tests taken, influences where students attend college beyond their own academic records: students in a relatively low-performing high school have a better chance of acceptance to selective colleges than equally performing students in a more competitive high school. Their study, then, sets the stage for the potential effects of academic "pond hopping," whereby a student moves from his small pond high school to bigger pond (i.e., more competitive) college, or vice versa. However, findings regarding such pond hopping—often framed by a "mismatch" hypothesis—have been mixed (e.g., Alon & Tienda, 2005; Sander & Taylor, 2012). In a more explicit examination of high school social effects on student outcomes, Fletcher and Tienda (2009) showed that entering college students who matriculate with a larger number of high school classmates outperform their counterparts from smaller high school cohorts, with same-race classmates predicting further marginal increases in GPA. The significant predictive power of social environment measures, then, suggests that school quality may in fact be an aspect of peer quality.

High School Social Composition

In their seminal study of K-12 education, Coleman and colleagues (1966) investigated the effects of both racial and socioeconomic composition on student achievement. Based on data for

600,000 students in 4,000 schools, the authors concluded from single-level regression models that black children started out academically behind their white peers and essentially never caught up—even if their schools were of comparable quality. Additionally, they determined that school-level variables, such as measures of quality, play less of a role in a student's educational achievement than his or her family's socioeconomic circumstances.

Since the first Coleman Report nearly 50 years ago, researchers have re-analyzed the *Equality of Educational Opportunity* data with very different results from the original study. Using hierarchical linear modeling (HLM), Borman and Dowling (2010) found that schools do indeed matter, with 40 percent of the differences in educational outcomes attributable to between-school effects. Specifically, both the racial/ethnic and social class composition of a student's school were 1.75 times more important than a student's individual race/ethnicity or social class in predicting high school verbal achievement scores. "In dramatic contrast to previous analyses of the Coleman data, these findings reveal[ed] that school context effects dwarf the effects of family background" (p.1239). Addressing school effects on attainment rather than achievement, which may differ in mechanism (Rumberger & Palardy, 2005), Palardy (2013) also used HLM and found a strong association between socioeconomic composition—an aggregate measure of students' socioeconomic status—and both high school graduation and college enrollment. Controlling for an array of student and school factors, students who attended high socioeconomic composition (SEC) schools were 68 percent more likely to enroll at a four-year college than students who attended low SEC schools. Furthermore, the associations between SEC and both attainment outcomes were consistent for students of varying individual SES backgrounds and for both minority and non-minority students.

Other research has similarly pointed to the high school social environment as a predictor of postsecondary outcomes. Goldsmith (2011) found a negative effect of high school racial composition on overall education attainment by age 26, even after controlling for socioeconomic composition and average test scores. Students in "minority-concentrated" high schools tended to attain lower levels of education, due perhaps to their tendency to have low-attaining friends and low-achieving schoolmates. Arguing that these negative effects of peer norms essentially cancel the benefits of frog pond processes (by which students have a better chance of standing out academically among these low performing peers than they would at a higher performing, predominantly white high school), he concluded that postsecondary education might help offset the inequities associated with segregated high school environments by rewarding students' relative academic performance.

College-Level Factors in Education Outcomes

Degree attainment rates vary widely across the landscape of American higher education, from as low as 10 percent of a student cohort within six years, to as high as over 90 percent (The College Board, 2008). Large differences are often discussed at the level of institution type, which might describe an institution's control, degree granted, and focus. By far, graduation rates are lowest for two-year public institutions, at which 36.3 percent of enrollees receive a degree or certificate within six years, with 12.4 percent of these students completing at a different institution from where they started (Shapiro et al., 2012). Among four-year degree programs, private research universities report average graduation rates of 84 percent. In contrast, public research universities report an average rate of approximately 60 percent, while their non-doctorate-awarding counterparts graduate approximately 37 percent of their students (The College Board, 2008).

In addition to association with degree attainment, institutional characteristics have been shown to be predictors of students' perceptions of their campus environments. Pike and Kuh (2006) used structural equation modeling to determine that characteristics such as public control, being a doctoral/research or master's university (as compared to general baccalaureate), and urban locale negatively predicted students' belief that their institutions are committed to their success. Undergraduate enrollment was also negatively associated with students' perceptions.

While characteristics such as control and mission are useful as broad scale controls for predicting attainment, completion rates vary considerably even within institution types, influenced in part by institution-specific policies and culture. Torres and Charles (2004) suggest that affirmative action policies, in particular, can exacerbate racial performance gaps by perpetuating beliefs among both white and racial minority students that minority students are less intelligent and would not be on campus except for a relaxation of academic standards. In testing this theory of social stigma effects, Charles and colleagues (2009) found that affirmative action policies indeed appeared to heighten the subjective performance burden felt by black and Latino students, which then led to lower grades. Furthermore, the greater the discrepancy in average SAT scores between minority and white students at a particular campus, the lower the grades earned by individual black and Latino students. Faculty recruitment or retention efforts that emphasize gender and racial diversity may also influence students' academic outcomes. Specifically, female faculty and faculty of color are more likely to use active or student-centered learning techniques and to value students' contributions as collaborators in the learning process (Milem, 1997; Umbach, 2006).

Peer Racial Composition

At the postsecondary level, racially diverse environments have been linked to positive intellectual and social outcomes such as complex thinking skills (antonio et al., 2004), citizenship engagement (Gurin, Dey, Hurtado, & Gurin, 2002), intellectual and social self-confidence (Chang, 2001), satisfaction with college (Chang, 2001; Park, 2009), and perceptions of a supportive campus environment (Pike & Kuh, 2006). For example, Terenzini and colleagues (2001) found that classroom diversity, operationalized as a "diversity index" reflecting the proportion of non-white students in the class, was positively related to students' reported gains in both problem-solving and learning. Furthermore, these gains remained even after controlling for students' own race/ethnicity, gender, academic ability, and classroom instructional practices. Racially and ethnically diverse college settings have also been shown to significantly interrupt students' tendencies to self-segregate as a result of their previous experiences in homogenous school settings (Sáenz, 2010). That is, campus structural diversity encourages both the frequency and quality of students' experiences with diverse peers.

High campus-level structural diversity may be especially beneficial for racial minority students, who face relatively greater obstacles to persistence. In addition to the academic and social pressures that generally affect all college students, racial minority students—particularly those at primarily white institutions—experience "minority status stresses" that constitute risk for maladjustment (Smedley, Myers, & Harrell, 1993). For racial minority students, personal and social "fit" may be harder to come by on a traditional college campus, where they appear noticeably different from their peers. As a result, they may be less likely to commit to an institution and more likely to withdraw or transfer (Nora, 2004). Hurtado, Carter, and Spuler (1996) found that Latino students ranked academic adjustment as the most difficult aspect of

their first year of college. They also found that race specific "structural diversity," defined as the proportion of Hispanic students among all students on campus, positively predicted their academic adjustment. This predictive relationship between racial composition and adjustment might be a natural consequence given that the same students ranked college peers as their most important source of support during the important transition year. Similarly, Lehman (2012) concluded that African American students, in particular, experience support group benefits from racially homogeneous friendship groups, which protect students' academic self-concept from stereotypes that demean their intelligence.

The structural diversity often linked with developmental benefits may be more or less a proxy for the *interactional* diversity that actually impacts student outcomes. That is, a racially diverse environment by itself does not shape students' development so much as provide opportunities to engage meaningfully with diverse peers, which are ultimately the mechanism for challenging students' assumptions and elevating their critical thinking skills (Hurtado, 2005; Sáenz, 2010). Several scholars (Chang, 2001; Chang, Astin, & Kim, 2004; Pike & Kuh, 2006) assert that the presence of a racially diverse student body is one of the most important institutional characteristics for promoting cross-racial interactions. Chang, Astin, and Kim (2004) found that the proportion of students of color on campus explained approximately five percent of the variance in students' cross-racial interaction, beyond the explanatory power of student background characteristics. And among these interactions, classroom based interactions in particular, consistently and positively predicted gains in students' intellectual ability, social ability, and civic interest.

While structural diversity is an important, and likely necessary, condition for the diversity experiences that predict benefits, demographic composition alone cannot promote positive

student outcomes. Drawing on Allport's (1954) contact theory, Hurtado, Dey, Gurin, and Gurin (2003) identified four key conditions for beneficial interactions with campus diversity: (a) the groups are of equal status, (b) there are common goals and inter-group cooperation, (c) institutional leaders support group equality, and (d) there are extended opportunities for group members to get to know one another. Similarly, Hurtado and colleagues (1998) posited that the connection between high minority student enrollment and student gains depends on positive racial climate, reflected at least in part by the quality of students' intergroup relations or the historical legacy of the institution. Umbach and Kuh's (2006) related construct of "diversity press" accounts explicitly for structural diversity as well as for students' perceptions of diversity within their larger measure of an institution's commitment to and emphasis on diversity. Using this indicator, the authors found positive effects on students' perceptions of academic challenge, general learning, and participation in classroom activities that represent higher order thinking.

Just as the academic environment cannot be fully understood without consideration of race, the impact of diversity cannot be discussed in a race-only vacuum. Highlighting the complexities at the intersection of interactional diversity and academic context, Arcidiacono and colleagues (2011) found that students tend to socially stratify themselves by characteristics that correlate strongly with their test scores. As they concluded, cross-racial interactions are most likely to occur within academic performance strata. antonio (2001) demonstrated that the academic ability of a student's friendship group negatively predicted interracial interaction, highlighting a possible relationship between academic performance and racial diversity in students' formation of peer groups. Thus, a nuanced approach to understanding campus diversity calls for consideration of other contextual factors, as well as perhaps more explicit definition of students' frames of reference.

Peer Socioeconomic Status

Higher education research regarding socioeconomic composition is generally limited to a framework of understanding how academic outcomes relate to institutions' enrollment of low-income students, as opposed to the mechanisms by which students are affected by socioeconomic diversity. Furthermore, whereas average student income often serves as a proxy for school resources and quality in the K-12 context (e.g., Niu & Tienda, 2013), the same is not necessarily true of postsecondary institutions, which vary considerably by mission and funding sources. Findings generally suggest that colleges that serve large percentages of low-income students have relatively lower graduation rates and average student achievement, as measured by grades or test scores. For example, four-year colleges with up to 20 percent of students receiving Pell Grants have an average six-year graduation rate of 80 percent and an average ACT score of 29. In contrast, four-year colleges with 80 percent or more of their students receiving Pell Grants have an average six-year graduation rate of 25 percent and an average ACT score of 19 (Muraskin et al., 2004). Additionally, regardless of institutional control, the proportion of Pell Grant recipients has been shown to account for more than half of the variance in six-year graduation rates at four-year institutions (Advisory Committee on Student Financial Assistance, 2013).

In their qualitative study of social class and identity development, Aries and Seider (2005) observed that lower income students at a highly selective private school faced more class-related difficulties than their counterparts at a nearby state institution. The authors concluded that wealth disparities between these students and their generally very high-income peers served to heighten their awareness of social class. Lower income students at the elite college noted that, compared to their classmates, they felt that they lacked the "right" linguistic skills, knowledge of

how to dress or act in various social situations, and skills or contacts to procure summer employment. They also reported a sense of exclusion, "social powerlessness," and inability to bridge the gap between themselves and their affluent peers. By contrast, lower income students at the state institution experienced less salience of class because their peers were more similar to them in terms of income and parental education. Supporting this notion of a social divide along income lines, Chatman's (2008) quantitative findings suggest a linear relationship between the size of one's SES group on campus and the frequency of one's interactions across SES. Diversity experiences across the University of California were most common for self-identified low-income or poor (11 percent of students) and wealthy (two percent of students) student groups, which he attributed to a pattern of probability. However, low-income or poor students were less likely to agree that they belonged at their campus.

Selectivity and Mismatch

At the intersection of students' academic performance and race, findings such as Espenshade and others' (2005) have been used to frame the possibility of "mismatch." In particular, critics of affirmative action have argued that racial minority students with lower credentials than the institutional average are mismatched at selective institutions—which may be the result of their standing out at a less competitive high school—and thus experience negative outcomes such as lower graduation rates (Sander & Taylor, 2012). However, Alon and Tienda (2005), and Bowen and Bok (1998) have countered mismatch arguments with evidence of a positive relationship between college selectivity and graduation for students regardless of race or test scores. Similarly, Titus (2004) found that institutional selectivity, or average student academic ability, promoted students' persistence beyond student-level factors. Highlighting the possibility of peer effects as the mechanism behind this relationship, Winston and Zimmerman

(2004) used data from students enrolled in thirty-four mostly selective institutions to demonstrate that with regard to academics, students' characteristics and behavior influenced other students' outcomes: roommates' standardized test scores positively predicted students' own academic performance, as measured by GPA.

Current state admissions policies have created quasi-experimental conditions to test for mismatch in a more local context. Furstenberg (2010) found that attending a more selective college had a positive effect on both minority and nonminority students' likelihood of graduation from Texas public institutions. However, focusing on a local average treatment effect, he determined that top decile high school students, who would not have attended their postsecondary institutions if they were not admitted under the Texas Top Ten Percent policy, experienced negative effects on first-semester and sixth-semester college GPA. Others (Fletcher & Mayer, 2013) though, have maintained that while the law had different local effects among students at two Texas flagships schools, there is little evidence of any systematic "mismatch" for the marginal admitted student. Thus, frog pond results with respect to students' academic contexts remain mixed overall.

Theoretical Frameworks

The scholarship reviewed earlier in this chapter highlights the importance of individual, structural, and social factors to consider as predictors of academic outcomes. Specifically, these studies point to the interactions of race, social class, and educational achievement or attainment. The following theoretical frameworks and their relevant findings go a step beyond identifying factors or conditions for outcomes, to shed light on the mechanisms that might explain *how* these factors influence students' outcomes. Importantly, the following theoretical frameworks and

findings suggest how students' social environments might affect academic outcomes in ways that are specific to students' background characteristics and experiences.

The Influence of the Peer Environment

The metaphor of the campus as a frog pond stems from Davis's (1966) application of relative deprivation theory to higher education phenomena. His advice that "it is better to be a big frog in a small pond than a small frog in a big pond" (p. 31) was based on the findings that 1) students' GPAs, or scholastic aptitudes, are positively correlated with aspirations to elite career fields, and 2) after controlling for GPA, academically competitive college environments have depressive effects on those aspirations. Since Davis's study, the frog pond metaphor has come to represent the attribution of adverse effects on psychosocial and performance outcomes to an academic environment of peers whom students may perceive as more capable or competitive than themselves. That is, academic outcomes are a product of students' performance as well as some measure of how well they think they do in relation to their peers. Furthermore, frog pond effects occur whenever comparison data are available with which to categorize one's standing in a group, whether the interaction with that group is intimate (e.g., within a friendship circle) or minimal (Alicke, Zell, & Bloom, 2010). Similarly, but traditionally limited to K-12 research (see Dai and Rinn, 2008), the "big-fish-little-pond effect" (BFLPE) (Marsh & Parker, 1984) was coined to explain students' use of a local frame of reference to influence their own academic self-concepts: "equally able students will have lower academic self-concepts in higher average-ability schools, but higher self-concepts in comparatively lower average-ability schools" (Dai & Rinn, 2008, p. 284).

Original frog pond and BFLPE studies focused on students' academic environments as predictors of academic outcomes by comparing similar students in dissimilar school contexts;

environmental differences were treated as a between-subjects factor (see Makel, Lee, Olszewki-Kubilius, & Putallaz, 2012). However, in applying the frog pond framework to transition outcomes, it is prudent to consider longitudinal studies, which may address individual students' shifts from one academic setting to another. Such studies have suggested that when students transition to a more competitive academic environment, they lower both their frequency of social comparison and importance placed on academics, in order to protect self-image (Gibbons, Benbow, & Gerrard, 1994). Additional studies have suggested that students are more susceptible to peer influence when they are of "middling ability" (Winston & Zimmerman, 2004), when their environmental shift is perceived as permanent (Makel et al., 2010), or when they have not yet experienced much feedback about their peers' or their own abilities (e.g., young students or students who have remained in same-ability groupings) (Bachman & O'Malley, 1986). Thus, in framing students' transitions from one peer context to another, it is important to consider that multiple aspects of students' social environments shape their internalization thereof.

A Threat in the Air

Stereotype threat offers a particularly useful explanation for the relationship between campus social context (e.g., demographic composition) and students' performance. It describes the phenomenon by which one's performance is undermined because of concerns about possibly confirming negative stereotypes about one's group (Steele & Aronson, 1995). The theory of stereotype threat posits that one's minority status (e.g., racial minority, female, elder) hinders performance specifically on stereotyped tasks or in a stereotyped domain (Lord & Saenz, 1985; Saenz, 1994), possibly as a result of vigilance or anxiety siphoning cognitive and emotional resources away from the task. Moreover, the stereotype need only be "in the air" (Steele, 1997), rather than explicitly present in order to pose risks to performance. Coping mechanisms include

reduced effort through self-handicapping (Steele & Aronson, 1995), and to the extent possible, detachment from the stereotyped group (Steele, 1997) and disidentification from the stereotyped domain as a metric of self-esteem (Steele & Aronson, 1995). However, prolonged or cumulative experiences with threat related stress can also result in psychological and physiological tolls, reflecting the phenomenon of allostatic load (Inzlicht, Tullett, & Gutsell, 2011).

Steele and Aronson's (1995) original study of stereotype threat demonstrated that black college students performed differently on a test of verbal ability based on the way in which their assessment was presented; they performed much better when told that they would be participating in a simple laboratory task, rather than a diagnostic measure of intelligence. Thus, the situations themselves in which students performed tasks could create or magnify group differences in performance. Since Steele and Aronson's (1995) work, stereotype threat has become one of the most studied concepts in social psychology, documenting effects for various populations and outcomes. And, in the case of academic outcomes, "experiment after experiment… [has shown] that social factors other than effort, intelligence, and preparation will boost or spoil performance. It is simply not enough to know how smart or motivated a student is. If intellectual performance can be made to rise or fall in response to simple and subtle manipulations of the social context, then something else must be involved beyond intelligence and motivations" (Aronson & Dee, 2012, p.266). That is to say, stereotype threat can harm the academic performance of *any* individual for whom the situation invokes a stereotype-based expectation of poor performance, regardless of actual ability.

In general, stereotype threat studies suggest that lower income students perform worse on academic performance measures than their higher income peers, regardless of intelligence or the measure's ability to accurately reflect intelligence (Harrison, Stevens, Monty, & Coakley,

2006)—the associated stereotype being that low socioeconomic status individuals are unintelligent, uneducated, unmotivated, and irresponsible (Cozzarelli, Wilkinson, & Tagler, 2001; Fiske, Cuddy, Glick, & Xu, 2002). Similarly, race-based threat effects, including those in Steele and Aronson's (1995) original study, are likely due to the notion that racial minority students are less intelligent or diligent than their white counterparts (Charles, 2000; Fiske et al., 2002).

Social Primes and Identity Salience

An individual's risk for stereotype threat is determined in part by his/her anxiety or concern about confirming particular stereotypes. Measures of such "stereotype vulnerability" have been shown to account for differences in performance among students of all races (Mendoza-Denton, Purdie, Downey, & Davis, 2002). Massey and Fischer (2005) for example, found that stereotype vulnerability accounted for 9-10 percent of variation in grades among racially diverse college students, and, when combined with background factors, accounted for the entire gap in GPA between black and white students. In addition to long-term effects, higher stereotype vulnerability has been associated with differences in small-scale or intermediate outcomes, such as black students' self-efficacy over the course of a day, even when compared to same-race peers (Aronson & Inzlicht, 2004). Stereotype vulnerability or anxiety, however, may also operate differently by race. Osborne and Walker (2006) found that students of color who reported higher levels of care about academics during their freshman year were more likely to drop out of high school than their peers who cared less about doing well; however, the same effect was not true of white students.

Stereotype threat is also predicted by the visibility of stereotyped identities or stigmatizable characteristics. How individuals experience stereotype threat may differ based on

whether they are contending with stereotypes about their race/ethnicity, weight, religion, mental health, or physical disability (Shapiro, 2011). And, to the extent that one's stigmatizable characteristic or group membership is effectively concealed or concealable (e.g., sexual orientation, mental illness, religion, political ideology), one may be less susceptible to experiencing or manifesting stereotype threat effects (Bosson, Haymovitz, & Pinel, 2004). Furthermore, those stigmatizable characteristics or group memberships need not be native to the individual. Lovaglia and colleagues (1998) induced stereotype threat effects on IQ test scores by implementing an artificial social hierarchy among study participants, arbitrarily assigning them "high" or "low" status and aptitude.

Numerical distinctiveness—solo status within a group or being in a numerical minority—is a key situational factor in stereotype threat in group situations (Inzlicht & Ben-Zeev, 2000; Inzlicht & Good, 2006), increasing the salience of an individual's relatively distinct social identity. Looking at gender composition, Inzlicht and Ben-Zeev (2000) confirmed that female students showed significant underperformance when they took a math test as the only female in a three-person group, although they did not experience performance deficits when they took the test in a group of three females, or in a group of two females and one male. Similarly, Inzlicht and colleagues (2006) found verbal performance deficits among black female students when tested in a racially mixed three-person group, with performance generally decreasing as a function of the number of white students in the testing environment. Yet, while numerical minority status within one's social environment certainly exacerbates threat, it is not a necessary condition to activate it. Within demographically mixed environments, even the expectation of experiences with an out-group member can activate stereotype threat. Cross-racial interaction, for instance, can lead individuals of all race groups to realize the potential for negative group

stereotypes and to be preoccupied by how they are perceived by out-group members. By way of example, Richeson and Shelton's (2007) findings regarding interracial interactions unsurprisingly suggested stereotype threat effects for black individuals in racially mixed settings. Interestingly, though, their participants also included white students who demonstrated concern with confirming the stereotype that "whites are prejudiced" or racist. As a result of this concern, these participants' pre-task interactions with black (i.e., non-majority status) individuals similarly induced performance deficits.

Sekaquaptewa, Waldman, and Thompson (2007) found that being in the numerical minority in a four-person group led to greater performance apprehension and feelings of representing one's race for black participants, but not for their white counterparts. Their findings suggest then, that the effects of numerical distinctiveness may be moderated by whether an individual's distinguishing characteristic is associated in general with minority versus majority social status—in this case having to do with race. Similarly investigating the interactions between numerical minority status and privileged social identities, Marx and Goff (2005) demonstrated that black students performed worse on a verbal aptitude test when their test administrator was white, despite the administrator being in the numerical minority. White students' performance, however, was unaffected by the administrator's race. Marx and Roman's (2002) manipulation of gender composition yielded similar results: women performed as well as men when math tests were administered by a woman, but more poorly and with lower self-esteem when the test was administered by a man. Taken together, these results then suggest the potential for in-group role models or authority figures to reduce stereotype threat and its associated depressive effects on performance.

Although much stereotype threat research has been experimental, observational studies provide clues as to the extent and impact of the phenomenon within a large population. Owens and Massey (2011), for example, used data from the National Longitudinal Survey of Freshmen to determine that college academic performance (GPA) is influenced indirectly by students' externalization of negative stereotypes and directly by their internalization of negative stereotypes—both latent variable constructs. Noting that their findings pertain specifically to students at selective colleges and universities, however, the authors recommended expanding survey-based work to explore the phenomenon of stereotype threat across a wide range of institutions. In their exploration of race and college major choice, Chang, Eagan, Lin, and Hurtado (2011) determined that among first-year URM students, the frequency of negative campus racial interactions and level of domain identification can combine to more negatively affect persistence in the behavioral and biomedical sciences (BBS) than either predictor alone. An increase of one standard deviation in domain identification among students who experienced high frequency of negative racial experiences predicted an approximately four percent decrease in their probability of persisting in a BBS major. Due to the study's design, which did not allow for experimental manipulation of threat levels, these results could not be conclusively attributed to threat effects. However, Chang and colleagues' (2011) study remains another useful example of applying this valuable theoretical lens to observational data in order to predict a postsecondary persistence outcome.

Cumulative Threat

Threat effects of stigmatized identities have been suggested as additive. For example, in what Gonzales, Blanton, and Williams (2002) termed a "double minority status" effect, Latina women demonstrated greater underperformance relative to both Latino men and white women—

groups that presented only one visible minority status. Hypothesizing that performance in a particular domain is influenced simultaneously by multiple group identities, the authors suggested that their Latina participants were likely sensitized to gender based stereotypes after experiencing threat activation related to their ethnic identity. They thus posited that African Americans, for example, might experience stereotype threat at a lower threshold or level of situational threat when they also happen to be poor and female. This nuance of cumulative or additive stereotype threat might then be tied to this study's final theoretical framework.

Jones and McEwen's (2000) conceptual Model of Multiple Dimensions of Identity (MMDI) presents identity as fluid and dynamic, and influenced by an individual's context (e.g., family background, sociocultural conditions, current life experiences) at any particular time. The model posits that the individual can hold several identities, which vary in their salience and extent of interaction throughout one's lifetime. For the purposes of this study, then, MMDI provides a model for an individual's transition from the high school to college context, which may influence shifts in the salience and/or interaction of identities related to race/ethnicity, socioeconomic status, and academic achievement.

CHAPTER 3: METHODS

As reviewed in Chapter 2, previous research demonstrates that students experience significant variation with respect to their college enrollment and completion based on both individual and environmental characteristics. In particular, these outcomes are disproportionately negative for racial minority and lower SES students despite their growing aspirations to, and presence in, postsecondary education. Furthermore, previous findings suggest that the effects of these factors can interact to uniquely predict achievement and attainment outcomes above and beyond either individual or institutional predictors alone.

Given the extent of literature that identifies both individual and institutional predictors of relevant academic outcomes and the lack of quantitative scholarship on how students might be impacted by their progress through their academic institutions, the present study explores how student, high school, and college characteristics predict students' postsecondary access and persistence. The study's purpose is thus two-fold: to explore race and class differences in students' postsecondary enrollment and to address related disparities in four-year degree attainment rates.

This chapter details the study's design, and begins by reiterating the study's research questions, offering specific hypotheses associated with each outcome of interest (i.e., enrollment at and graduation from, a four-year college). The second section of the chapter describes the conceptual frameworks guiding analyses. The next major sections overview the data, sample, and variables, and then the analyses that were used to address specific research questions related to students' enrollment and degree completion at four-year institutions. The chapter then concludes with a section that details specific limitations associated with the study's data and design.

Research Questions and Associated Hypotheses

Research Questions for Outcome 1: Enrollment at Four-Year Institutions

- *Controlling for background characteristics, to what extent do students' peer academic, racial, and socioeconomic contexts in high school predict matriculation at a four-year postsecondary institution?*
    - *Do the effects of these peer contexts moderate student-level race or SES effects?*

Individual academic performance during high school is one of the strongest predictors of later academic outcomes such as college grades (Geiser & Santelices, 2007). Furthermore, high school grades and test scores are used as indicators of applicant strength during the college admissions process (see Sander & Taylor, 2012). Thus, I predict that higher individual performance will be associated with higher rates of acceptance to and enrollment at a four-year college. Consistent with the literature framing the context of this study, I also predict that students will aspire to bachelor's degrees and, correspondingly, to attending four-year institutions, at similar rates across race. However, white and Asian students will enroll at four-year institutions at higher rates than their peers and at more selective or well-reputed institutions (McDonough, Lising, Walpole, & Perez, 1998). Finally, given the higher costs associated with attending a four-year institution, as compared to a two-year institution (The College Board, 2011), I predict that low SES students will enroll at four-year schools as their first-attended postsecondary institutions at lower rates than their higher SES peers, regardless of degree aspirations or expectations that they may have initially reported as high school sophomores.

Consistent with frog pond studies reviewed in Chapter 2 (e.g., Espenshade et al., 2005), I predict that low average peer academic performance will positively predict a student's average likelihood of matriculating at a four-year institution, as compared to not matriculating at a four-

year institution (an alternative outcome measure that includes enrolling at a two-year institution, enrolling at a less than two-year institution, or not entering postsecondary education at all). Because the analysis will control for students' background characteristics, including individual academic achievement, low-performing peers should enable a student to stand out for his or her own performance and thus stand a greater chance of acceptance at non-open admissions institutions.

K-12 education studies suggest that both racial and socioeconomic composition schools are indicative of the quality of learning environments (Charles et al., 2009; Duncan & Brooks-Gunn, 2000). Specifically, students from schools with larger proportions of non-white or low SES peers are associated with worse academic outcomes, such as standardized test scores. Hence, I predict that both racial diversity, as measured by the proportion of non-white students, and low socioeconomic composition will negatively predict college enrollment.

Stereotype threat theory suggests that numerical minority status would depress academic performance among individuals for whom academics is a stereotyped domain (e.g., Inzlicht & Ben-Zeev, 2000; Inzlicht & Good, 2006). Thus, controlling for measures of school quality, I predict that the likelihood of a non-white or low-SES student matriculating at a four-year institution will decrease as a function of the representation of high school peers who share that student's stigmatizable characteristic. For example, a Latino (or black, or Native American) student's average predicted likelihood of enrolling in college will decrease as the proportion of Latinos (or blacks or Native Americans) among all of his high school's students goes down. Furthermore, in the case that students identify with other stigmatized groups (e.g., Latino students identifying with the larger category of "underrepresented racial minority" or "students of color"), their chances of college enrollment would likely be affected by the size of this other

group as well. Stereotype threat effects would manifest similarly for low-SES students. Based on the literature (Osborne & Walker, 2007; Sekaquaptewa et al., 2007), I would not predict this same numerical minority status effect for white students—for whom academics is not a stereotyped domain—and am unsure of outcomes for Asian American students.

Additionally, I predict that outcomes will be inversely related to the number of students' stigmatizable characteristics. Stereotype threat studies and Jones and McEwen's (2000) MMDI suggest a cumulative effect of low-status group identities. Thus, for example, in the vein of Gonzales and colleague's findings (2002), the environment of a predominantly white, male high school will more negatively affect black female students, who have both racial and gender minority statuses, than it would affect black male students' likelihood of enrollment in a four-year degree program.

Research Questions for Outcome 2: Bachelor's Degree Completion

- *Controlling for background characteristics, to what extent do students' peer academic, racial, and socioeconomic contexts in both high school and college predict bachelor's degree attainment?*
    - *What types of transition patterns (with respect to average academic performance, and racial and socioeconomic diversity of institutions) do students tend to exhibit from high school to college?*
    - *Do the effects of transition patterns between these high school and college contexts (e.g., from low average SES high school to high average SES college) differ for students of different racial and SES backgrounds?*

- *Do the effects of postsecondary peer contexts (with respect to academic performance, and racial and socioeconomic composition) moderate student-level race or SES effects?*

With respect to the transition between social contexts, I predict that students from higher performing high schools will tend to enroll at higher selectivity colleges, based on the likelihood that a high school's high average academic performance would be reflective of better academic preparation across its students (Adelman, 2006). With respect to patterns between social contexts, I predict that students will tend to attend colleges that are demographically similar to their high school or their home environment. For students from largely racial minority or low SES schools, this tendency to self-segregate (Sáenz, 2010) may reflect a college choice process that is informed by friends or relatives (Freeman & Thomas, 2002; Kim, DesJardins, & McCall, 2009), or constraint to local institutions due to a limited knowledge of the universe of postsecondary educations, financial concerns, or desire to live near home (Butler, 2010; Hoxby & Avery, 2012; Santiago, 2007).

Alon and Tienda (2005) and Bowen and Bok (1998) found that higher selectivity postsecondary institutions tend to promote positive student outcomes, perhaps due to their availability of academic supports or greater financial resources, which could then be applied toward academic resources. Furthermore, these findings were true for students regardless of key background characteristics. Thus, I predict similar outcomes with regard to college students' peer academic performance, whereby high achieving college peers positively predict degree completion regardless of individual performance.

Regarding institutions' racial and socioeconomic composition, I predict that high racial diversity and prevalence of low SES students will improve performance outcomes for minority

status students (i.e., racial minority and low-SES students) due to the presence of in-group peers decreasing the risk for stereotype threat associated with numerical distinctiveness. This prediction stands in contrast to hypotheses for Research Question 1 because, unlike high schools, colleges do not necessarily resemble their surrounding communities with respect to racial and socioeconomic segregation or resource inequities. Thus, and particularly at more selective institutions, larger proportions or racial minority or low-SES students would not function as a proxy for lower quality learning environments. However, campus demographic composition may suggest the presence of certain support structures that influence students' outcomes separately from institutional selectivity. For instance, a school with a large Latino student body (e.g., Hispanic serving institution (HSI) or emerging HSI) would tend to be less selective (Santiago, 2007) yet might offer social supports tailored to that population in an effort to attract or retain students.

In addition to the aforementioned hypotheses, I predict that college-level predictors will mediate high school level effects and manifest in college-level variables with overall greater explanatory power than their high school analogs. I base this prediction on Goldsmith's (2011) and Sáenz's (2010) suggestions regarding the ameliorating effects of college experiences for students who were subject to segregated K-12 learning environments. Additionally, Park's (2009) model of satisfaction with campus diversity demonstrated that students' experiences during college explain a far greater proportion of outcome variance relative to their background characteristics.

Stereotype threat is exacerbated by the salience of, or individual's investment in, the stereotyped domain (Osborne & Walker, 2006). Furthermore, both stereotype threat and relative deprivation studies (e.g., Gibbons, Benbow, & Gerrard, 1994) suggest that in order to protect

self-esteem, individuals may disassociate themselves from this domain as a means of reducing threat. Institutional selectivity at the postsecondary level is consistent with strong identification with the academic domain, given that students at selective schools probably tended to have higher academic performance in high school and thus a longstanding expectation of, or investment in, their academic achievement. Furthermore, students select into colleges (Berger & Milem, 2000); thus, students who choose to attend competitive colleges are likely doing so with that characteristic in mind. The mechanism for ending up at a particular college then differs from the mechanism for high school, which is likely to have been chosen by parents or, in the case of public school, assigned to students based on where they reside. Based on these arguments, I would predict that performance gaps between minority status and majority status groups widen as institutional selectivity goes up, as minority status individuals will tend to disassociate themselves from the academic domain. However, because the college success outcome is so broadly measured in this study (i.e., bachelor's degree within six years), I am doubtful that there will be any measureable effect.

Based on the reviewed general studies of relative deprivation (e.g., Gibbons, Benbow, & Gerrard, 1994), I predict that the direction of academic pond hopping—for example, from low to high average academic performance—will have the same direction of effect for students regardless of their race or SES. However, I also expect that the effect of matriculating at a more academically competitive college, relative to one's high school, will more negatively affect racial minority and low SES students, for whom academic stereotypes present a more salient threat. With regard to racial and socioeconomic composition, I predict that increasing exposure to diversity will promote white and high SES students' outcomes. Based on higher education research, this relationship might be attributable to majority status students' increased likelihood

of interacting with diverse peers, which has been shown to contribute to wide ranging learning outcomes (Hu & Kuh, 2003; Hurtado, 2005; Pike & Kuh, 2006; Sáenz, 2010). With regard to students with negatively stereotyped characteristics in the academic domain, such as racial minority status or low SES, I predict that remaining in the numerical minority from high school to college (e.g., a Latino student from predominantly white high school going to a predominantly white college) will negatively predict outcomes because of students' prolonged exposure to stereotype threat and thus increased risk for allostatic load or racial battle fatigue (Smith, 2008). Furthermore, this risk would be heightened for students who ever report negative diversity experiences or environments.

Empirical Frameworks

Most broadly, student development models and theories fall into one of two categories of framework: "developmental," which focus on person-level conditions and growth processes, and "college impact," which highlight the environmental and between-person factors that affect student growth (Pascarella & Terenzini, 1991; 2005). One perspective with regard to the best fitting framework is that organizational characteristics play a key and long overlooked role in students' development, especially considering that they enter institutions with established and sometimes longstanding organizational characteristics and cultures (Terenzini & Reason, 2005). However, others (Pascarella & Terenzini, 1991; 2005) have maintained that such "structural-demographic measures" are too far removed from students' experiences to appreciably influence their learning outcomes.

This study bridges the two aforementioned perspectives, borrowing from one developmental and one college impact model. The following section describes Nora's (2003) Student/Institution Engagement Model, and Berger and Milem's (2000) College Impact Model,

which serve in conjunction as a framework for accounting for student-level experiences within institution-level conditions.

Nora's (2003) Student/Institution Engagement Model

Nora's (2003) Student/Institution Engagement Model, adapted from Nora and Cabrera's (1996) model of minority student adjustment, expands upon earlier persistence frameworks in that it recognizes factors that may be particularly salient for racial minority and non-traditional students. Furthermore, the model effectively combines previous frameworks to highlight the importance of students' fit with their institution in two domains: the academic, involving experiences with faculty and staff; and the social, involving experiences with fellow students. The model consists of six major components (a) pre-college/pull factors, (b) sense of purpose and institutional allegiance, (c) academic and social experiences, (d) cognitive and non-cognitive outcomes, (e) goal determination/ institutional commitment, and (f) persistence, the overall desired outcome among college students (see Figure 3.1).

Given that this study seeks to address race, class, and academic performance as both individual and institutional predictors of degree attainment, the model's conceptualization of "fit" provides a particularly valuable framework for analysis. Moreover, by explicitly accounting for relationships with significant others, such as peers and faculty, as well as for students' perceptions of the campus climate, it highlights the importance of the social environment as a predictor of academic outcomes. This facet then allows for consideration of effects consistent with those predicted by relative deprivation and stereotype threat theories, which are based on students' interactions with and perceptions of their social environments.

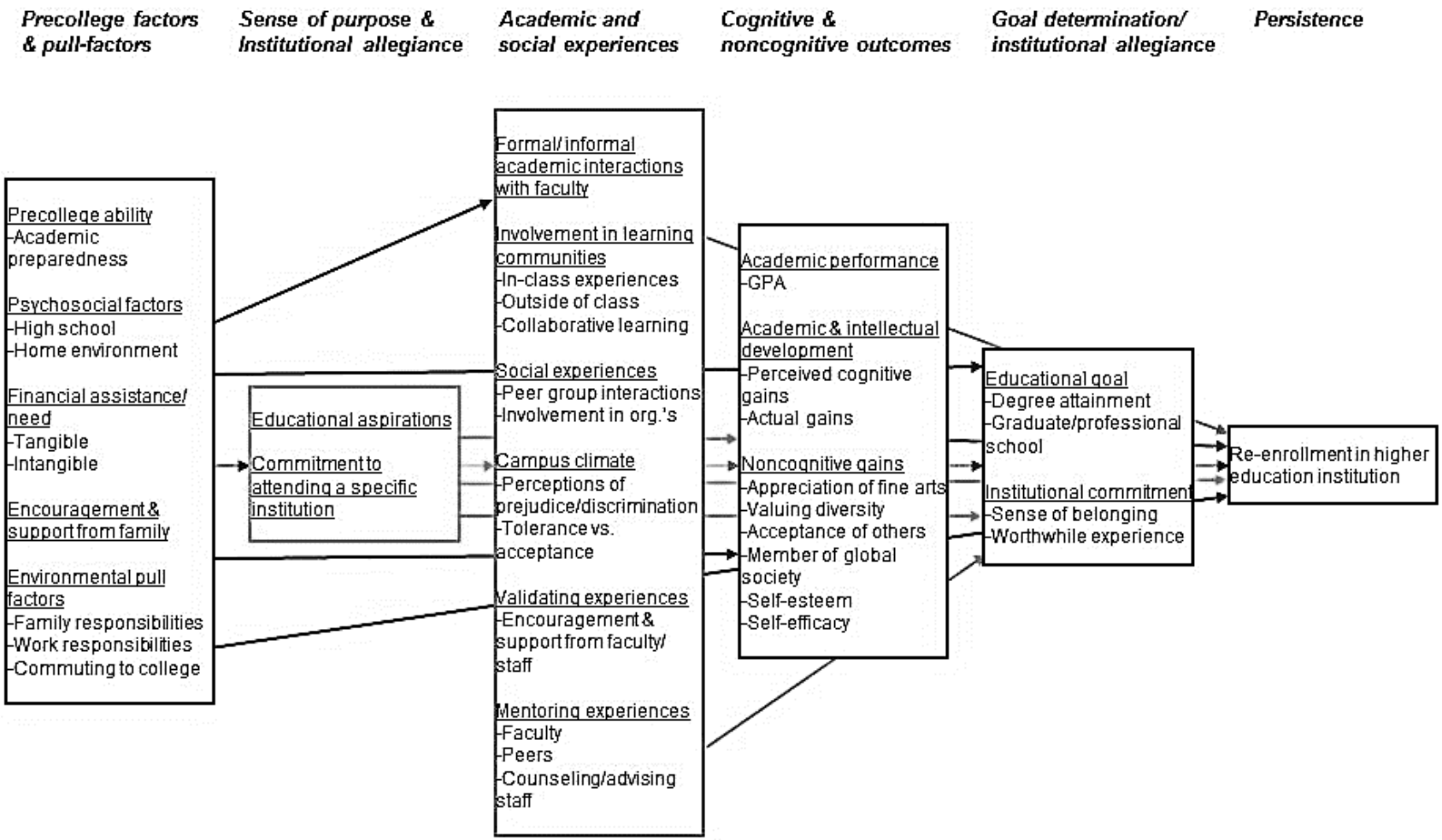

Figure 3.1. Nora's (2003) Student/Institution Engagement Model.
From Nora, A. *(*2003*).* Access to higher education for Hispanic students: Real or illusory? *In* J. Castellanos & L. Jones *(Eds.), The majority in the minority: Expanding the representation of Latina/o faculty, administrators, and students in higher education (pp.* 47-68*).* Sterling, VA*:* Stylus.

While Nora's model was conceptualized as a framework for understanding college student development, studies regarding the relationships between academic outcomes and academic and social fit (e.g., Borman & Dowling, 2010; Palardy, 2013) suggest that the model may be applicable to the framing of students' high school experiences. Furthermore, the comprehensive nature of the study's primary dataset (ELS:2002/2012) allows for consideration of several high school beliefs and behaviors that align with the five predictive components in Nora's model. Thus, this framework is instrumental in additionally considering high school influences on students' college enrollment and completion.

Berger and Milem's (2000) College Impact Model

Berger and Milem (2000) created their college impact model in order to address a conceptual gap between higher education organizations and their students' outcomes. Their framework suggests that students' academic, social, and functional experiences are influenced by organizational characteristics and peer group climates, conceptualized as the aggregate of individual peer characteristics at a particular college or university. Thus, while the effects of the college environment are not necessarily direct, they can be pervasive. Furthermore, the model suggests that students' experiences, comprising behaviors and perceptions, as well as student and peer characteristics, directly influence outcomes such as persistence (see Figure 3.2).

Prior to Berger and Milem's model, organizational behavior studies of higher education institutions tended to ignore individual students as a valid unit of analysis or source of data (2000). Outcomes were therefore informed by faculty perceptions of their students rather than by actual measures of student perceptions and behavior. As a result, the linkages between institutional environments and their students' outcomes were only understood in terms of effects on students as a group across particular institutions, and not on different students within the same

institution (Berger, 2000). However, as Berger and Milem (2000) asserted, "students do not randomly assign themselves to different colleges and universities" (p. 309). Thus one key implication for the purpose of this study is the prudence of considering students' individual and aggregate characteristics when they enter college and the effects thereof on student-level outcomes.

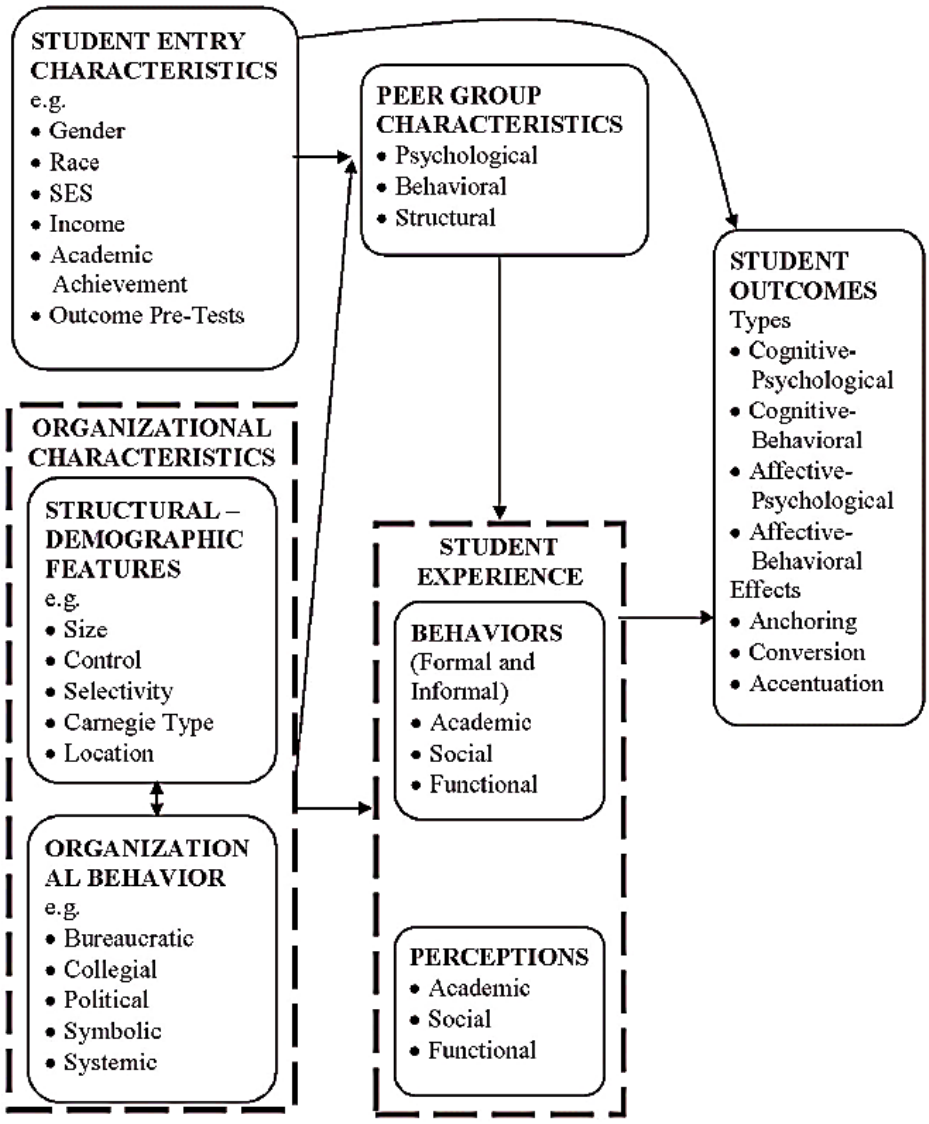

Figure 3.2. Berger and Milem's (2000) College Impact Model.
From Berger, J.B. & Milem, J.F. (2000). Organizational behavior in higher education and student outcomes. In J.C. Smart (Ed.), *Higher education: Handbook of theory and research*. New York: Agathon Press.

Organizational characteristics include organizational behavior, of which Berger and Milem (2000) identify five dimensions or categories: systemic, bureaucratic, collegial, symbolic, and political. However, analysis of these dimensions is beyond the scope of this study. Instead, the study borrows heavily from the model's concept of structural-demographic characteristics, which comprise the other facet of the organizational characteristics that influence students and their peers. The structural-demographic features of an institution include attributes such as its type, control, mission, size, selectivity, and location. These characteristics function as both indicators of peer climate (e.g., selectivity as an aggregate measure of student achievement) and sources of attraction for students to the institution (e.g., when students want to attend a large research intensive university). They also impact students' formal and informal involvement in the academic and social domains of their institution. For example, a small liberal arts college may not offer certain pre-professional majors or programs. Thus, structural demographic characteristics are also key considerations when predicting institutional effects on student outcomes.

Similar to Nora's (2003) model, Berger and Milem's (2000) framework specifies the utility of considering students' social environment with regard to peers' attitudes, behaviors, and composition. This perspective is also appropriate, then, for framing analyses related to the social psychology theories posited as mechanisms for students' academic outcomes. In line with stereotype threat and relative deprivation hypotheses, students' social contexts should be testable for effects above and beyond those attributable to individual attributes and experiences. Additionally, by offering multiple ways to conceptualize peer group characteristics, Berger and Milem's model allows for consideration of the multiple factors that contribute to stereotype threat and frog pond effects: climate, relative performance, and numerical status.

Considering both Nora's (2003) and Berger and Milem's (2000) models as they pertain to this study, the adapted empirical framework is shown in Figure 3.3.

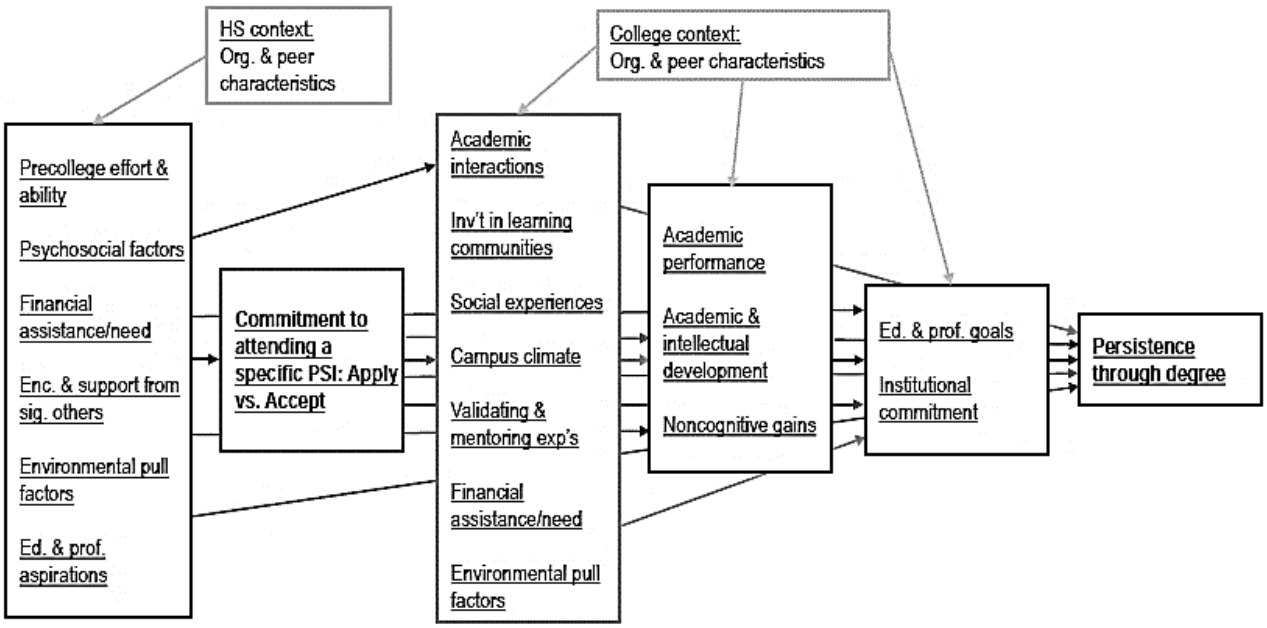

Figure 3.3. Adapted empirical model.

Data and Sample

Students and Schools: ELS:2002/2012

This study used student-level, high school-level, and limited college-level data collected by the National Center for Education Statistics (NCES) as part of the Education Longitudinal Study of 2002 (ELS:2002) baseline and follow-up surveys (NCES, n.d. b). The following sample descriptive statistics come from the ELS follow-up report (Lauff & Ingels, 2013) or are based on the publicly available dataset.

The ELS:2002 dataset contains nationally representative, multilevel survey data from high school sophomores and their parents, teachers, and school administrators. Additional data capture assessment of students' math and reading skills, and measures of school facilities. In

2002, 1,221 high schools were identified as eligible participant institutions for base-year (BY) data collection according to stratification by control, geography (i.e., U.S. Census regions), and urbanicity. From among these schools, 752 participated; 17,591 10th grade students from these schools were then invited to participate in the study, of whom 15,362 participated.

Follow-up data collection involved surveys and interviews in 2004, 2006, and then finally in 2012, when the majority of the cohort was approximately 26 years old. All base-year students were invited to participate in follow-up data collection. Additional information was collected during the 10-year follow-up period from existing data sources, including high school transcripts and achievement test scores, postsecondary entrance exam scores, and financial aid data.

Table 3.1 presents a summary of participation rates across the ELS:2002/2012 components.

Table 3.1
Summary of ELS:2002/2012 Component Participation Rates

Survey Component	Selected	Participated	Unweighted Participation Rate (%)
Base-year school sample	1,221	752	61.6
Base-year student sample	17,591	15,362	87.3
First follow-up questionnaire	16,515	14,989	90.8
High school transcripts	16,373	14,916	91.1
Second follow-up questionnaire	15,892	14,159	89.1
Third follow-up questionnaire	15,724	13,250	84.3

The first follow-up of data collection (F1, in year 2004) implemented a sample freshening procedure so that then-current seniors who had not had a chance to participate in the base-year sample would have a chance to be included in the ELS cohort. Overall, 16,515 base-year and new students were invited to participate in the follow-up, of whom 14,989 actually did. In 2006, a total of 14,159 individuals (of 15,892 eligible) responded to the second follow-up invitation.

And in 2012, a total of 13,250 individuals (of 15,724 eligible) responded to the third follow-up (F3) invitation. By the third follow-up, 13,133 participants from the BY/F1 through F3 sample were identified as the 2002/2012 sophomore cohort.

Sample description. Due to the complexity of the study design, the ELS:2002/2012 dataset includes several weights "to compensate for unequal probabilities of selection of schools and students into the… sample and to adjust for the fact that not all schools and students selected into the sample actually participated" (Lauff & Ingels, A-5). These weights adjust for participation within any given year of data collection as well as for participation between years. Norming weights were also calculated at each stage of follow-up in order to generate a national sample for each cross-sectional and longitudinal dataset. The general descriptive statistics provided throughout this section are based on unweighted, publicly available data for the 2002/2012 sophomore cohort (n=13,133). As such, these statistics are intended to provide a broad overview of the data rather than of students across the U.S., as well as a baseline for comparison with subsequent analytic samples. Later chapters refer to findings from unweighted descriptive analysis as well as—where possible—weighted multilevel modeling. Specifically, samples used for multilevel modeling were weighted by the panel weight, F3BYPNLWT, which attempts to adjust for selective sampling and non-response among 2002 sophomores from their first point of participation through the 2012 follow-up.

The ELS:2002/2012 cohort consists of slightly more women (52.7%) than men. White students are the single largest racial group, constituting nearly 58 percent of the sample. In order of decreasing group size, the cohort also consists of Latinos (14.1%), black or African American students (12.9%), Asian/Asian Americans (9.8%), and "other race" (5.5%) students, comprising multiracial non-Hispanics, American Indians, and Alaska Natives.

Among cohort members who persisted through the 2012 follow-up, 11,413 participants reported ever attending a postsecondary institution, and 11,147 participants reported start dates for their postsecondary education. The large majority of these respondents (75.8%) matriculated in 2004, the year during which the cohort would have been expected to graduate from high school. Approximately 9.5 percent of students started at their institutions in 2005, and 2.8 percent started in 2006. Subsequent to that period, yearly enrollment rates remained between one and two percent through 2012. These differences in time to enrollment are worth considering in light of Adelman's (2006) observation that the longer students wait to begin college, the less likely they are to finish a degree. Interestingly, 2.7 percent of respondents reported that they started their postsecondary education in 2003, when the cohort would have been spring-term juniors or fall-term seniors in high school. These students as well as the 2004 spring-term seniors mentioned previously were likely dual enrollees.

Among the 2002/2012 cohort sample, the NCES aggregated category of "some postsecondary attendance, no postsecondary credential" was the most prevalent highest level of education completed, with approximately 31 percent reporting as much. Slightly fewer respondents (29.7%) obtained a bachelor's degree. The proportions of participants with an associate's degree or undergraduate certificate were similar at 8 percent and 9.5 percent, respectively. A little less than three percent of the sample had not completed high school. Table 3.2 presents a summary of education attainment, as reported in the 2012 survey follow-up, broken down by various student background characteristics.

Table 3.2
Educational Attainment of ELS:2002/2012 Cohort by Select Student Background Characteristics, in Percentages

	Less than HS Diploma	HS Diploma or Equivalent	Some Postsecondary/ Undergraduate certificate	Associate's Degree	Bachelor's Degree or Higher
Total (N=13,133)	2.7	10.4	40.4	8.0	38.6
Sex					
Male (n=6,211)	3.2	13.3	40.9	7.2	35.4
Female (n=6,922)	2.2	7.8	39.9	8.7	41.4
Race/Ethnicity					
Asian (n=1,288)	1.4	5.3	35.9	5.3	52.2
Black (n=1,690)	4.4	11.7	53.8	6.9	23.3
Latino (n=1,855)	5.9	13.5	49.4	8.8	22.4
White (n=7,578)	1.6	9.8	35.8	8.4	44.4
Other (n=722)	4.3	15.1	41.7	8.2	30.7
Parents' SES					
Lowest Quartile (n=2,940)	6.7	19.9	48.3	8.0	17.1
Second Quartile (n=3,084)	3.1	14.4	48.0	9.9	24.7
Third Quartile (n=3,189)	1.3	7.9	41.6	9.2	40.1
Highest Quartile (n=3,899)	0.4	2.1	27.3	5.5	64.7

Institutional characteristics. Later results sections consider descriptive statistics of institutional characteristics measured at the high school and college levels. However, for the purposes of this general overview of the ELS:2002/2012 cohort, schools are described here at the student-level. That is, institutions' characteristics are described in terms of the students who attended them.

The majority (77.5%) of the 13,133 ELS:2002/2012 cohort members attended public high schools, as compared to Catholic (13.2%) or other private (9.3%) schools. Nearly half of the sample (47.8%) attended suburban high schools, as compared to urban (34.1%) or rural (18.1%) schools. With regard to geographic distribution, the largest proportion of students (36.3%)

attended high school in the South, followed by the Midwest (25.7%), West (20.1%) and Northeast (17.8%).

Among the 11,183 cohort members who reported their first postsecondary institutions' (PSI) level and control, public four-year and public two-year institutions were the most attended, at 38.7 percent and 32.6 percent, respectively. Table 3.3 presents a summary of cohort members' distribution across institutional sectors.

Table 3.3
Distributions of Participants' First-Attended PSI's Control and Level (N=13,133)

	4-Year Institution	At Least 2, but Less Than 4-year Institution	Less than 2-year Institution	*Totals*
Public	4,329	3,650	159	8,144
Private not-for-profit	2,094	39	41	2,174
Private for-profit	339	296	236	872
Totals	6,767	3,987	457	13,133

Additional Data Sources

ElSi. The Elementary/Secondary Information System (ElSi) is an NCES web application used to gather information regarding the racial composition of high schools included in the ELS: 2002/2012 data. While the ELS core surveys provide administrators' reports of certain characteristics of their student population, demographic data are limited to the overall proportions of racial minority and low-income (free or reduced price lunch) students. ElSi reports data from the NCES Common Core of Data (CCD) and Private School Survey (NCES, n.d. c), and was thus used for variables that measure the representation of specific racial/ethnic groups at public and private schools across the country, as well as to supplement free or reduced price lunch statistics that were not included in the ELS:2002/2012 data release. For the few schools without information in ELS:2002/2012 or ELSi, racial composition and free or reduced

price lunch program statistics were found on school and district websites as well as state food and nutrition program websites.

IPEDS. Institutional data for both of this study's major research foci (enrollment and completion) come from the Integrated Postsecondary Educational Data System (IPEDS), run by the National Center for Education Statistics within the U.S. Department of Education. IPEDS annually collects data from more than 7,500 postsecondary education providers, including two and four-year institutions, public and private universities, and non-profit and for-profit institutions across all Carnegie classifications. Because participation in IPEDS is "mandatory for institutions that participate in or are applicants for participation in any federal student financial aid program" (NCES, n.d. a), IPEDS data is representative of all U.S. postsecondary institutions.

CIRP. Data from the Cooperative Institutional Research Program's (CIRP) annual Freshman Survey were used to create college campus climate measures. See "Conditions of threat or interaction" within the following Key Variables section.

Key Variables

The primary dependent variable for analyses regarding college enrollment (Research Question 1) is a dichotomous outcome coded to reflect whether students matriculated at a four-year institution after high school as their first postsecondary institution attended, versus all other outcomes (i.e., did not enter postsecondary education, enrolled at a two-year institution, or enrolled at a less than two-year institution). For the primary analyses in response to Research Question 2, degree completion was coded as another dichotomous outcome, based on a 2012 follow-up variable that measures students' time to degree, in months. The measure was calculated by comparing the date a respondent first attended a postsecondary institution to the date he or she received a bachelor's degree from any institution. Respondents were thus coded as

completers if they obtained their bachelor's degree within 72 months of starting their postsecondary education. The original ELS time to degree variable was also used as an outcome measure for follow-up analyses in response to Research Question 2.

Additional independent variables considered for this study measured students' learning experiences and environments, including cumulative high school GPA, types and levels of courses taken in high school, high school demographic composition, composition of high school friendship group, postsecondary institutions to which students applied, financial aid status, and derived variables that describe the postsecondary institutions that students ultimately attended. Additionally, the restricted-use ELS dataset provided the NCESSI and IPEDS codes that were used in clustering students at their secondary and postsecondary institutions, respectively, for multilevel modeling and in linking data from additional sources (i.e., ElSi, IPEDS, CIRP).

Key individual-level variables included single indicator measures of race, socioeconomic status (an NCES derived variable based on parents' education, income, and occupational prestige) and independent income, degree aspirations, extracurricular activities, and of students' timeline from high school through college. An SAT flag was also created to distinguish actual reported standardized test scores from those that were imputed. Despite the relatively high missingness of SAT/ACT scores (25%), the variable was kept because of the historical and continued importance placed on standardized test scores in college admission decisions (National Association for College Admission Counseling, 2008). Furthermore, the SAT flag serves as an indicator of students' dispositions to sit for a college entrance examination. That is, while a student might be expected to obtain a certain SAT score based on a host of demographic, sociocognitive, and academic factors, even with 100 percent accuracy, an imputed score would

not be able to account for the factors that contributed to that student's ultimate unwillingness or inability to actually take the test.

Factor analyses (detailed below in General Analytic Approach) were conducted to identify possible constructs that align with Nora's (2003) predictive components, including parents' and significant others' goal for their student's education, family responsibilities, involvement in school organizations, perceptions of campus support, mentoring/advisory experiences, academic self-efficacy, academic effort, and orientation toward academic and professional success.

Racial composition was considered as a key institutional characteristic at both the high school and college levels, and these measures reflect the proportions of racial minority students, disaggregated by race to the extent possible[1]. Previous studies have operationalized racial diversity as the proportion of students of color (e.g., Charles et al., 2009) or have utilized diversity indices (e.g., Chang, 2001; Park, 2009) to reflect the probability of students' interactions across race. Use of the former measure alone would obfuscate stereotype threat effects specific to students' conceptualization of same-race peers as in-group members, or would assume that racial minority students identify with a larger group of students (all students of color, or all underrepresented racial minority students) who may not actually inform their frames of reference. Furthermore, collapsing students of color into one group ignores the salience of race-specific effects as demonstrated by higher education research (e.g., Hurtado et al., 1996; Lehman, 2012; Sáenz, 2010). By contrast, the use of disaggregated race addresses these concerns while also allowing me to model the potential effects of students' experiences with other,

[1] The original race/ethnicity categories identified by sources used for level-2 data are as follows:
ELSi: American Indian/Alaska Native; Asian or Asian/Pacific Islander; black; Hispanic; white
IPEDS: American Indian/Alaskan Native; Asian/Pacific Islander; black, non-Hispanic; Hispanic; white, non-Hispanic; non-resident alien; race and ethnicity unknown.

specific race groups, with whom they may or may not identify. Thus, the representation of specific race groups (e.g., proportion of black students) is included in several analyses.

In addition to proportions of specific race groups, this study used Meyer and McIntosh's (1991) diversity index, an indicator of potential for cross-racial interactions, which might be understood in line with Umbach and Kuh's (2006) construct of "diversity press." The diversity index measures the probability that any two randomly selected students will be from different racial groups, and is calculated thusly:

$$\text{Index Score} = 1 - P_R \qquad P_R = (A^2 + B^2 + C^2 + D^2), \qquad (1)$$

where A, B, C, and D are the proportions in the population of four hypothetical racial groups. Scores were scaled to range from 0 to 100, with 0 representing absolute homogeneity and 100 representing absolute heterogeneity.

Socioeconomic composition was measured by the proportion of students who are eligible for free lunch and the proportion of federal grant recipients[2] at the high school and college-levels respectively. Unlike racial composition, which accounts for multiple identity categories, socioeconomic composition was considered a reflection of whether students fall into in- or out-group status with respect to a single category of social identity. That is, students were considered to be low SES if their family had low enough income to receive federal subsidy. At the aggregate, this measure then represents high schools' proportions of low-income students, and college's proportions of low-income undergraduate students.

In addition to the categorical selectivity measures present in the ELS dataset, an institution-level measure of students' academic performance was created based on IPEDS reported standardized test scores. Because IPEDS does not require institutions to report their

[2] The IPEDS variable measuring the proportion of Pell Grant recipients, which would more accurately measure the representation of low-income students, was not available for the years of interest to this study.

average ACT or SAT scores of entering freshmen, the selectivity measure was calculated as the average of the 25th and 75th percentiles of SAT and ACT scores, converted to a single SAT scale. As reviewed previously, standardized test scores often reflect race or socioeconomic disparities that may be attributable to differential familiarly with cultural norms (Eells et al., 1951, as cited in Croizet & Millet, 2012). Additionally, high school GPA has been demonstrated to be a consistently strong predictor of both first-year college grades and four-year college outcomes (Geiser & Santelices, 2007). However, indicators of matriculating cohorts' grades were not available to serve as either an alternative or supplementary measure of aggregate performance.

In order to ensure sufficient predictive power, the number of independent variables that I was willing to consider was such that there would be at least 10-30 observations per independent variable at level-1, and 30-50 groups at level-2 (Hox, 1998).

Conditions of threat or interaction. Stereotype threat and higher education diversity scholarship both suggest that the benefits of compositional diversity are contingent upon the institutional climate, or conditions for contact (Allport, 1954; Hurtado et al., 1998) or identity salience (Charles et al., 2009). That is, for example, the effect of a student's experiences with racial minority status or interactions across race can be influenced by whether the student, or his or her peers, has internalized certain beliefs about race or about members of a race group. The lack of ELS and IPEDS measures capturing college campus climate or students' perception thereof limits the extent to which these preconditions might be considered. However, in an effort to provide indicators of relevant psychosocial factors (e.g., peer beliefs about minority status students), institutional identifiers were used to obtain this student-level data from the Cooperative Institutional Research Program (CIRP), housed within the Higher Education

Research Institute (HERI) at UCLA. Campus-level aggregate measures of psychosocial dynamics regarding diversity, based on those used in previous studies (e.g., Chang et al., 2004; Umbach & Kuh, 2006), were then created for use as level-2 variables.

Analytic Sample

Missing values analysis was used to address issues of missing data at both the variable and case levels. Cases with missing data for the outcome variables or key demographic characteristics (e.g., race, gender, SES) were deleted from the sample. For all other variables in the study, and in order to preserve the greatest number of participants in the sample, data were imputed using the expectation-maximization (EM) algorithm. The EM algorithm uses maximum likelihood (ML) estimates to replace values for cases with missing data and is thus preferred over other less robust, less accurate methods such as mean replacement (McLachlan & Krishnan, 1997).

Both student- and institution-level variables with a large proportion of missing values (15% or more) or with data that are not missing at random (MAR) were considered for removal from analyses. Also, multilevel modeling relies on an assumption of variation in the outcome variable, both within and between groups. Thus, institutions with fewer than two respondents were removed from the multilevel modeling samples.

Analyses

General Analytic Approach

Descriptive analyses by way of cross-tabulations with chi-squared tests, and Analysis of Variance (ANOVA) were used to compare college enrollment and completion outcomes for participants based on their background characteristics (i.e., academic performance, race, SES) as well as based on the peer contexts (i.e., aggregate measures of academic performance, race, SES)

associated with their institutions. Additionally, descriptive statistics were used to generally describe the final analytic samples used for multilevel modeling. These statistics include the overall sample's mean, standard deviation, and range for each of the independent and dependent variables.

Both exploratory and confirmatory factor analysis were conducted to reduce the number of independent variables in the final multilevel models. Principle axis factoring with promax rotation was used in order to maximize the strength of each unique factor, while allowing for a more realistic assumption of correlation between factors (Russell, 2002). In order to be considered for multilevel analyses, within-factor variables must have loaded at .40 or higher. Additionally, all factors had an eigenvalue higher than 1.0 and a minimum Cronbach's *alpha* of .65 in order to ensure internal reliability (DeVellis, 2003). Based on these requirements, five final student and high school-level factors were used for multilevel modeling, many of which were based on existing ELS constructs: students' perceived school safety, perceived quality of teacher-student relationships, social agency, math self-efficacy, and school academic climate as reported by administrators. A subset of analyses also included a college-level factor comprising CIRP survey items, which measures entering students' social and pluralistic goals. For a list of factors and their constituent items, including factor loadings, and all scale measures, see Appendix A2.

Multicollinearity checks and missing data analyses were conducted in order to reduce the preliminary list of variables that were identified based on extant literature and theory. Preliminary single-level logistic regression analyses were then conducted to further reduce this list of student-level variables. Finally, specifically for the cross-classified model, a preliminary multilevel model was run in order to eliminate extraneous high school-level variables. A list of

final variables, as well as those removed after preliminary logistic regression or multilevel modeling, and their coding schemes is available in Appendix A1.

Because ELS:2002 relied on a two-stage sampling of high schools, and then students within those schools, the data are particularly well suited for multilevel modeling (see Palardy, 2013). Thus, hierarchical linear modeling (HLM) was used as a general analytic approach for analysis of both the enrollment and completion outcomes. One key advantage that HLM offers over traditional, single-level regression is that it allows for simultaneous consideration of variables at any of the three "levels" inherent to this dataset (student, high school, college). As such, HLM accounts for the clustering of students within schools to estimate the separate effects of students' individual characteristics (level-1) on their educational attainment from those effects related to the characteristics of the school(s) they attend (level-2). Taken together, these features allowed for practical considerations of how and for whom schools make a difference. Furthermore, HLM is preferred over the use of single-level techniques to analyze multilevel data because the latter approach can result in underestimated standard errors, which subsequently increases the likelihood of Type I error (i.e., claiming that a parameter is statistically significant when it is not) (Raudenbush & Bryk, 2002). Finally, HLM utilizes maximum likelihood techniques, as opposed to ordinary least squares, which yield robust and consistent parameter estimates for large samples with unequal group sizes (de Leeuw & Kreft, 1986; Hox, 1998; Raudenbush & Bryk, 2002). Thus, in addition to being sensitive to the high likelihood of students sharing experiences or traits within their school settings, HLM provides a comprehensive and statistically sound analysis of the myriad factors that may account for enrollment at a four-year institution and bachelor's degree attainment.

Multilevel modeling techniques also require consideration of centering and weighting in order to produce both accurate and interpretable estimates. All continuous independent variables were centered about their grand means with the exception of level-one measures that would be tested for interaction effects. These variables were centered about their group means, when possible, in order to increase the interpretability of results (Bauer & Curran, 2005; Enders & Tofighi, 2007). All dichotomous predictors were left uncentered. Additionally, models were weighted whenever possible, using the ELS panel weight mentioned previously. Weighting and group-mean centering were not options for cross-classified models—a limitation of the software used for this study (HLM 6.08).

The following sections provide more detailed description of analytical approaches with regard to the two major research questions.

Predicting College Enrollment (Research Question 1)

As a preliminary approach to Research Question 1, contingency tables (cross-tabulations) were used to determine whether students' rates of enrollment at four-year institutions differ significantly with respect to race and SES. Due to the dichotomous nature of the dependent variable, this analysis is recommended over Analysis of Variance or Covariance, which assumes normal outcome distribution and equal variances between groups (Seltman, 2013). In addition to individual level independent variables, the three contextual predictors of interest were measures of high school racial diversity, and aggregate socioeconomic status and academic competitiveness. Categorical variables with "Low," "Medium," and "High" values were also created based on the distribution of original scale scores for the social context measures. In other words, schools were divided into thirds based on their student composition with respect to race, SES, or academic performance.

HGLM. Given that this study seeks to predict a dichotomous outcome—whether or not a student enrolls at a four-year institution—hierarchical generalized linear modeling (HGLM) is the most appropriate multilevel modeling technique to address Research Question 1. In order to warrant the use of a multilevel model, I began this portion of analysis by constructing a null, or fully unconditional model, which had no predictors at either level.

The HGLM level-1 sampling model is Bernoulli, and uses a logit link function to predict the log-odds of the outcome event for student *i* in school *j*, as represented in Equation 2 (Raudenbush & Bryk, 2002):

$$\eta_{ij} = \text{Log}\left[\frac{\Phi_{ij}}{1-\Phi_{ij}}\right] = \beta_{0j} \qquad (2)$$

η_{ij} represents the log odds, or likelihood of enrolling versus not enrolling at a four-year institution based on the institutional average of the outcome, β_{0j}.

The level-2 model is specified thusly:

$$\beta_{0j} = \gamma_{00} + u_{0j} \qquad u_{0j} = N(0, \tau_{00}) \qquad (3)$$

where the institutional average on the outcome measure (college enrollment), β_{0j}, is a function of the average log-odds of enrollment across all high schools, γ_{00}, and a random effect, u_{0j}, that is unique to each institution.

Generally, use of hierarchical linear modeling techniques requires consideration of the extent to which the outcome measure varies across the level-2 unit of analysis (Raudenbush & Bryk, 2002). Covariance estimates taken from the null model are used to calculate the Intra-Class Correlation (ICC), which estimates the proportion of variance between groups. The ICC would thus allow for assessment of the extent to which students' average likelihood of enrollment at a four-year college university varies across high schools. In the case of models with dichotomous outcomes, though, individual-level variance is heteroscedastic, which reduces the overall

accuracy of the ICC. However, because it can still be informative, ICCs were assessed to estimate the amount of variation in the outcome variable between institutions. For HGLM, the ICC is estimated by the formula:

$$\text{ICC}= \frac{var(u_{oj})}{(var(u_{oj})+\frac{\pi^2}{3})} \quad (4)$$

Variance component estimates and box-plots of empirical Bayes (EB) estimates of average enrollment rates (see Park & Eagan, 2011; Titus, 2004) were also inspected to determine the extent of outcome variation across schools (Raudenbush & Bryk, 2002).

Blocks of independent variables were added to the level-1 model in the following order: demographic characteristics; high school experiences/behaviors; academic and social attitudes; educational aspirations; and key academic indicators. Level-2 predictors were then added to the model to take into account a number of high school institutional characteristics. Finally, cross-level interactions between school-level characteristics and individual-level characteristics were added to determine whether the overall effects of race or SES (individual-level attributes measured at level-1) on students' likelihood of enrollment varies according to the risk for stereotype threat presented by students' high school environments (measured at level-2). That is, referring to the threat posed by numerical minority status, I investigated whether the representation of certain race or SES groups moderates individual race or SES specific predictive effects on college enrollment rates. From among these interactions, in particular, I looked for significance at the intersection of students' stigmatizable social identities (e.g., identifying as black) and the prevalence of in-group peers (e.g., proportion of black students at their institution).

The final HGLM model can then be described by the following equations, where Equation 5 represents the general student-level model:

$$\text{Log}\left[\frac{\Phi_{ij}}{1-\Phi_{ij}}\right] = \beta_{0j+}\beta_{1j}\ (\text{Demographics})_{ij} \quad (5)$$

$$+ \beta_{2j}*(\text{Parental influences})_{ij} + \beta_{3j}*(\text{HS social environment})_{ij}$$

$$+ \beta_{4j}*(\text{Sociocognitive factors})_{ij} + \beta_{5j}*(\text{Peer influences})_{ij}$$

$$+ \beta_{6j}*(\text{College-going behaviors})_{ij} + \beta_{7j}*(\text{ HS academic performance})_{ij}$$

and Equation 6 represents the high school-level model:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}*(\text{HS structure})_j \quad (6)$$

$$+ \gamma_{02}*(\text{Instructional and counseling staff})_j$$

$$+ \gamma_{03}*(\text{Learning environment})_j$$

$$+ \gamma_{04}*(\text{Academic performance and stereotype threat contexts})_j + u_{0j}$$

and where all level-2 parameters are constrained to be fixed across schools.

Predicting Bachelor's Degree Completion (Research Question 2)

In describing students' transition patterns from high school to college, contingency tables were used to identify the types of schools from which students graduate and the schools at which they matriculate to determine whether there are significant relationships between the two. To do this, the sample for this analysis was limited to the 6,767 participants who matriculated at a four-year college or university as their first postsecondary institution. Similarly to descriptive analyses for Research Question 1, three-category independent variables describing the peer environment were created based on aggregate measures of race, SES, and academic competitiveness (based on average test scores).

Following descriptive analyses of students' transition pathways, Research Question 2 was addressed primarily using the sub-sample of ELS:2002/2012 cohort members whose first-attended postsecondary institution was a four-year college or university in order to control for

students' intentions to obtain a bachelor's degree, as compared to an associate's degree or other credential at the time of matriculation to college. Furthermore, this sample was reduced to include only students who attended one or two postsecondary institutions (as compared to anywhere between one and seven institutions), under the assumption that students need to spend enough time at their institution in order for institution-level effects to manifest measurably.

To test whether differences in postsecondary outcomes exist across students' background characteristics (race, SES) and transition patterns, I created contingency tables comparing enrollment and degree completion for students by their respective sub-groups. This way, as an example of transition or "pond hopping" comparisons, the prevalence of white students from high performing high schools who then go to non-competitive colleges could be compared to the rates at which their black, Latino, or Asian counterparts exhibit the same pond hopping patterns. Additionally, degree completion rates could be compared by differences in students', say, academic contexts of high schools and colleges (e.g., students from low performing high schools who go to highly selective colleges compared to their high school peers who go to non-selective or moderately selective colleges).

CCHGLM. To account for the unique effects of high school, college, and individual factors in students' college transitions, I used cross-classified hierarchical generalized linear modeling (CCHGLM) as the primary method of predicting bachelor's degree attainment within six years of entering college. CCHGLM considers the clustered nature of students within different school contexts that are not necessarily hierarchically related to one another (Hox, 2010). That is, it considers the similarities of students within the same high schools, and within the same colleges, without assuming that any given student's high school is similar to his or her college. Figure 3.4 provides a visual representation of CCHGLM data, as compared to the purely

hierarchical structure of the data used to address Research Question 1. This method, then, is appropriate given the high likelihood of students sharing characteristics with other students at their high schools (e.g., SES) as well as with their college peers (e.g., academic rigor of courses), that might affect degree completion. Additionally, this technique represents an appropriate method to examine the effects of independent variables on a dichotomous dependent variable.

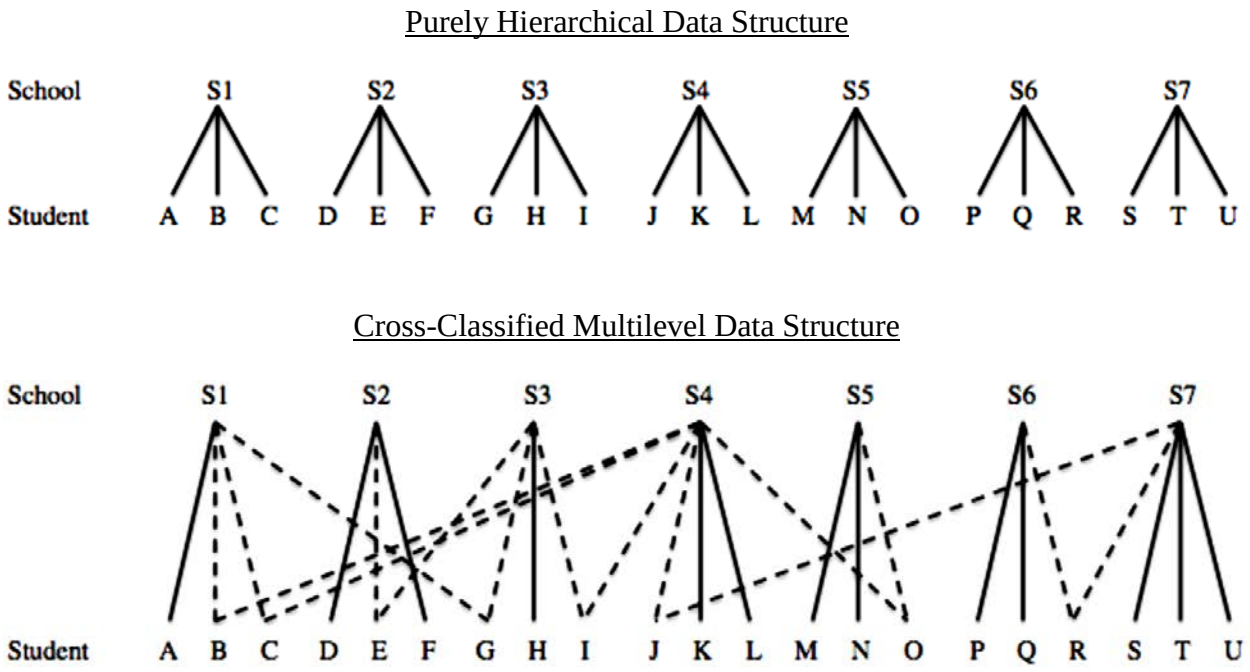

Figure 3.4. Comparison of purely hierarchical and cross-classified multilevel data structures.

Foundational studies that explored stereotype threat and frog pond effects tended to rely on single-level statistical techniques, which ignore the clustered nature of student and school based data. Additionally, most current research utilizes multilevel modeling techniques that draw from only student and high school variables, or from only student and college data, similar to the analyses for Research Question 1. CCHGLM thus offers a much more comprehensive analysis of the factors affecting students' degree completion, allowing for linkages between students' individual characteristics and the institutional contexts of their high schools and colleges (e.g., Park & Eagan, 2011).

As in my analyses for Research Question 1, I began with a null model to investigate the extent to which variation might be explained at level-2. The final HGLM model used to address Research Question 1 was then used to create a parallel HGLM predicting degree completion in order to compare whether independent variables differ in their significance between the two outcomes.

Based on the previously mentioned HGLM predicting degree completion, as well as results from preliminary analyses (in General Analytic Approach, above), a cross-classified model was then built using key student and high school predictors, and final college predictors, thus also capturing students' *college* experiences and context. Furthermore, to address the predictive effects of transition, additional level-1 indicators accounted for students' patterns from high school to college with respect to their institutional contexts. Thus, for example, the student-level effects of going from a non-competitive (i.e., low average SAT score) high school to a highly competitive college could be distinguished from the effects of going from a non-competitive high school to a non- or moderately academically competitive college. Finally, level-1 interactions between these transition patterns and individual-level characteristics were added to determine whether the overall effects of race or SES on student's likelihood of enrollment varies according to their pattern of pond hopping.

As in HGLM, the level-1 sampling model for CCHGLM is Bernoulli, and uses a logit link function to predict the log-odds of the outcome event for student *i*, in school *j*, and college *k*. At level-2, CCHGLM differs from HGLM in that models can simultaneously account for two types of institutional variables: those measuring high school characteristics, and those measuring college characteristics. Thus the final CCHGLM model can be understood by Equation 7 (student-level):

$$\text{Log}\left[\frac{\Phi_{ij}}{1-\Phi_{ij}}\right] = \pi_{0j+}\pi_{1jk}\,(\text{Demographics})_{ijk} \quad (7)$$

$+ \pi_{2jk}$*(Parental influences)$_{ijk}$ + π_{3jk}*(HS experiences)$_{ijk}$

$+ \pi_{4jk}$*(Peer influences)$_{ijk}$ + π_{5jk}*(College-going behaviors)$_{ijk}$

$+ \pi_{6jk}$*(HS Academic performance)$_{ijk}$

$+ \pi_{7jk}$*(Transition and college experiences)$_{ijk}$

and Equation 8 (high school and college levels):

$\pi_{0jk}=\gamma_{00}+ \gamma_{01}$*(HS structural characteristics)$_j$ (8)

$+ \gamma_{02}$*(HS composition)$_j$

$+ \beta_{01}$ *(College structural characteristics)$_k$

$+ \beta_{02}$ * (College composition)$_k$ + b_{00j} + c_{00k}

Again, all level-2 variables were constrained to be fixed across schools and colleges.

The same variable blocks were also used for supplementary statistical analyses using a continuous outcome variable, time to degree. The equations for these cross-classified hierarchical linear models are thus the linear analogs of the CCHGLM equations above (i.e., Equations 7-8, but without a logit link function). The ICC for these analyses was estimated according to Equation 9:

$$\text{ICC}= \rho= \frac{\tau_{00}}{\sigma^2+\tau_{00}} \quad \text{(Equation 9)}$$

τ_{00} = variance at level-2

σ^2 = variance at level-1.

Limitations

By utilizing a recently released and uniquely comprehensive database that combines high school institutional characteristics, student attitudes and behaviors, and characteristics of the colleges

attended by students, this study provides a rare and timely opportunity to better understand predictors of college access and completion. However, this study is not without its limitations.

Within the U.S. higher education context, it has become increasingly common for students to attend multiple institutions during their higher education careers. Due in part to the creation of a "curricular currency" through the standardization of course credits, mobility patterns now include non-linear trajectories and simultaneous enrollments, or "swirling" and "double dipping" (McCormick, 2003). Nearly one-third of first-time college students attend multiple institutions during their postsecondary educational trajectory, and close to one in four (23.6%) of traditional college-age students complete their degree at an institution other than where they started (Shapiro et al., 2012). However, the ELS:2002/2012 dataset contains information for only a limited number of postsecondary institutions, including students' first and last attended college or university, but not necessarily for all the institutions that participants may have attended (though not for lack of attempt to gather such information from participants). Furthermore, the data used for this study does not give indication of the pattern or duration of students' enrollment at any given postsecondary institution. Thus, it is unclear whether students took time off between institutions or were enrolled concurrently, or left one institution for another but then returned. Yet these distinctions are noteworthy given that previous research (McCormick, 2003) has demonstrated that different enrollment patterns correspond with different degree attainment rates. Also, several analyses are limited to a sample of students who started college at a four-year institution, a decreasingly prevalent sub-group of college attendees. Thus, results may neither capture the full range of influential postsecondary experiences and environments nor be generalizable to the current population of students pursuing diverse and increasingly less "traditional" postsecondary pathways.

While the ELS:2002/2012 data is comprehensive, the study remains incomplete; postsecondary transcript data, which would serve to measure students' college academic performance and history, was not available at the time this study was conducted. However, as noted in Nora's (2003) model, postsecondary academic performance, indicated by GPA, is an explicit component of student persistence. Furthermore, it is possible that while significant effects of certain variables do not manifest in predicting the general enrollment and completion outcome variables used in this study, they would for a more incrementally measured outcome, such as GPA or time to academic milestones. In an attempt to address this limitation of the data, multiple individual-level variables were used to capture a range of students' postsecondary academic experience. Furthermore, all models included multiple indicators of students' high school performance and ability, which also predict college persistence and completion (DeAngelo et al., 2011). However, the lack of this key in-college measure likely poses the risk of attributing degree completion outcomes to correlated predictors.

Self-selection is a concern at both the high school and college levels. That is, students (and instructors) select into institutions, and likely do so in ways that are not entirely explained by controls included in the data or in predictive models. For example, this study tests whether students' academic outcomes are explainable in part by characteristics of their high schools. While statistical analyses can control for the type of high school students attended (e.g., private, public), they cannot necessarily control for the reason why they attended them. For example, the choice to attend a private, religiously affiliated high school may have to do with income or affordability—which can be somewhat accounted for in the ELS dataset; but it can also have to do with a desire for safety, culture, proximity, or curricular rigor that is not offered by a public alternative. Moreover, the prevalence of families choosing to send their child to a public or

private school other than the public one to which they were assigned continues to grow (Grady & Bielick, 2010). Thus, confounding factors informing high school choice can influence students' graduation, college choice, and ultimately college completion.

Demographic composition is based on institution-level measures of racial and socioeconomic diversity and academic performance. However, even diverse campuses can be highly segregated, thus limiting the peer interactions and reference groups to which stereotype threat or frog pond effects should be attributed (antonio, 2001; Arcidiacono et al., 2011). Additionally, evidence suggests that academic tracking in U.S. K-12 schools results in the sorting of students by race and social class (Oakes, 2005). Thus, without the availability of track or classroom-level data, this approach to measuring peer context is also limited in that it likely does not account for educational opportunities that might differ for white or upper income students compared to their racial minority or lower SES schoolmates. Furthermore, the measures used in considering racial composition can only be disaggregated to the extent that they were when originally reported. Thus, for example, the category of "Asian/ Pacific Islander" includes both Native Hawaiian (NH) and Pacific Islander students (PI), whose educational attainment do not mirror that of students of East or South Asian descent. This aggregation results, then, in minimizing the potential significance of experiences or environments that impact NH/PI students, who might otherwise be treated as a distinct group or as part of the AIAN racial/ethnic category.

Finally, while these analyses take certain school characteristics into account by assuming clustering among the students who attend the same institutions, they cannot explicitly account for the predictive effects of characteristics that are not reflected in the dataset. At the high school level, for example, neither per pupil expenditure nor school practices (e.g., extended day

program) is measured. However, both are ostensibly factors that influence student outcomes through some association with school quality (see Palardy, 2013). Similarly, postsecondary institutional measures fail to capture aspects of curricular quality or degree of difficulty. Thus, while this study attempts to predict completion, it does so without consideration of potential hurdles to passing courses, moving onto higher level coursework, or competing with peers whose preparatory experiences might look the same with regard to performance indicators but very different with regard to content.

CHAPTER 4: RESULTS

This study utilized multilevel modeling techniques to examine the relationships between student and institutional characteristics, and multiple postsecondary outcomes. For reference, Table 4.1 presents a summary of these analyses and their corresponding analytic samples, which were used to answer this study's two primary research questions. The following chapter then highlights results from each set of analyses as they pertain to students' likelihood of enrolling at a four-year postsecondary institution (PSI), and completion of a four-year degree.

Table 4.1
Summary of Multilevel Analyses

Analysis	Sample Size and Description[3]
Research Question 1: Enrollment at 4-Year Postsecondary Institution	
DV 1: Enrollment at 4-Year PSI	
HGLM	N=8,050 Students, 650 HS's Enrolled at same school for 10th grade in 2002 and for 12th grade in 2004
Research Question 2: Bachelor's Degree Attainment	
DV 1: Degree completion within 6 years	
HGLM	N= 4,010 Students, 570 HS's Enrolled at 4-year college/university as first-attended PSI
CCHGLM	N=3,080 Students, 540 HS's, 590 PSI's Started at 4-year PSI; Attended 1 or 2 PSI's total
CCHGLM	N=2,090 Students, 500 HS's, 390 PSI's Started at 4-year PSI; Attended 1 or 2 PSI's total; First-attended PSI has CIRP TFS data
DV 2: Time to degree (in months)	
CCHLM	N=2,430 Students, 550 HS's, 640 PSI's Started at 4-year PSI; Attended 1 or 2 PSI's total; Completed bachelor's degree
CCHLM	N=1,650 Students, 480 HS's, 380 PSI's Started at 4-year PSI; Attended 1 or 2 PSI's total; Completed bachelor's degree; First-attended PSI has CIRP TFS data

[3] These numbers and all subsequent references to student and institutional sample sizes have been weighted and/or rounded per NCES reporting guidelines.

Predicting Enrollment at Four-Year Postsecondary Institutions (Research Question 1)

This section highlights results specifically from descriptive analyses and hierarchical generalized linear modeling used to answer this study's first general and subsidiary research questions:

- *Controlling for background characteristics, to what extent do students' peer academic, racial, and socioeconomic contexts in high school predict matriculation at a four-year postsecondary institution?*
    - *Do the effects of these peer contexts moderate student-level race or SES effects?*

In order to address the question of whether high school-level characteristics influence students' enrollment in postsecondary education, the original ELS:2002/2012 sophomore cohort sample was reduced to the 9,080 students who were identified as both 2002 sophomores and 2004 seniors, who remained at their same high school between their sophomore and senior years (i.e., did not transfer), and who participated in all four points of student data collection, thus supporting the use of independent and dependent variables taken from all four time points (used in these and subsequent analyses). This sample was then further narrowed to the 9,010 cohort members who had values for the dependent variable of interest—level of first postsecondary institution attended—and such that each high school in the level-2 sample represented at least two student cases.

This section begins with a presentation of descriptive analyses that draw from both student and institution-level variables, based on the sample of 9,010 students discussed previously. It presents findings from cross-tabulations and one-way analysis of variance (ANOVA) that disaggregate outcomes by key student demographics (i.e., race and SES), and institutional characteristics (i.e., academic competitiveness, racial diversity, and socioeconomic

context). Then, results from multilevel statistical analysis are presented, highlighting relationships between student and high school-level variables, and students' likelihood of entering a four-year institution. Differences in those relationships, as determined by comparisons of intermediate and final models, are also discussed. It should be noted that this section and others pertaining to multilevel generalized linear modeling results discuss only general differences between models, referencing overall model statistics for nested models only. Additionally, discussion of specific variables across different models is framed by their general significance rather than direct comparison of variables' coefficients, which could otherwise lead to invalid or misleading conclusions due to differences in residual variation between variables and analytic samples (Allison, 1999; Mood, 2010).

Descriptive Analyses

Postsecondary outcomes by key demographic characteristics. Sample members' degree expectations and outcomes vis-à-vis the study's two dependent variables of interest—starting postsecondary education at a four-year school and completing a bachelor's degree within six years of starting postsecondary education—were compared based on key demographic characteristics.

Table 4.2 presents students' aggregate outcomes by race. On the whole, fairly large proportions of students across all race groups expect to earn at least a four-year college degree, as reported while still sophomores in high school; however, there are clear differences at the extremes. For example, 84.1% of Asian American/Pacific Islander students (AAPI, which, for the purposes of this study combines the ELS categories of "Asian" and "Native Hawaiian or Pacific Islander") students expect to at least graduate from college while only 62.5% of American Indian or Alaskan Native (AIAN) sophomores have similar expectations. After AAPI

students, multiracial, and white students most commonly expect a college degree or higher, with 82.1% to 84.1% reporting as much. Black and Latino students then report expectations for a college degree at slightly slower rates, 78.3% and 73.1%, respectively. It should be noted that these overall differences between race groups reflect those in students' expectations or "anticipations" (Adelman, 2006), which are not necessarily a measure of their postsecondary aspirations. However, these statistics begin to shed light on race-related disparities in postsecondary outcomes, which emerge well before students even apply for college.

Table 4.2
Postsecondary Outcomes by Race

	% Expect at Least 4-Year Degree, in 10th Grade	% Matriculated at 4-Year PSI	% Among 4-Year PSI Starters with Bachelor's in 6 Years
AAPI (n=890)	84.1	67.7	66.1
AIAN (n=60)	62.5	35.9	12.0
Black (n=990)	78.3	55.2	43.8
Latino (n=1,080)	73.1	42.0	52.5
Multiracial (n=390)	83.4	59.0	53.7
White (n=5,610)	82.1	64.0	65.7

As might be expected based on previously discussed statistics describing the larger ELS:2002/2012 cohort, as well as the national education attainment landscape, white and AAPI students enter four-year schools at the highest rates, followed by their black, Latino, and AIAN peers. Multiracial students, who represent a little over four percent of the sample, exhibit enrollment rates between those of white and AAPI students, and underrepresented racial minority students; however, given the potentially wide variety of racial groups and identities represented by this category, it is difficult to interpret results for this group. The largest disparity in four-year college access rates—between AAPI and AIAN students—is a difference of 31.8 percentage points.

With respect to bachelor's degree attainment among participants who start at a four-year postsecondary institution, Asian and white students again demonstrate similar and relatively high rates, followed by multiracial students. Among underrepresented racial minority groups, Latino students demonstrate the highest rate of degree completion at 52.5%, followed by black and then AIAN students. In comparing these rates, it is important to note that AIAN statistics are based on a sub-group that starts out much smaller than any of the others. However, AIAN students are considered as a distinct sub-group in this study in order to allow the option of testing for the effects of attending tribal high schools and colleges, which enroll predominantly or entirely Native student bodies.

Students' postsecondary outcomes were also disaggregated by socioeconomic status. Students were categorized into low, medium, and high SES based on the SES factor scores calculated for them as part of the first ELS follow-up. "Low SES" students in this study represent those with SES values equal to 0.5 or more standard deviations below the general population average—zero; "High SES" represents 0.5 or more standard deviations above average. While the original ELS SES variable demonstrates a normally distributed scale score, reflecting the same distribution as would be expected in the general public, the sample used for this analysis did not demonstrate the same distribution. Instead, the sample for this research question is skewed toward middle and high SES students. This difference is likely attributable to the fact that the sample was limited to "traditional" high school students who attended the same school for at least their last two years of high school, and who finished their sophomore and junior year requirements in one academic year each. Thus, even after allowing for a relatively large range of raw SES scores to be included in the category, the low SES group remains the smallest with 1,520 students, as compared to 4,500 middle SES and 3,000 high SES students.

Also supporting literature and general cohort statistics, Table 4.3 suggests that students' socioeconomic status is invariably associated with education expectations and attainment. By the 10th grade, high SES students are by far the most likely to expect at least a four-year degree; nearly all (91.2%) report as much. High SES students also enroll at four-year colleges at substantially higher rates than their middle and low SES peers—differences of 26.6 and 44.4 percentage points, respectively. While less stark, comparisons of degree attainment rates also point to SES as a key factor, with differences of 16.3 percentage points between high and middle SES students, and 29.8 percentage points between high and low SES students.

Table 4.3
Postsecondary Outcomes by SES

	% Expect at Least 4-Year Degree, in 10th Grade	% Matriculated at 4-Year PSI	% Among 4-Year PSI Starters with Bachelor's in 6 Years
Low SES (n=1,520)	67.8	36.7	42.4
Middle SES (n=4,500)	78.3	54.5	55.9
High SES (n=3,000)	91.2	81.1	72.2

Taking one step further in examining students' postsecondary outcomes, Table 4.4 shows institutions' average academic competitiveness (or, selectivity) as measured by the quasi-average SAT score of students' first-attended four-year college or university. As suggested in the literature, AAPI and white students, on average, attend the most competitive institutions, with average SAT scores of 1172 and 1123, respectively. Furthermore, these same institutions have the highest average SAT scores of those attended by students in any racial group, with maximum average SAT scores of 1525 each. Interestingly, Latino students tend to attend schools with test scores that are fairly similar, on average, to those of white and multiracial students. Finally, and similarly to other postsecondary outcomes, SES is positively correlated with college academic

competitiveness. High SES students attend, on average, more selective institutions than their low and middle SES peers, as measured by both mean and maximum SAT scores.

Table 4.4
Average PSI Academic Competitiveness (Mean SAT Score) by Student Characteristics

	Mean	S.D.	Sig. Mean Differences	Min.	Max.
Race Group					
AAPI[AA] (n=540)	1172	146	B, L, M, W	870	1525
AIAN[AI] (n=10)	1088	158		940	1485
Black[B] (n=420)	1031	147	AA, L, M, W	770	1490
Latino[L] (n=330)	1107	139	AA, B	805	1500
Multiracial[M] (n=180)	1119	140	AA, B	805	1485
White[W] (n=3,040)	1123	121	AA, B	805	1525
SES					
Low SES (n=390)	1061	123	Middle, High	770	1490
Middle SES (n=1,980)	1091	122	Low, High	770	1500
High SES (n=2,150)	1155	135	Low, Middle	805	1525

Superscripts denote references for group comparisons with significant differences at $p<.05$.

In examining race and SES as factors in education and/or life outcomes, it is important to note that the two are strongly correlated. As Table 4.5 shows, on average, white students have a mean SES score of 0.32, multiracial students a score of 0.22, and AAPI students a score of 0.20. AIAN, black, and Latino students, however, all have negative SES scores, signifying that the average SES of each of these groups is below the average for the overall ELS sophomore cohort. ANOVA results confirm that overall SES differences between race groups are statistically significant (F [5, 9010= 123.14, $p<.001$). They also confirm that white students have a significantly higher average SES than all other groups with the exception of multiracial students. The lowest SES scores within the sample are associated with Latino students, who have a group minimum value of -1.33. And while AIAN students demonstrate the highest minimum value, they also have the lowest *maximum* SES among any race group with a score of 1.80.

Table 4.5
Mean SES by Race

	Mean	SD	Sig. Mean Differences	Min.	Max.
AAPI[AA] (n=890)	0.20	0.72	AI, B, L, W	-0.99	1.97
AIAN[AI] (n=60)	-0.21	0.59	AA, M, W	-0.91	1.80
Black[B] (n=990)	-0.05	0.61	AA, L, M, W	-1.06	1.90
Latino[L] (n=1,080)	-0.13	0.64	AA, B, M, W	-1.33	1.97
Multiracial[M] (n=390)	0.22	0.65	AI, B, L	-0.98	1.97
White[W] (n=5,610)	0.32	0.67	AI, AA, B, L	-1.01	1.97

Superscripts denote references for group comparisons with significant differences at $p<.05$.

Postsecondary outcomes by key high school characteristics. In seeking to determine the relationship between student characteristics and postsecondary outcomes, it is prudent to also consider the distribution of students across high schools. As noted in literature, high school characteristics are as likely, if not more, to influence students' education and life outcomes, compared to student characteristics alone (Espenshade et al., 2005; Fletcher & Tienda, 2009). Furthermore, the confounding relationships between race and SES at the student level likely manifest at the school level as well. Table 4.6 thus presents a summary of students' distribution across high schools with respect to school-wide SES and racial diversity measures, disaggregated by students' race. ANOVA results confirm that differences in group means with respect to both school SES and diversity measures are significant ($F_{\%\text{ Free Lunch}}$ [5, 8310= 261.93, $p<.001$; $F_{\text{Diversity Index}}$ [5, 8310]= 318.21, $p<.001$).

School socioeconomic context, specifically, often serves as a proxy for school quality (for example see Palardy, 2013). White students tend on average to attend high schools with the lowest proportions of low SES students, as measured by those students who participate in free lunch programs. Based on this proxy, then, white students generally attend the highest quality schools. AIAN students, on the other hand, generally attend what would be considered the lowest quality schools. While AIAN students tend to go to high schools with the smallest range of

values for proportion of students on free lunch, the average across AIAN students' schools is the highest among all racial groups at 33.6%.

Table 4.6
Average High School Characteristics by Students' Race

	Mean	SD	Min.	Max.
AAPI (n=790)				
% Free Lunch	20.98	18.47	0.00	82.25
Diversity Index	45.89	19.17	0.00	74.88
AIAN (n=60)				
% Free Lunch	33.57	22.78	0.00	76.61
Diversity Index	32.62	22.55	0.00	70.91
Black (n=860)				
% Free Lunch	32.48	22.60	0.00	100.00
Diversity Index	38.83	21.03	0.00	74.64
Latino (n=1,000)				
% Free Lunch	27.93	22.72	0.00	100.00
Diversity Index	42.62	19.44	0.00	74.88
Multiracial (n=350)				
% Free Lunch	15.69	17.12	0.00	100.00
Diversity Index	33.90	21.40	0.00	74.88
White (n=5,260)				
% Free Lunch	13.43	15.44	0.00	100.00
Diversity Index	24.54	18.56	0.00	72.73

While high school racial diversity is perhaps less explicitly tied to academic outcomes, it is worth noting that white students tend to attend the least diverse high schools; on average, students at these schools have about a 24.5% random chance of interacting with students from a different racial group. By contrast, AAPI students experience the most racial diversity in high school, and have an average 45.9% chance of random cross-racial interaction. Latino students follow closely, with an average racial diversity index score of 42.6. The relative lack of opportunities for white students to interact with racially diverse others is likely due to the fact

that white students tend to attend very white schools—on average, 82.6% white, in contrast to 64.6% white for multiracial students, and 41.5% to 48.2% white for students from all other racial groups. In terms of the general distribution of students at high schools in this sample, multiracial students, as a group, experience the widest range of both peer SES and diversity contexts.

Focusing explicitly on the relationship between students' demographic characteristics and school academic quality, Table 4.7 summarizes the distribution of students by race and SES, at high schools based on their proportion of graduates who attend four-year colleges. AIAN students, in particular, are relatively likely to attend low quality, or low performing high schools, with 43.5% attending a school from which 0-24% graduates go on to enroll at a four-year college or university. Similarly, they demonstrate the lowest rates of attending a high-quality school. White and multiracial students, on the other hand, attend high-quality high schools at the highest rates, with white students also attending low quality high schools at the lowest rates among all racial groups. The relationships between race and high school quality are less clear for AAPI, black, and Latino students, who attend high-performing high schools at similar rates to one another. With regard to socioeconomic context, the proportion of high schools' graduates who go on to four-year colleges corresponds with their socioeconomic composition. This relationship, as measured by the distribution of students at either low- or high-performing schools, lends some support to the use of school SES as at least a rough proxy for academic performance. Analyses of school-level correlations between these key characteristics further support this practice (r (637)= -0.44, p<.001).

Table 4.7
Distribution of Students, by SES and Race, at High Schools by Academic Quality

	% Among Group Attend HS where 0-24% of Graduates go to 4-Year PSI	% Among Group Attend HS where 75-100% of Graduates go to 4-Year PSI
Race Group		
AAPI (n=790)	20.5	21.6
AIAN (n=60)	43.5	6.5
Black (n=860)	18.9	20.7
Latino (n=1,000)	28.0	19.3
Multiracial (n=350)	19.3	31.0
White (n=5,260)	12.0	33.1
SES		
Low SES (n=1,390)	29.9	10.2
Middle SES (n=4,120)	17.8	22.2
High SES (n=2,800)	6.3	47.8
All Students	16.0	28.8

In general, when considering the role of student characteristics in postsecondary outcomes, it is critical to consider the nuanced relationships between race, SES, and academic performance at both the student and high school levels. Thus in considering, for example, that a black or Latino student is less likely to attend, or graduate from, a four-year PSI than his/her white peers, it is prudent to recognize that the difference is probably at least partly attributable to the fact that he/she is more likely to be low SES and/or more likely to attend a low-SES high school, which is then also less likely to send its students to four-year colleges. However, that AAPI students tend to attend schools that send their graduates to four-year institutions at similar rates to those attended by black students, while demonstrating overall higher rates of college enrollment and completion, suggests the utility of considering other individual factors—those besides demographics—to better understand disparities in postsecondary outcomes. Furthermore, these individual-level factors should be considered within the context of schools. To that end, the

following section presents the results of multilevel modeling predicting students' likelihood of four-year college enrollment.

Multilevel Modeling

Preliminary and final analyses. In order to enhance model parsimony, preliminary step-by-step logistic regression models were first run to identify student-level predictor variables that should be considered for hierarchical generalized linear modeling (HGLM). Independent variables were entered in successive blocks measuring student demographics, parental influence, school social environment, sociocognitive factors, friends' influence, college-going behaviors, and academic indicators. Separate, parallel models were run for the study's two outcomes of interest: four-year college enrollment versus all other postsecondary outcomes (i.e., no college, less than two-year college, and two-year college), and bachelor's degree completion within six years. With the exception of key predictors for this study (i.e., race, SES, academic performance) variables that did not enter the regression model significantly during their respective steps, and that were not significant in the complete model for either dependent variable, were eliminated. See Appendix A1 for variables initially considered for multilevel modeling.

A hierarchical generalized linear (HGLM) model predicting students' enrollment at a four-year PSI was then built and run in multiple steps, using the same sequence of blocks as was used in the preliminary, single-level logistic regression. High school-level variables were then entered in blocks corresponding to structural characteristics, instructional and counseling staff measures, peer learning environment, academic performance, and conditions for stereotype threat.

HGLM sample. Table 4.8 presents descriptive statistics for all student- and institution-level variables included in the final HGLM model, including their minimum and maximum values, means, and standard deviations (see Appendix A1 for variable coding).

The final analytic sample consists of approximately 8,050 students at 650 high schools, of whom 61% enrolled at a four-year college as their first PSI after high school. Fifty-four percent of the sample is female, and most (64%) are white. As in the descriptive analyses, AIAN students were retained in a distinct category so as to test for the effects of high schools with predominantly or all Native students. The HGLM sample also demonstrates higher average SES than would be expected in the general population (mean SES factor score= 0.22, compared to an expected value around zero). Both parents' and students' average educational aspirations for their children or themselves, respectively, correspond to completing at least a four-year college degree. In terms of the composition of friendship groups, participants tended to report more diversity with regard to grade level than gender, with averages of 0.54 other-grade and 0.44 other-sex friends. Students also reported engaging in relatively few SAT preparation practices ($\bar{x}$= 1.25) and help-seeking behaviors ($\bar{x}$= 2.01) than might be expected given the range of possible scores (0 to 6). Since variety and quantity, as measured by the college-going behavior scales, do not necessarily indicate quality of preparation or help, these three variables are somewhat uninstructive for practice. Instead, these measures may point to students' ability to access certain materials or knowledgeable individuals, which can thus reflect economic or social capital.

Table 4.8
Descriptive Statistics for Variables Included in Final HGLM (N=8,050 Students, 650 High Schools)

	Mean	SD	Min.	Max.
Outcome				
Enrolled in 4-yr PSI (vs. all else)	0.61	0.49	0.00	1.00
LEVEL-ONE				
Student Demographics				
Sex: Female	1.54	0.50	1.00	2.00
Race: AAPI (Ref.= White)	0.09	0.29	0.00	1.00
Race: AIAN	0.01	0.08	0.00	1.00
Race: Black	0.10	0.30	0.00	1.00
Race: Latino	0.12	0.32	0.00	1.00
Race: Multiracial	0.04	0.20	0.00	1.00
SES	0.22	0.69	-1.33	1.97
# Parents/Guardians	1.79	0.42	0.00	2.00
# Parent(s)' dependents	2.63	1.24	0.00	8.00
Parental Influence				
Parent(s)' aspirations for students' education	5.51	1.17	1.00	7.00
Parents expect success in school	3.48	0.63	1.00	4.00
Parents help with homework	2.51	0.87	1.00	4.00
Social Environment				
School Safety factor	0.02	0.85	-3.07	1.28
Students are friendly with other racial groups	3.21	0.63	1.00	4.00
Negative teacher-student relations	-0.02	0.86	-1.83	3.35
HPW: Extracurriculars	3.35	1.90	1.00	8.00
Sociocognitive Factors				
Social Agency factor	-0.02	0.86	-2.12	1.58
Math Self-Efficacy factor	0.01	0.98	-2.08	1.85
Impt: Good grades	3.47	0.68	1.00	4.00
HPW: Homework	6.69	6.14	0.00	26.00
Impt: Good education	2.89	0.33	1.00	3.00
Impt: Good job	2.93	0.27	1.00	3.00
Degree aspirations	6.40	1.47	1.00	9.00
Friends' Influence				
# Friends who consider grades impt.	1.46	1.00	0.00	3.00
# Friends who plan to attend 4-yr PSI	3.58	0.98	1.00	5.00
# Friends of different sex	0.44	0.65	0.00	3.00
# Friends in different grade	0.54	0.81	0.00	3.00
College-Going Behavior				
# SAT prep methods scale	1.25	1.24	0.00	6.00
Social Capital scale	3.02	1.72	0.00	7.00
External Help scale	2.01	1.31	0.00	6.00

Table 4.8, continued
Descriptive Statistics for Variables Included in Final HGLM (N=8,050 Students, 650 High Schools)

	Mean	SD	Min.	Max.
Academic Indicators				
Academic GPA	2.84	0.73	0.30	4.30
# AP/International Baccalaureate courses	1.03	1.86	0.00	18.00
SAT composite score (in hundreds)	9.78	2.12	4.00	16.00
Took SAT (vs. imputed)	0.75	0.43	0.00	1.00
LEVEL-TWO				
High School Structure				
Control: Private	0.23	0.42	0.00	1.00
Total enrollment	1225.81	830.70	25.00	4391.75
% Total enrollment is HS (in tens)	8.40	2.80	1.10	10.00
Urbanicity	2.13	0.71	1.00	3.00
Coed	1.94	0.24	1.00	2.00
Instructional and Counseling Staff				
Student/Teacher ratio	16.44	4.53	5.28	57.35
% FT teachers certified	91.02	19.88	0.00	100.00
# FT guidance counselors	3.74	2.55	0.00	16.00
Part/Full-Time teacher ratio	0.08	0.14	0.00	1.50
% Excellent teachers	38.52	25.14	0.00	100.00
Peer Learning Environment				
% LEP/non-English proficient	5.40	9.40	0.00	50.00
% Special education	10.93	7.39	0.00	31.00
Racial climate (racial tension is not an issue)	4.33	0.56	2.00	5.00
Academic Climate factor	0.01	0.94	-3.94	1.57
Academic Performance				
% Grads to 4yr PSI (in quartiles)	2.57	1.08	0.00	4.00
% in AP	14.81	13.72	0.00	81.00
Conditions for Stereotype Threat				
% Free lunch	20.14	19.81	0.00	100.00
Diversity index	31.48	20.60	0.00	72.73
% AAPI	4.83	11.59	0.00	100.00
% AIAN	1.27	6.07	0.00	100.00
% Black	14.68	21.78	0.00	100.00
% Latino	12.49	20.63	0.00	98.38
% White	66.71	30.61	0.00	100.00

Turning now to high school characteristics, few schools in the sample were private (23%, including Catholic and other religiously affiliated schools), and most were suburban or urban in

locale. Nearly all schools (94%) were coeducational. On average, administrators reported that the large majority of their full-time teachers were certified (91%) and considered 38.5% of their teachers to be "excellent." Despite the wide range of reported values (0 to 50%), only 5.4% of the average school's students are designated limited or non-English proficient. Similarly, while reported proportions of students in AP classes ranged widely (from 0 to 81%), the average proportion across sample schools is 14.8%. Finally, among the racial groups reported, white students are the most prevalent while Asian and AIAN students are the least; on average, schools reported a 66.71% white, compared to a 4.83% AAPI and 1.27% AIAN student body[4].

HGLM Results. A fully unconditional weighted model, with no predictors, was first run to gauge the significance of between-school effects in students' enrollment at a four-year PSI. For multilevel models with a continuous dependent variable, an intra-class correlation (ICC) is normally calculated based on level-1 and level-2 coefficients from the null model, and would be used to determine the amount of outcome variation associated with the high school-level. Based on this standard ICC calculation, education researchers suggest a minimum ICC value of 0.10 (i.e., at least 10% of total outcome variance lies between level-2 units) in order to justify the use of multilevel modeling techniques (Lee, 2000). For this model, however, which predicts a dichotomous dependent variable, an alternate ICC calculation was used (Equation 4 in Methods chapter), yielding an estimate of 0.227. Thus, an estimated 22.7% of the variance in students' enrollment in four-year postsecondary institutions might be attributable to high school-level effects.

Because the individual-level variance of this model is heteroscedastic, the ICC is less accurate and therefore relatively uninformative than would be the case for a continuous outcome.

[4] To this point, it should be noted that ELS:2002 deliberately oversampled Asian/Asian American students, a fact that was considered in their weighting schemes. As a result, the size of the AAPI sample, relative to all students, looks very different than would otherwise be expected based on these school racial composition statistics.

Thus, the level-2 variance component itself was also analyzed for an indication of level-2 variance, as well as for later estimates of differences in the amount of explained variance between nested models. The variance component from the HGLM null model is significant ($X^2(650, N=650)= 2260.09$, $p<.001$), suggesting that there is indeed variation across high schools with respect to their proportion of students enrolling in four-year colleges and universities; thus, the use of multilevel models is warranted. The following section presents the results of such modeling, with discussion of both intermediate and final models.

Table 4.9 presents the unit-specific coefficient estimates from both the (complete) level-1 and full multilevel models predicting college enrollment. Delta-*p* statistics are reported for all significant predictors, as recommended by Petersen (1985) and Cruce (2009). Delta-*p* values are calculated based on log odds coefficients and represent the difference in probability of the average student's enrollment at a four-year PSI associated with a one-unit difference in his or her value for a given predictor variable, as compared to that variable's mean for the high school or the entire sample (depending on whether the variable has been centered about the group or grand-mean). For dichotomous predictors, the delta-*p* value can be understood as the difference in probability of four-year college enrollment for a student with that characteristic as compared to a student without it. Variance statistics are also presented, with proportions of explained variance relative to the complete level-1 model (Raudenbush & Bryk, 2002). Overall, the full HGLM model accounts for 31.1% more variance than the level-1 model alone, suggesting the utility of considering the school-level variables included in the model, and of future studies looking at other possible institutional measures.

Table 4.9

Level-1 & Full HGLM Models Predicting Enrollment at 4-Year PSI (N=8,050 students, 650 HS's)

	Level-1 Only				Full-Model			
	Coeff.	S.E.	Sig.	Δ*P* (pp)	Coeff.	S.E.	Sig.	Δ*P* (pp)
LEVEL-ONE								
Student Demographics								
Sex: Female	-.200	.086	*	-4.5	-.186	.087	*	-4.2
Race: AAPI (Ref.= White)	-.105	.183			-.032	.195		
Race: AIAN	.722	.530			.998	.497	*	20.6
Race: Black	.402	.140	**	9.1	.653	.146	***	14.4
Race: Latino	-.167	.139			.049	.142		
Race: Multiracial	.049	.203			.137	.210		
SES	.201	.072	**	4.7	.252	.075	**	5.8
# Parents/Guardians	-.080	.097			-.134	.097		
# Parent(s)' dependents	.023	.031			.037	.032		
Parental Influence								
Parent aspirations for student ed.	.062	.038			.031	.039		
Parents expect success in school	.056	.060			.080	.062		
Parents help with homework	-.053	.046			-.044	.046		
Social Environment								
School Safety factor	.221	.053	***	5.1	.180	.056	**	4.2
Students friendly w/ other races	-.128	.067			-.119	.070		
Teacher-Student Rel. factor	-.018	.052			.009	.053		
HPW: Extracurriculars	.110	.022	***	2.6	.118	.022	***	2.8
Sociocognitive Factors								
Social Agency factor	-.025	.048			-.008	.049		
Math Self-Efficacy factor	.052	.041			.037	.042		
Impt: Good grades	-.028	.077			.006	.078		
HPW: Homework	.003	.008			-.003	.008		
Impt: Good education	.379	.141	**	8.6	.417	.144	**	9.4
Impt: Good job	-.014	.177			.008	.184		
Degree aspirations	.176	.030	***	4.1	.164	.030	***	3.8
Friends' Influence								
# Friends consider grades impt.	-.095	.041	*	-2.3	-.082	.042	*	-2.0
# Friends plan to attend 4-yr	.370	.047	***	8.4	.312	.048	***	7.1
# Friends of diff. sex	-.056	.063			-.055	.064		
# Friends in diff. grade	-.001	.050			.034	.050		
College-Going Behavior								
# SAT prep methods	.065	.032	*	1.5	.059	.032		
Social Capital scale	.003	.026			-.002	.027		
External Help scale	.192	.033	***	4.5	.187	.033	***	4.4
Academic Indicators								
Academic GPA	.548	.091	***	1.5	.607	.092	***	13.2
# AP/IB courses	.247	.049	***	0.1	.216	.048	***	5.0
SAT comp. score (100s)	.262	.000	***	4.5	.318	.038	***	7.2
Took SAT (vs. imputed)	1.088	.102	***	26.4	.986	.100	***	23.9

Table 4.9, continued

Level-1 & Full HGLM Models Predicting Enrollment at 4-Year PSI (N=8,050 students, 650 HS's)

	Level-1 Only				Full-Model			
	Coeff.	S.E.	Sig.	Δ*P* (pp)	Coeff.	S.E.	Sig.	Δ*P* (pp)
LEVEL-TWO								
High School Structure								
Control: Private					-.555	.337		
Total enrollment					.000	.000		
% Total Enr is HS (in tens)					-.145	.420	**	-3.4
Urbanicity					.252	.104	*	5.8
Coed					-.241	.251		
Instructional and Counseling Staff								
Student/Teacher ratio					.018	.016		
% FT teachers certified					.002	.004		
# FT guidance counselors					.032	.035		
P/FT teacher ratio					-.466	.611		
% Excellent teachers					.002	.002		
Peer Learning Environment								
% LEP/non-Eng. proficient					.006	.007		
% SPED					.002	.010		
Racial climate					-.122	.088		
Academic Climate factor					.053	.067		
Academic Performance and Stereotype Threat Context								
% Grads to 4yr PSI (in quartiles)					.535	.076	***	11.8
% in AP					-.005	.005		
% Free lunch					-.018	.004	***	-0.4
Diversity index					-.007	.003	*	-0.2
Intercept	.048	.180			.749	.540		
Variance Component (S.D.)	1.232	(1.110)	***		.849	(0.922)	***	
% Variance Explained					31.1%			
Reliability	.641				.543			
-2 Log Likelihood	11357.9				11514.3			

*p<.05, **p<.01, ***p<.001

After controlling for all student and school-level variables, several independent variables emerged as significant predictors. For example, based on coefficients from the full model, female students are 4.2 percentage points less likely than their male counterparts to enroll at a four-year school. This gender effect, further discussed below with respect to changes across intermediate

models, is interesting to note given that women have been increasingly more likely than men to enroll at four-years institutions (Cho, 2006), replacing men as the majority of first-time full-time students at these schools (Pryor, Hurtado, Saenz, Santos, & Korn, 2007). AIAN and black students, somewhat surprisingly, are respectively 20.6 percentage points and 14.4 points more likely than their white peers to enroll. These gender and race differences are due to sign changes in their coefficients, which are also explained below in greater detail. Other positive student-level predictors, though less surprisingly so, include socioeconomic status, perceived school safety, participation in extracurricular activities, valuing a good education and having high educational aspirations, having friends who plan to attend a four-year school, seeking college entrance information, and doing well academically. The only other negative student-level predictor is having friends who consider grades important, though it cannot be determined whether these friends actually earn good grades or worry about grades because they receive lower marks than they would like.

At the school level, urbanicity—or being located in a large and/or dense city—is positively associated with four-year college enrollment. On the other hand, having a larger proportion of high school students, among all enrolled students, is a negative predictor. In other words, schools with grades lower than the high school level (e.g., those with a middle school campus) might expect more of its graduates to enroll in a four-year school than schools offering only grades 9 through 12. Also, and unsurprisingly, students' likelihood of attending a four-year PSI is higher at schools with high rates of sending their graduates to four-year schools. Finally, student diversity and the proportion of low-income students have negative relationships with college enrollment.

While the final HGLM coefficients are instructive in and of themselves, a comparison of intermediate models can generate a more nuanced understanding of the effects of, and relationships among, student and school characteristics and college enrollment. For example, in order to determine the significance of demographic characteristics, gender and race were first entered into an otherwise empty model. (For a complete table of step-by-step HGLM models, see Appendices B1-B2.) Controlling only for gender and race, women are 3.7 percentage points more likely than men to enroll at a four-year school. However, the effect of gender becomes non-significant after the addition of sociocognitive factors, controlling for parental influence and social environment measures. This change suggests that the positive effect of being female is perhaps attributable instead to women's greater tendency to value good grades, spend time doing homework, and aspire to higher education while in high school. Moreover, the effect of being female becomes significant and *negative* at the final step of level-1 modeling, after the addition of academic indicators. Hence, controlling for other student-level variables, women actually enroll at four-year colleges at lower rates than would be expected based on their academic performance, which tends to exceed that of men. This effect of high school academic achievement has also been identified in previous research as a key factor in women's overall increased representation across U.S. postsecondary institutions over the past few decades (Cho, 2006).

As supported by previous research, being black or Latino were significant negative predictors of enrollment at a four-year institution in the initial model, whereas being an AAPI student was a positive predictor relative to being white—the model's reference category. However, upon adding SES indicators, the effect of being black became non-significant (though was then significant on-and-off throughout the addition of other level-1 predictors). This initial

change in significance indicates that, when controlling only for demographic characteristics, the negative relationship between being black and enrolling at a four-year school is actually explained through the effect of SES. That is, much of the reason for black students' lower likelihood of matriculating to four-year institutions is the fact that they tend to come from poorer families. At the final step of level-1 modeling, upon the addition of academic performance variables, the black indicator variable becomes once again significant, and *positive*. Thus, all other individual-level variables being equal, black students would be 9.1 percentage points more likely to enroll at four-year PSIs than their white peers if they had similar grades and standardized test scores. Both AAPI and Latino indicators remained significant through the addition of SES variables, with AAPI students 8.8 percentage points more likely than white students to enroll at a four-year school, and Latino students 16.1 percentage points less likely to do so, controlling only for demographics. While the AAPI indicator dropped out of the model midway through the addition of other variable blocks, the Latino indicator variable remained significant until the final step of the level-1 model, at which point academic indicators were added. Thus, the negative effect of being Latino is likely due to the tendency for Latino students to have lower grades and SAT scores and to take fewer AP/IB courses during high school compared to their white peers.

All three parental influence variables were significant when added to a model controlling only also for student demographics. However, after accounting for students' perceptions of their school environment and sociocognitive factors such as math self-efficacy, value placed on educational norms, and degree aspirations, one parental influence variable became non-significant: students' belief that their parents expect success in school. The remaining two parental influence variables, parents' reported degree aspirations for their child and students'

perceptions that their parents provide homework help, then dropped out of the model at the final step. It might be understood, then, that parents' influence on their child's college enrollment is enacted through students' own beliefs about and efforts toward education, as well as their overall academic performance in high school. Similarly, addressing the effect of significant others, it might be said that the influence of having friends in a different grade—who, if ahead in school, could likely provide advice or mentoring about college—manifests in students' own steps toward preparing for the college application process.

Finally, in considering the step-by-step process of modeling level-1 variables, it should be noted that the addition of academic performance variables had by far the most dramatic effect with respect to the explanatory power of other variables. Accounting for key academic indicators, such as GPA and SAT score, diminishes the effects of variables from nearly all other blocks. This finding is unsurprising considering that colleges generally rely heavily on this information in their admissions decisions. However, it is not to say that the other predictors are irrelevant. To the contrary, it is likely that parents' expectations and support, students' beliefs and efforts, and teacher and peer relationships all contribute ultimately to students' academic performance—including actually taking a college entrance exam—and therefore to students' college outcomes.

Interpreting school-level effects is somewhat more straightforward. Looking at only structural characteristics, students at coeducational schools are 9.3 percentage points less likely than their peers at either all-girls or all-boys schools to enroll at a four-year college. However, the benefits of single-sex education are explained by measures of staff quantity and quality: having full-time teachers who are certified, guidance counselors, and teachers considered "excellent" by their school administrators. While a positive academic climate, as reported by

administrators, also predicts enrollment, its effects are obfuscated by the more easily measured rate at which schools' graduates enroll at four-year institutions. Finally, urbanicity becomes significant only at the final step of the model, when school SES and diversity are added. In other words, after controlling for student and school-level characteristics, including socioeconomic and racial composition, students are more likely to enroll at a four-year institution if they attended a high school that is close to a city center, as opposed to being located in a rural area. This effect is perhaps due to students in urban centers having greater exposure to postsecondary institutions or individuals who have attended college, as compared to students living in rural areas. This finding also suggests the utility in considering resource differences between schools serving rural communities comprising rural versus urban poor families, or the mediating effect of urbanicity on student diversity.

Across levels, few relationships emerged from model comparison. Most notably, being an AIAN student became significant after the addition of school-level academic performance variables, and remained significant through the final step. This shift to significance then suggests that AIAN students who attended high schools that were comparable to white students', in terms of academic quality and student composition, are approximately 20.6 percentage points more likely than a white student to enroll at a four-year college. However, this finding is tempered by the limited representation of AIAN students in this analysis.

Cross-level interaction effects. Cross-level interaction terms were added to the complete main-effects HGLM model in order to test whether the effects of school composition moderate the effects of key student-level predictors. Three separate interaction effect models were built in order to separately test the relationships between students' race and school diversity, students' SES and school socioeconomic composition, and students' academic performance (measured by

both GPA and SAT score), and high schools' academic performance or quality. Appendix B3 shows all three cross-level interaction effect models. None of the interaction terms entered its respective model significantly. Also, none of the interaction effects model explained much more level-2 variance compared to the main effects HGLM model; in fact, the variance component increased for the race*diversity and GPA/SAT*academic quality interaction effects models, which indicates that these cross-level interactions actually decreased model fit. Interestingly, the addition of race*diversity interaction terms coincided with the AIAN effect becoming non-significant. Similarly, the number of friends who consider grades important became non-significant after the addition of race*diversity interaction terms.

Racial composition measures. Parallel models substituting different racial composition measures were built to test whether alternative measures of student diversity would yield differences in variable effects—particularly the effects associated with student race. Appendix B4 shows the results of models that account for either school-level diversity index scores or proportions of AAPI, AIAN, black, Latino, or white students (with this last measure essentially also serving as a measure of the proportion of all students of color). Relative to the model run immediately prior to the addition of racial composition—that is, the model controlling for school-level effects through the proportion of students in free lunch programs—none of the alternative racial composition measures yielded significant effects or model differences.

Finally, interaction terms using these same school-level diversity measures and student-level race were modeled (see Appendix B5). Significant interaction terms would signify that the effect associated with a student's race is moderated by the proportion of students in his/her high school who are of a certain race. Based on this study's theoretical frame of stereotype threat and numerical minority status, I looked specifically for interaction effects between student race and

the high school-level proportion of students of that same race. When compared to their respective nested, main effects models, only the interaction terms associated with being Latino entered significantly for both the "% Latino" and "% white" models. However, neither of the interaction terms' constituent main effects was significant in the previous models. Therefore, the overall effects of being Latino and effects of a school's proportion of Latino or white students average to zero.

Predicting Bachelor's Degree Attainment (Research Question 2)

This section highlights results from descriptive analyses and multiple multilevel modeling methods used to answer this study's second general and subsidiary research questions:

- *Controlling for background characteristics, to what extent do students' peer academic, racial, and socioeconomic contexts in both high school and college predict bachelor's degree attainment?*
    - *What types of transition patterns (with respect to average academic performance, and racial and socioeconomic diversity of institutions) do students tend to exhibit from high school to college?*
    - *Do the effects of transition patterns between these high school and college contexts (e.g., from low average SES high school to high average SES college) differ for students of different racial and SES backgrounds?*
    - *Do the effects of postsecondary peer contexts (with respect to academic performance, and racial and socioeconomic composition) moderate student-level race or SES effects?*

In order to address the question of whether high school and college-level characteristics influence students' completion of a four-year degree, the ELS:2002/2012 sophomore cohort

sample was further reduced from the sample for Research Question 1 (n=9,010) to the 5,440 students who started their postsecondary education at a four-year college or university.

This section begins with a presentation of descriptive statistics, summarizing the "pond hopping" patterns exhibited by students in their transition from high school to college. Contingency tables present degree attainment rates for students based on their direction and degree of transition. Results are also disaggregated by key student demographics (i.e., race and SES). Multilevel modeling results are then presented, first highlighting general differences between HGLM models that separately predict college enrollment and college degree completion. Then, results from cross-classified multilevel models are discussed, with attention paid to the relationships among student-level, high school-level, and college-level variables, and their predictive effects on students' likelihood of earning a bachelor's degree.

Descriptive Analyses

Degree completion by transition patterns. High schools were divided into three groups, representing low, medium, and high values for each of three contexts: diversity (diversity index), socioeconomic (proportion of students in free lunch program), and academic (proportion of graduates who matriculate at a four-year college). For diversity and socioeconomic contexts, cut-off values were determined based on the distribution of values among the entire sample of high schools attended by the 9,080 sample members originally identified as the cohort for analysis in Research Question 1. With regard to academic performance, high schools from which fewer than 25% of graduates enrolled at a four-year school were coded as "low" performing or low quality, 25-75% as "medium," and schools that sent more than 75% of its graduates to four-year colleges were coded as "high." Low, medium, and high scores for each measure of context were represented by numeric values of 1, 2, and 3, respectively.

Similarly, college-level measures of diversity (diversity index), SES (proportion of students receiving federal grants), and academic performance (average SAT score) were each divided into equal thirds, representing low, medium, and high values for each measure. Cut-off values for college context were based on each measure's raw-score distribution across all four-year PSIs at which sample members enrolled as their first-attended college. Each student was then assigned a pattern score—representing the magnitude and direction of transition—based on the difference between his/her college's and high school's scores, for each of the three contexts of interest. For example, a student who attended a highly diverse high school (relative to all high schools represented in Research Question 1) and then enrolled at a college with low diversity would be considered to have demonstrated a transition pattern of "High to Low" with respect to diversity. In numeric terms, that student would be assigned a score of "-2" for their transition with respect to diversity.

Table 4.10 shows the distribution of sample members with regard to their transition patterns, based on the magnitude, direction, and type of transition they experienced from high school to college. College completion rates for each pattern are also displayed.

As might be expected based on the method for conceptualizing transition pattern scores, each of the three contexts for transition demonstrates a relatively normal distribution with respect to students' patterns between high school and college. Approximately 42.8% to 46.2% of students exhibit transition patterns of "Low to Low," "Medium to Medium," or "High to High." For both diversity and socioeconomic contexts, slightly fewer students experience moderate change in either direction, relative to their high schools: approximately 43.6% of students have a transition score of "1" or "-1" with regard to diversity, and 37.7% with regard to socioeconomic context. Within the academic context, however, more students are likely to experience moderate

rather than zero-change, 47.4% with a score of 1 or -1, compared to 42.8% with a score of zero. Among the most dramatic possible transitions, "High to Low" and "Low to High," relatively few students (4.9%) experience a transition from high to low racial diversity. And most notably, only 2.3% of students graduate from a low performing high school and then enroll at a highly competitive college.

Table 4.10
Degree Attainment Rates Based on Transition Patterns from High School to 4-Year PSI

	Context					
	Diversity (N=4,540)		Socioeconomic (N=4,540)		Academic (4,190)	
Transition Score & Corresponding Patterns	% Show Patterns	% Within Patterns with Degree in 6 Years	% Show Patterns	% Within Patterns with Degree in 6 Years	% Show Patterns	% Within Patterns with Degree in 6 Years
-2 High to Low	4.9	58.6	8.0	59.6	7.5	63.9
-1 Med to Low; High to Med	17.9	60.3	22.2	58.3	25.8	57.3
0 Low to Low; Med to Med; High to High	44.3	62.5	46.2	65.1	42.8	69.9
1 Low to Med; Med to High	25.7	66.9	17.5	67.2	21.6	73.8
2 Low to High	7.2	70.9	6.0	67.0	2.3	67.0

Looking now at degree completion rates within each context for transition, students generally tend to fare better as their diversity transition scores go up: 70.9% of students who transitioned from a low diversity high school to highly diverse college earned bachelor's degrees within six years, compared to 58.6% of students who went from a highly diverse high school to relatively homogeneous college. The same pattern, though less distinct, is apparent among socioeconomic transitions. That is, completion rates tend to be positively associated with transition scores vis-à-vis socioeconomic context. Among academic transition patterns, there

does not appear to be a single definitive pattern associated with degree attainment. Regarding students who transition downward, students with scores of -2 tend to graduate at higher rates than students with scores of -1. This difference might be expected, however, given that only students from high performing high schools—those who are likely well prepared for the academic rigor of college—can have a score of -2 (compared to students with scores of -1, who come from both high and medium performing high schools). Additionally, it is interesting to note that students whose patterns arguably reflect academic mismatch, those who move upward with regard to school academic performance, demonstrate relatively high degree completion rates—67.0% and 73.8% for students with transition scores of 2 and 1, respectively. Students with transition scores of 1, specifically, demonstrate the highest college degree attainment rates of any group. Furthermore, given that students who reflect the greatest risk of mismatch, going from a low performing high school to highly competitive college are so few and also demonstrate relatively high completion rates begins to call into question the significance of the academic mismatch "problem."

Table 4.11 provides more context to students' transitions to college, summarizing transition patterns across the types of high schools from which students graduated. As might be expected, students at "high" level schools across the three contexts most commonly experience zero change in their transition to college (in part because mathematically, they cannot go "up" any level). Similarly, students at "low" level high schools most commonly attend "low" level colleges. Across middle SES, moderately diverse, and moderately performing high schools, students most often move up one level (as opposed to down one level or staying the same). That is to say, a substantial proportion of these students matriculate at colleges with peers who are

relatively wealthier and more racially diverse than their peers in high school. Additionally, they more often attend competitive colleges than moderately or non-competitive institutions.

Table 4.11
Transition Patterns by High School Context

	% from High School Type with Transition Score				
	-2	-1	0	1	2
Socioeconomic Context					
Low SES (n=960)			45.5	26.0	28.5
Middle SES (n=1,400)		26.2	34.6	39.2	
High SES (n=2,180)	16.5	29.4	54.0		
Diversity Context					
Low Diversity (n=1,700)			48.0	32.8	19.2
Moderate Diversity (n=1,600)		27.8	34.1	38.1	
High Diversity (n=1,240)	17.9	29.6	52.5		
Academic Context					
Low Performing (n=350)			36.5	35.6	27.9
Moderately Performing (n=2,040)		27.3	34.5	38.2	
High Performing (n=1,800)	17.4	29.1	53.5		

When compared to the distribution of students from low SES, low diversity, and low performing high schools, students from "middle" level high schools are much more likely to attend "high" level colleges. In other words, it is much more common for students to move up one level (e.g., from "middle" to "high") than to move up two (from "low" to "high") with respect to any context. This difference is most pronounced with respect to racial diversity, where 38.1% of students from moderately diverse high schools go on to highly diverse colleges, compared to 19.2% of students from non-diverse high schools. Additionally, as mentioned previously, it is most common among students already at "high" level high schools to then matriculate at "high" level colleges. Considering the positive effects of peer socioeconomic status (Muraskin et al., 2004), racial diversity (Chang, 2001; Park, 2009), and institutional selectivity (Furstenberg, 2010; Titus, 2004) on postsecondary outcomes including graduation,

these findings suggest that students at “middle” and especially “high” level high schools are better positioned to benefit from the college effects of peer wealth, racial diversity, and academic competitiveness. In other words, where students attend high school matters for where students enroll for college (which then ultimately affects their chances of earning a bachelor’s degree). Moreover, the effects of high school context may be especially salient with respect to socioeconomic context, considering that the largest subgroup of students attending four-year colleges, in general (n=2,180), graduated from high SES high schools.

Transition patterns and demographic characteristics. Cross-tabulations were also run to determine the distribution of transition patterns with respect to students’ demographic characteristics.

Table 4.12 presents a summary of transition patterns across student race groups. Across all contexts for transition from high school to college (i.e., diversity, socioeconomic, and academic), Latino, multiracial, and white students demonstrate the same general distribution with respect to direction of transition. Students from these race groups most commonly demonstrate relatively little change in diversity, socioeconomic, and academic contexts, with the percentages of students who “stayed at same level” ranging from 43.0% to 49.3%. For AIAN, AAPI, and black students, however, this roughly normal distribution across transition patterns is not as consistent.

Among AIAN students, while the most common transition pattern with respect to diversity is zero change, this pattern is the least common with respect to socioeconomic context. Within the academic context, AIAN students most commonly move downward, with 46.2% of students moving down either one or two levels. This finding is particularly noteworthy because AIAN students tend to start at the poorest and lowest quality high schools, as shown in earlier

analyses. Their tendency to then attend the least selective colleges suggests additional evidence of the possible effect of high school characteristics on postsecondary outcomes. Among black students, four-year college enrollees most typically experience little change in socioeconomic context. However, the largest proportions of students transition downward for both diversity (40.2%) and academic competitiveness (51.5%). The only group to demonstrate relatively more upward transition is AAPI students, 41.8% of whom enroll at a relatively more academically competitive college, compared to their high school.

Table 4.12
High School to 4-Year PSI Transition Patterns by Student Race

Context	% Transitioned Downward	% Stayed at Same Level	% Transitioned Upward
AAPI			
Diversity (n=500)	15.8	48.9	35.3
Socioeconomic (n=500)	22.0	46.9	31.1
Academic (n=480)	17.7	40.5	41.8
AIAN			
Diversity (n=10)	35.7	42.9	21.4
Socioeconomic (n=10)	35.7	28.6	35.7
Academic (n=10)	46.2	30.8	23.1
Black			
Diversity (n=420)	40.2	37.6	22.2
Socioeconomic (n=420)	27.7	49.6	22.7
Academic (n=370)	51.5	34.5	14.0
Latino			
Diversity (n=(360)	21.6	49.3	29.1
Socioeconomic (n=360)	28.6	48.6	22.8
Academic (n=300)	33.2	43.0	23.8
Multiracial			
Diversity (n=190)	17.6	44.9	37.4
Socioeconomic (n=190)	30.5	47.6	21.9
Academic (n=170)	31.5	44.0	24.4
White			
Diversity (n=3,050)	21.9	43.9	34.2
Socioeconomic (n=3,050)	32.0	45.4	22.6
Academic (n=2,860)	33.6	44.2	22.2

Table 4.13 summarizes students' high school to college transitions, disaggregated by socioeconomic status. As can be seen, low SES students constitute a very small proportion of the students represented in the table, 8.6% to 9.5%, as compared to 16.7%—or 1,390 out of 8,310 students with high school-level data—in Table 4.7, in Research Question 1. The small size of the low SES subsample among students who enrolled at a four-year PSI, as well as its even smaller size relative to the original cohort sample, suggests more evidence of higher education's sorting mechanism with respect to socioeconomic status. Indeed, descriptive analysis of this sample shows that the largest proportion of low-SES students (40.3%) attend a two-year institution after high school (as opposed to no college, or attending a less-than-two-year college or a four-year college) while middle and high-SES students most commonly enroll at a four-year school (54.5% and 81.1% respectively, as shown in Table 4.3).

Table 4.13
High School to 4-Year PSI Transition Patterns by Student SES

Context	% Transitioned Downward	% Stayed at Same Level	% Transitioned Upward
Low SES			
Diversity (n=430)	24.5	47.4	28.0
Socioeconomic (n=430)	27.9	45.7	26.5
Academic (n=360)	36.3	37.7	26.0
Middle SES			
Diversity (n=2,010)	23.1	47.6	29.3
Socioeconomic (n=2,010)	32.4	42.7	25.0
Academic (n=1,810)	36.2	38.7	25.1
High SES			
Diversity (n=2,100)	22.1	40.6	37.4
Socioeconomic (n=2,100)	28.6	49.8	21.6
Academic (n=2,020)	30.1	47.4	22.5

Across all contexts (i.e., diversity, socioeconomic, and academic), students within each of the three SES groups most commonly demonstrate little change. However, low and middle SES

students demonstrate downward academic transition at rates similar to their rates of zero change—36.3% compared to 37.7% for low-SES students, and 36.2% compared to 38.7% for middle-SES students. Overall, the least common transition patterns are among high SES students. Only 22.1% demonstrate downward diversity transition (i.e. matriculate to a less racially diverse college), 21.6% demonstrate upward socioeconomic transition (i.e., matriculate to a wealthier college), and 22.5% demonstrate upward academic transition. However, considering the characteristics of students who likely fall into this high SES category and the schools they tend to attend (as shown in Tables 4.5–4.7 in Research Question 1), this finding may be an indication of the fact that these students practically have nowhere to go that is less diverse, more wealthy, or more academically competitive. That is, high SES students likely already experience the least high school racial diversity, the most peer wealth, and the highest peer academic performance from among all SES groups. Thus, the relatively small proportions of high SES students who exhibit the transition patterns mentioned previously serve as reminders of how high schools position or prepare their students to experience college environments.

Multilevel Modeling

Several sets of multilevel analyses were conducted in order to address the various specific questions comprising this study's general inquiry regarding degree completion. First, an HGLM model, analogous to the final model from Research Question 1, was built in order to roughly compare the significance of predictor variables for college enrollment and college degree attainment. Next, cross-classified hierarchical generalized linear modeling was conducted to determine the predictive effects of student-level, high school-level, and college-level variables specific to students' bachelor's degree attainment within six years of starting postsecondary education. A subset of these analyses also looked specifically at the influence of college diversity

climate. Finally, a third general set of analyses utilized cross-classified modeling in order to predict a *continuous* measure of degree attainment: time to degree. Similarly, a subset of these analyses specifically considered college climate effects.

Comparing HGLM models: Enrollment versus completion. The final HGLM model from Research Question 1 was replicated to predict degree completion within six years for the approximately 4,010 students who matriculated at a four-year college or university as their first-attended postsecondary institution. (For sample descriptive statistics, including variable means, standard deviations, minimums, and maximums, see Appendix C1). Table 4.14 presents both the final multilevel model predicting college enrollment and its analogous model predicting degree completion.

Compared to the model predicting four-year college enrollment, the degree completion model yielded few significant student-level variables and no significant school-level predictors. This difference is perhaps unsurprising considering that, after entering college, these students undergo up to six years of college and general later-life experiences that can influence their paths to degree completion. Moreover, it is likely that beginning postsecondary education at a four-year institution is itself a contributing factor to students' likelihood of degree completion. Among student-level variables, it is interesting to note that SAT scores do not predict degree completion considering that they play such a strong role in college admissions. This finding may supports others' (e.g., DeAngelo et al., 2011), which suggest that standardized test scores add only marginally to the predictive power of a comprehensive set of student attitudes and experiences.

Table 4.14

HGLM Models Predicting Enrollment at 4-Year PSI, and Degree Attainment within 6 Years

	DV: Enrollment (N=8,050 Students, 650 HS's)				DV: Completion (N= 4,010 Students, 570 HS's)			
	Coeff.	S.E.	Sig.	ΔP (pp)	Coeff.	S.E.	Sig.	ΔP (pp)
LEVEL-ONE								
Student Demographics								
Sex: Female	-.186	.087	*	-4.2	.032	.102		
Race: AAPI (Ref.= White)	-.032	.195			-.382	.162	*	-8.8
Race: AIAN	.998	.497	*	20.6	-.807	.796		
Race: Black	.653	.146	***	14.4	-.336	.175		
Race: Latino	.049	.142			-.120	.245		
Race: Multiracial	.137	.210			-.012	.226		
SES	.252	.075	**	5.8	.257	.095	**	5.4
# Parents/Guardians	-.134	.097			.046	.123		
# Parent(s)' dependents	.037	.032			-.073	.044		
Parental Influence								
Parent aspirations for student ed.	.031	.039			-.042	.050		
Parents expect success in school	.080	.062			.143	.071	*	3.1
Parents help with homework	-.044	.046			.061	.058		
Social Environment								
School Safety factor	.180	.056	**	4.2	-.007	.072		
Students friendly w/ other races	-.119	.070			-.113	.079		
Teacher-Student Rel. factor	.009	.053			.044	.059		
HPW: Extracurriculars	.118	.022	***	2.8	.100	.030	**	2.2
Sociocognitive Factors								
Social Agency factor	-.008	.049			-.066	.057		
Math Self-Efficacy factor	.037	.042			-.043	.054		
Impt: Good grades	.006	.078			.103	.091		
HPW: Homework	-.003	.008			.010	.008		
Impt: Good education	.417	.144	**	9.4	.126	.204		
Impt: Good job	.008	.184			-.174	.185		
Degree aspirations	.164	.030	***	3.8	-.007	.056		
Friends' Influence								
# Friends consider grades impt.	-.082	.042	*	-2.0	-.039	.054		
# Friends plan to attend 4-yr	.312	.048	***	7.1	.058	.064		
# Friends of diff. sex	-.055	.064			-.013	.071		
# Friends in diff. grade	.034	.050			-.068	.065		
College-Going Behavior								
# SAT prep methods	.059	.032			.037	.044		
Social Capital scale	-.002	.027			.077	.029	*	1.7
External Help scale	.187	.033	***	4.4	.012	.046		

Table 4.14, continued

HGLM Models Predicting Enrollment at 4-Year PSI, and Degree Attainment within 6 Years

	DV: Enrollment (N=8,050 Students, 650 HS's)				DV: Completion (N= 4,010 Students, 570 HS's)			
	Coeff.	S.E.	Sig.	ΔP (pp)	Coeff.	S.E.	Sig.	ΔP (pp)
Academic Indicators								
Academic GPA	.607	.092	***	13.2	1.259	.130	***	20.7
# AP/IB courses	.216	.048	***	5.0	.067	.028	*	1.5
SAT comp. score (in 100s)	.318	.038	***	7.2	.038	.045		
Took SAT (vs. imputed)	.986	.100	***	23.9	.064	.195		
LEVEL-TWO								
High School Structure								
Control: Private	-.555	.337			.023	.261		
Total enrollment	.000	.000			.000	.000		
% Total Enr is HS (in 10s)	-.145	.420	**	-3.4	.004	.371		
Urbanicity	.252	.104	*	5.8	-.005	.083		
Coed	-.241	.251			.014	.185		
Instructional and Counseling Staff								
Student/Teacher ratio	.018	.016			.003	.016		
% FT teachers certified	.002	.004			-.002	.003		
# FT guidance counselors	.032	.035			.055	.044		
P/FT teacher ratio	-.466	.611			.723	.582		
% Excellent teachers	.002	.002			.000	.002		
Peer Learning Environment								
% LEP/non-Eng. proficient	.006	.007			-.003	.008		
% SPED	.002	.010			-.009	.009		
Racial climate	-.122	.088			-.020	.086		
Academic Climate factor	.053	.067			.090	.071		
Academic Performance and Stereotype Threat Context								
% Grads to 4yr PSI (in 25%'s)	.535	.076	***	11.8	.119	.069		
% in AP	-.005	.005			.004	.004		
% Free lunch	-.018	.004	***	-0.4	-.007	.004		
Diversity index	-.007	.003	*	-0.2	-.003	.003		
Intercept	.749	.540			.660	.454		
Variance Component (S.D.)	.849	(0.922)	***		.272	(0.521)	***	
Reliability	.543				.269			
-2 Log Likelihood	11514.3				5760.5			

*p<.05, **p<.01, ***p<.001

AAPI status is a negative predictor for degree completion, whereas it does not significantly predict college enrollment. This effect indicates that controlling for student and high school-level variables, AAPI students are on average 8.8 percentage points less likely than their white peers to complete a bachelor's degree within six years. Interestingly, the effect of being an AAPI student on degree completion does not significantly differ from being white until the addition of academic indicators to the model. Thus, the negative effect that persists thereafter through the full model can be attributed to AAPI students' lower likelihood of degree completion relative to what would be expected given their grades, standardized test scores, and course-taking patterns. Additionally, given that AAPI students actually demonstrate higher rates of degree attainment than white students (as shown in Table 4.2) and the highest rates among all racial groups, this finding may also underscore the utility of considering college-level and additional student-level variables. That is to say, attributing AAPI students' relatively high college completion rates to race and academic performance is both overly simplistic and incorrect. Besides AAPI status, only two variables predict degree attainment but not college enrollment: students' perception that their parents expect academic success, and social capital. Thus, students who feel support, or perhaps even pressure, from their parents to do well academically, and who utilize a variety of resources from their network of friends and family for information about the college application process, demonstrate a greater likelihood of completing college.

These models serve to offer only a very rough comparison. As previously noted, differences in dependent variables and in analytic samples make it difficult to interpret direct comparisons of coefficients between models. However, this exercise suggests the merit of considering alternative, and additional factors that might predict degree completion rates. The following section details subsequent multilevel analyses to that effect.

Degree completion within six years. A single-level logistic regression was first run in order to identify significant student-level predictors of degree completion among all students who started at a four-year postsecondary institution (see Appendix A1 for all originally considered variables). Next, a cross-classified model using significant student variables and all possible high school-level variables was run to identify extraneous level-2 variables (where $p \geq 0.5$). In addition to variables meeting the significance threshold for their respective preliminary analyses, key measures pertaining to race, SES, and academics were retained.

CCHGLM sample. Using the same logic as in the decision to keep only students who remained at the same high school between their 10th and 12th grades, the sample of four-year PSI starters was reduced to the 3,250 participants who reported having attended either one or two institutions over the course of their college career. This sample was then reduced again to include only the high schools and colleges associated with at least two student cases, per the assumption of outcome variation referred to in Chapter 3. After accounting for missing values among college-level variables, the final CCHGLM analytic sample consists of approximately 3,080 students, representing 540 high schools and 590 first-attended four-year colleges. Table 4.15 presents descriptive statistics for this final sample.

Overall, approximately 71% of the sample completed their degree within six years—a larger proportion that would be expected based on statistics describing the overall cohort and sample used for Research Question 1. This skew towards degree completers compared even to the 67% in the previous HGLM sample used to predict completion (see Appendix C1 for HGLM sample descriptives) is likely attributable to the sample having been winnowed to students who attended relatively few institutions over the course of their college careers. Thus, even without

any further analysis, it might be concluded that students who attend fewer institutions are more likely to complete their bachelor's degree by the end of six years.

Compared to the HGLM sample from Research Question 1, the CCHGLM sample consists of the same proportion of female students, relatively more AAPI students (11%, as compared to 9%), and fewer AIAN, black, and Latino students. The CCHGLM sample also includes generally higher SES students, with both a higher average SES value and higher minimum SES value. Among these students, the average GPA is 3.19 (compared to 2.84 in Research Question 1) and the average SAT score is 1101 (compared to 978). Additionally, only 7% of the CCHGLM sample has imputed SAT scores. These student-level indicators, and their corresponding differences between samples, make sense considering that the CCHGLM sample consists only of students who started college at a four-year institution.

With regard to high school characteristics, the CCHGLM sample represents relatively more private schools than the HGLM sample from Research Question 1, with high school students representing relatively less of their schools' overall enrollment. The CCHGLM sample's schools also tend to have more full-time guidance counselors (3.83 versus 3.74), and smaller proportions of limited/non-English proficient (4.3% versus 5.4%) and special education students (10.3% versus 10.9%). With regard to student composition, CCHGLM sample schools have smaller proportions of students receiving free lunch (17.3%, as compared to 20.1%) and less racial diversity (average index score of 31.02, as compared to 31.48). Again, considering that this sample consists of four-year PSI starters, these differences in school-level measures are not surprising.

Table 4.15
Descriptive Statistics for Variables Included in Final CCHGLM for Degree Completion (N=3,080 Students, 540 HS's, 590 PSI's)

	Mean	SD	Min.	Max.
Outcome				
Bachelor's degree within 6 years	0.71	0.45	0.00	1.00
LEVEL-ONE				
Student Demographics				
Sex: Female	1.54	0.50	1.00	2.00
Race: AAPI (Ref.= White)	0.11	0.31	0.00	1.00
Race: AIAN	0.00	0.05	0.00	1.00
Race: Black	0.08	0.28	0.00	1.00
Race: Latino	0.07	0.25	0.00	1.00
Race: Multiracial	0.04	0.19	0.00	1.00
SES	0.48	0.67	-0.99	1.97
HS Attitudes & Experiences	3.11	0.64	1.00	4.00
HPW: Extracurriculars	3.88	1.79	1.00	8.00
Social Agency factor	0.02	0.85	-2.10	1.53
Math Self-Efficacy factor	0.21	0.98	-2.08	1.85
# Friends in different grade	0.42	0.73	0.00	3.00
HS Academic Indicators				
Academic GPA	3.19	0.56	0.78	4.30
SAT composite score (in hundreds)	11.01	1.81	4.20	16.00
Took SAT (vs. imputed)	0.93	0.25	0.00	1.00
Transition & College Experiences				
# Life stresses	0.82	0.92	0.00	6.00
Job earnings in 2005 (in thousands)	3.97	4.57	0.00	76.00
Greatest selectivity of applied PSI	5.57	0.64	1.00	6.00
Enrolled mostly or all full-time	2.95	0.29	1.00	3.00
# High impact ed. activities	1.72	1.47	0.00	6.00
Met advisor re: academic plans	2.20	0.56	1.00	3.00
# PSIs attended	1.49	0.50	1.00	2.00
SES transition	-0.04	0.96	-2.00	2.00
Diversity transition	0.11	0.94	-2.00	2.00
Academic transition	-0.15	0.92	-2.00	2.00
LEVEL-TWO				
High School Characteristics				
Control: Private	0.26	0.44	0.00	1.00
% Total enrollment is HS (in tens)	8.30	2.80	1.10	1.00
% FT teachers certified	91.15	19.48	0.00	100.00
# FT guidance counselors	3.83	2.52	-0.77	16.00
% Excellent teachers	39.82	25.18	0.00	100.00
% LEP/non-Eng. proficient	4.34	7.74	-0.07	50.00
% SPED	10.28	7.14	0.00	31.00

Table 4.15, continued
Descriptive Statistics for Variables Included in Final CCHGLM for Completion (N=3,080 Students, 540 HS's, 590 PSI's)

	Mean	SD	Min.	Max.
High School Composition				
% Grads to 4yr PSI (in quartiles)	2.78	1.00	1.00	4.00
% Free lunch	17.34	18.25	0.00	100.00
Diversity index	31.02	20.86	0.00	74.88
% AAPI	5.08	11.65	0.00	100.00
% AIAN	0.85	3.09	0.00	57.91
% Latino	10.75	18.23	0.00	98.38
% Black	13.62	20.42	0.00	99.37
% White	69.69	28.67	0.00	100.00
College Structure				
Control: Private	1.44	0.50	1.00	2.00
Sector: For-profit	0.00	0.06	0.00	1.00
HBCU	0.05	0.21	0.00	1.00
FTE	9781.20	9175.91	347.00	47173.70
% FTFT Degree seeking undergrads	19.77	5.15	1.00	36.67
Tuition & fees (in thousands)	13.13	9.88	0.60	36.08
Offers remedial services	0.69	0.46	0.00	1.00
Average SAT score (in hundreds)	10.97	1.38	7.70	15.25
College Composition				
% Undergraduate women	55.47	9.88	0.00	100.00
Avg fed. grant amount (in thousands)	3.34	0.98	1.36	18.31
% Fed. grant recipients	27.32	14.56	4.33	84.00
Avg loan amount (in thousands)	4.19	1.37	1.76	11.51
% Loan recipients	53.11	18.05	2.00	92.67
Diversity index	40.41	17.72	1.48	77.56
% AAPI	5.25	7.48	0.00	62.78
% AIAN	0.66	1.28	0.01	21.05
% Black	11.58	18.65	0.25	99.26
% Latino	6.08	9.89	0.07	91.92
% White	67.94	22.58	0.16	97.55
% Non-Resident alien or unknown	8.48	7.78	0.06	53.18

In terms of college characteristics, the CCHGLM sample consists of 44% public institutions, nearly no for-profit institutions, and 5% HBCUs. Seventy percent of institutions offer remedial services. The average proportion of women at these institutions is 55.5%, and both coeducational and single-sex schools are included in the sample. On average, white students

make up by far the largest racial group, with the average proportion of white students at 67.9%. At 0.7%, AIAN students are on average the least prevalent racial group at sample institutions. Furthermore, with the proportion of AIAN students ranging from essentially zero to 21% across all sample institutions, the sample most likely does not include any of the few existing four-year tribal colleges. Finally, approximately 27.3% of students at CCHGLM sample institutions receive federal grants, and more than half (53.1%) take out loans to help offset the cost of college.

CCHGLM results. As with the HGLM for Research Question 1, analysis began with running a fully unconditional null model, from which an ICC was estimated in order to approximate the proportion of outcome variance attributable to level-2 effects. Because CCHGLM produces coefficients for both level-2 units, variance can be estimated separately for high school and college-level effects. Using the same general equation for estimating the ICC for a dichotomous outcome, the level-2 variance was calculated as 14.0% of total outcome variance, of which 17.6% could be attributed to high school effects and 82.4% to college-level effects. The high school-level variance component in the null model was not statistically significant (p=.054). However, because high school-level predictors are key to this research question, I proceeded with CCHGLM analyses rather than using HGLM with only colleges at level-2.

In building the CCHGLM main effects model, student demographics were first entered to test the significance of gender, race, and SES without controlling for any other variables. Then, using the variables determined statistically or conceptually significant during preliminary analyses, student-level variables reflecting both high school and college experiences were added in a single block, followed by variables designed to capture college enrollment and transition patterns. Level-1 interaction terms were then added to test whether the effects of socioeconomic,

diversity, and academic transitions are moderated by students' SES, race, and SAT scores. Among these interaction terms, only AAPI*Diversity transition was significant. However, because neither of its constituent main effects was significant in the previous, main-effects only model, the race*diversity interaction terms and all other level-1 interaction terms were left out of subsequent modeling (see Appendix C2 for comparison of level-1 main-effects and interaction effects models). Level-2 variables were then added in the following order: high school structure and staff characteristics, key high school contexts (academic, diversity, and socioeconomic), college structural characteristics, and college student composition. For a table summarizing step-by-step main-effects model building and corresponding coefficients, see Appendix C3.

Table 4.16 summarizes the CCHGLM model from four key steps: with student demographics only, with complete student-level predictors, with complete student and high school-level predictors, and with complete student, high school, and college-level predictors. Controlling for all student-level variables—including transition patterns—accounts for nearly all high school-level variance, and reduces college-level variance by approximately 76% as compared to the null model. In other words, student characteristics explain most of the between-group variance for both high schools and colleges. Adding high school-level variables then explains another 8% of variance originally attributed to college-level effects. Finally, with the addition of college-level predictors, the final CCHGLM explains most (95%) of the level-2 variance in student outcomes.

In the earliest step of modeling, both gender and race entered as significant predictors. Furthermore, unlike in the HGLM model in Research Question 1, the addition of SES—while significant—did not eliminate the effects associated with other background characteristics. Thus, controlling only for student-level demographics, female students are 6.8 percentage points more

likely than their male counterparts, and AIAN and black students 36.0 percentage points and 10.4 points, respectively, less likely than their white counterparts to complete bachelor's degrees within six years. However, these gender and race effects drop out of the model with the addition of students' beliefs and experiences. Hence, better high school grades, and key high school and college experiences, such as participation in extracurricular activities, enrolling full-time, and utilizing academic resources and faculty advisors, can improve college completion rates for male and racial minority students. In comparing intermediate models, few other variables demonstrate changing significance. Students' diversity transition, for example, becomes significant after the addition of college-level structural characteristics, but drops out of the model after the addition of variables measuring college composition vis-à-vis gender, SES and racial diversity.

Between the final two models, college control and tuition both become non-significant, while the effect of students' annual average loan amount enters as statistically significant and positive (delta-p= 2.3). The shift in effect significance at this step is likely attributable to the relationship between all three predictors: private colleges tend to have higher tuition and fees than their public counterparts; students, in turn, tend to take out more or larger loans in order to pay these costs. The Pearson correlation coefficient ($r_{tuition,\ loans}$=.399, p<.05) provides statistical confirmation of this relationship. However, all three variables were included in the models in order to control for characteristics that were conceptualized as distinctly structural versus compositional.

Table 4.16

CCHGLM Models Predicting Bachelor's Degree Attainment within 6 Years (N=3,080 Students, 540 HS's, 590 PSI's)

	Demographics				Full Level-1				HS Variables				PSI Variables			
	Coeff.	S.E.	Sig.	ΔP (pp)	Coeff.	S.E.	Sig.	ΔP (pp)	Coeff.	S.E.	Sig.	ΔP (pp)	Coeff.	S.E.	Sig.	ΔP (pp)
Student Characteristics																
Sex: Female	.298	.086	**	6.8	.047	.102			.060	.102			.076	.104		
Race: AAPI (Ref.= White)	.143	.150			.027	.163			-.006	.178			-.026	.179		
Race: AIAN	-1.517	.757	*	-36.0	-1.067	.839			-.978	.848			-.783	.834		
Race: Black	-.471	.148	**	-10.4	.148	.173			.156	.180			.145	.197		
Race: Latino	-.022	.172			.194	.193			.176	.202			.239	.205		
Race: Multiracial	-.353	.214			-.187	.245			-.286	.249			-.295	.249		
SES	.579	.067	***	10.4	.255	.078	**	5.0	.211	.080	**	4.1	.224	.080	**	4.4
School place to meet friends					.110	.074			.095	.074			.093	.074		
HPW: Extracurriculars					.084	.027	**	1.7	.090	.027	**	1.8	.090	.027	**	1.8
Social Agency factor					-.101	.056			-.108	.057			-.104	.057		
Math Self-Efficacy factor					-.076	.051			-.090	.051			-.088	.051		
# Friends in diff. grade					-.072	.062			-.041	.063			-.048	.063		
Academic GPA					.883	.109	***	14.5	.966	.112	***	15.5	.990	.112	***	15.8
SAT comp. score (in 100s)					.070	.037			.046	.038			.059	.039		
Took SAT (vs. imputed)					-.095	.189			-.063	.192			-.063	.193		
# Life stresses					-.141	.050	**	-3.0	-.144	.050	**	-3.1	-.151	.050	**	-3.2
Job earnings in 2005 (in 1000s)					-.037	.000	**	-0.8	-.035	.000	**	-0.7	-.035	.000	**	-0.7
Greatest selectivity of applied PSI					.450	.086	***	10.0	.365	.089	***	8.0	.345	.091	***	7.6
Enrolled mostly or all full-time					.796	.193	***	13.4	.786	.193	***	13.3	.790	.194	***	13.4
# High impact ed. activities					.356	.037	***	6.8	.349	.037	***	6.6	.344	.038	***	6.6
Met advisor re: academic plans					.212	.086	*	4.2	.217	.087	*	4.3	.206	.087	*	4.0
# PSIs attended					-.864	.095	***	-11.3	-.871	.096	***	-11.3	-.883	.096	***	-11.4
SES transition					-.068	.058			.040	.069			-.001	.095		
Diversity transition					.087	.054			.109	.064			.118	.117		
Academic transition					-.021	.063			.004	.076			.127	.111		
School Characteristics																
Control: Private									.233	.235			.205	.238		
% Total enr is HS (in 10s)									.050	.353			.044	.354		

Table 4.16, continued

CCHGLM Models Predicting Bachelor's Degree Attainment in 6 Years (N=3,080 Students, 540 HS's, 590 PSI's)

	Demographics				Full Level-1				HS Variables				PSI Variables			
	Coeff.	S.E.	Sig.	ΔP (pp)	Coeff.	S.E.	Sig.	ΔP (pp)	Coeff.	S.E.	Sig.	ΔP (pp)	Coeff.	S.E.	Sig.	ΔP (pp)
% FT teachers certified									-.003	.003			-.003	.003		
# FT guidance counselors									.056	.024	*	1.1	.048	.024	*	1.0
% Excellent teachers									-.002	.002			-.002	.002		
% LEP/non-Eng. proficient									-.012	.008			-.011	.008		
% SPED									-.015	.009			-.017	.009		
% Grads to 4yr PSI (in 25%s)									.037	.080			.101	.093		
% Free lunch									-.006	.004			-.004	.005		
Diversity index									.003	.003			.003	.005		
PSI Characteristics																
Control: Private													-.486	.258		
Sector: For-profit													.017	1.399		
HBCU													.161	.371		
FTE													.000	.000		
% FTFT Degree seeking UGs													.011	.014		
Tuition & fees (in 1000s)													.010	.000		
Offers remedial services													.094	.120		
Average SAT score													-.116	.099		
% Undergraduate women													.002	.007		
Avg fed. grant amt (in 1000s)													-.017	.000		
% Fed. grant recipients													-.010	.007		
Avg loan amt (in 1000s)													.114	.000	*	2.3
% Loan recipients													.004	.004		
Diversity index													.005	.007		
Intercept	.514	.142	**		1.132	.241	***		.986	.249	***		1.609	.460	**	
HS Variance Comp. (S.D.)	.027	(.163)			.002	(.041)			.001	(.034)			.001	(.032)		
PSI Variance Comp. (S.D.)	.304	(.551)	***		.107	(.327)	*		.071	(.266)	*		.020	(.143)	*	
-2 Log Likelihood	4318.7				4403.9				4410.2				4445.8			

*p<.05, **p<.01, ***p<.001

The final CCHGLM model suggests several significant student-level predictors, many of which make intuitive sense. SES, for example, positively predicts degree completion, as does GPA. However, job earnings, which may serve as an indicator of students' difficulty in paying for college, tend to decrease students' likelihood of degree attainment. The number of stressful life events (e.g., parents/guardians divorced, parent/guardian lost job, close relative/friend died, respondent became seriously ill) is also negatively associated with completion. Besides high school grades, the amount of time spent in extracurricular activities is the only high school experience that significantly predicts college degree attainment. This finding perhaps suggests that students who successfully balance extracurricular, academic, and family responsibilities in high school transfer that skill to their college responsibilities. Academic aspirations, or rather the application behaviors associated with them, also predict degree attainment. The effect associated with the selectivity of schools to which students applied indicates that students who apply to four-year—as opposed to two-year—schools, and more selective four-year schools by their second year out of high school stand a better chance of completing their degrees within six years of starting college.

Among high school-level variables, few measures demonstrate significant effects, yet this might be expected given the non-significant high school-level variance discussed previously. Only the number of full-time guidance counselors is significant. However, it is unclear whether this positive relationship reflects a more general positive effect of high school resources or if counseling staff provide unique services that later translate to college success. It is also worth noting that the proportion of students in special education programming, while not technically significant, did approach significance (p=0.05) by the final model. At the college-level, only the average loan amount significantly predicts degree completion. Key positive college experiences

include “high impact educational activities” (such as participating in an internship, study-abroad, or mentoring), and meeting with an advisor about academic plans. Finally, despite having narrowed the sample to only students who attended either one or two institutions during college, the effect of the number of PSI’s attended is a significant negative predictor: students who attend two PSIs are 11.4 percentage points less likely to complete their degree in six years than their peers who attend the same institution for the entirety of their college career.

In light of the significance of student-level SES and college-level average loan amount—both indicators of socioeconomic status—a cross-level interaction term comprising the two variables was also tested. However, the effect was not significant.

Transition effects. Considering the non-significance of the socioeconomic, diversity, and academic transition measures in the final model, a separate CCHGLM analysis was conducted in which changes in the effect significance of all three transition variables were examined throughout the addition of student, high school, and college-level variables. Based on a model controlling for transition scores with respect students’ to socioeconomic, racial diversity, and academic contexts—but no other variables—only diversity transition and academic transition were significant. Furthermore, these two transition effects remained significant through the addition of student race and SES. However, students’ diversity transition became non-significant with the addition of the three high school context measures (proportion of graduates who attend four-year colleges, proportion of students participating in free lunch program, and racial diversity index). Thus, the positive effect of attending a relatively more racially diverse college than one’s high school is explained by high schools’ student composition.

The remaining transition variable, academic transition score, remained significant through the addition of key college context measures (average SAT scores, aggregate federal

grant and loan measures, and racial diversity index) and individual sociocognitive factors. It became non-significant, however, upon the addition of students' GPA. Thus, the positive effect of matriculating at a relatively competitive college can be explained by students' own academic performance in high school. In other words, students with strong academic records or ability are more likely to persist in college despite challenges they may face in acclimating to a more competitive or rigorous academic environment. Moreover, GPA remained a significant predictor of degree completion after the subsequent addition of standardized test scores. Based on these and previously discussed effects, it might be concluded that high school academic quality does matter—the effect of proportion of graduates at four-year colleges remained significant through each step. But differences in academic quality between students' high school and college—or becoming a relatively small frog in a big pond—are less important for college degree attainment than how well students do in high school. Moreover, grades significantly predict likelihood of degree attainment above and beyond the arguably more objective measure of SAT scores. This finding may support previous research (Hiss & Franks, 2014) suggesting that high school GPA is at least as good a predictor of college outcomes as SAT scores, based on the observation that students who do not submit test scores, and are thus admitted on the basis their high school grades, graduate from college at the same rates as students who do submit their scores.

Testing alternative racial composition measures. Similarly to the analyses detailed in Research Question 1, alternative college-level measures of racial diversity were tested in order to look for the more nuanced effects of numerical minority status. Prior to running these models, however, I decided to include only student and college-level predictors in order to enhance model parsimony. This determination was based, in part, on a comparison of models containing a) all level-1 and level-2 predictors, b) complete level-1 but only high school-level predictors,

and c) complete level-1 but only college-level predictors (see Appendix C4). Compared to the full, two-level model (Model a), excluding high school-level predictors did not decrease the explained proportion of high-school level variance. This observation is likely due both to having an initially non-significant high school-level variance component and the fact that student-level predictors can explain a good deal of the differences in average bachelor's degree completion rates across high schools. However, in the absence of high-school level variables, certain student and college characteristics emerged as significant: namely, students' SES transition pattern and colleges' proportion of students receiving federal grant monies. These effects were not explored further, as this set of analyses was intended to focus on differences between college-level racial diversity indicators.

Table 4.17 presents several models, controlling separately for the representation of various race groups among undergraduate students, in addition to their corresponding nested or "base" model, which does not include any diversity measures. (For complete table, including original coefficients and standard errors, see Appendix C5.)

Across all models, the addition of racial composition measures did not impact the significance of any other independent variables. That is to say, all effects present in the base, "No Diversity Measure" model remained unchanged with regard to significance and direction, regardless of which racial composition measure was added. Furthermore, each diversity measure model explained more college-level variance than the base model alone, with the largest difference in explained level-2 variance between the base model and "% White" model. Relative to the base model, only the proportion of white undergraduates entered as a significant variable, with a coefficient suggesting a negative relationship between an above average proportion (i.e., greater than 67.9%) of white students on campus and students' overall likelihood of degree

completion. However, the fact that other diversity measures, including the diversity index, did not significantly enter their respective models, may be reflective of relatively little variation in the representation of non-white students across colleges in the sample.

On one hand, this finding might support previous research concluding that racial diversity, as measured by the representation of non-white students, and interactions across race yield cognitive benefits for all students (Terenzini et al., 2001). Another way to interpret this relationship may be to consider the presence of students of color a reflection of institutional priorities vis-à-vis racial diversity. The effect of the proportion of white (or alternatively, non-white) students might then be interpreted in line with Umbach and Kuh's (2006) construct of diversity press, which considers institutional commitment to diversity and has been tied to undergraduate students' cognitive gains and academic engagement. Moreover, an institution's commitment to diversity may manifest in academic supports (e.g., bridge programs, tutoring), curriculum (e.g., ethnic or women's studies courses), and co-curricular programming (e.g., faculty or peer mentoring) that are not accounted for in this analysis, but could generally improve completion rates.

Cross-level interaction terms were created in order to test whether the effects of student race are moderated by each of five diversity measures: diversity index, and the proportions of AAPI, black, Latino, and white students. Due to their limited representation, and lack of tribal colleges in the sample, the proportion of AIAN students was not tested. None of the race*diversity terms entered their respective models as significant predictors of degree completion. (Appendix C6 contains a table of all five interaction effects models, which can be compared to their respective, nested main effects models in Table 4.17).

Table 4.17

CCHGLM Using Alternative PSI Racial Composition Measures (N=3,080 Students, 590 PSI's)

	No Measure		Div. Index		% AAPI		% Black		% Latino		% White	
	ΔP	Sig.	ΔP	Sig.	ΔP	Sig.	ΔP	Sig.	ΔP	Sig.	ΔP	Sig.
Student Characteristics												
Sex: Female												
Race: AAPI (Ref.= White)												
Race: AIAN												
Race: Black												
Race: Latino												
Race: Multiracial												
SES	4.6	**	4.6	**	4.6	**	4.5	**	4.5	**	4.5	**
School place to meet friends												
HPW: Extracurriculars	1.7	**	1.7	**	1.7	**	1.7	**	1.7	**	1.7	**
Social Agency factor												
Math Self-Efficacy factor												
# Friends in diff. grade												
Academic GPA	14.7	***	14.9	***	14.7	***	14.8	***	14.7	***	14.8	***
SAT comp. score (in 100s)												
Took SAT (vs. imputed)												
# Life stresses	-3.0	**	-3.1	**	-3.1	**	-3.0	**	-3.0	**	-3.1	**
Job earnings (in 1000s)	-0.8	**	-0.8	**	-0.8	**	-0.8	**	-0.8	**	-0.8	**
Greatest sel. of applied PSI	8.5	***	8.3	***	8.5	***	8.5	***	8.5	***	8.3	***
Enrolled mostly or all FT	13.6	***	13.5	***	13.6	***	13.6	***	13.6	***	13.5	***
# High impact ed. activities	6.7	***	6.7	***	6.6	***	6.7	***	6.7	***	6.7	***
Met advisor re: acad. plans	4.0	*	4.0	*	4.2	*	3.9	*	4.0	*	4.1	*
# PSIs attended	-11.0	***	-11.0	***	-11.0	***	-11.0	***	-11.0	***	-11.1	***
SES transition	-3.2	*	-3.1	*	-2.9	*	-3.3	*	-3.2	*	-3.0	*
Diversity transition												
Academic transition												
PSI Characteristics												
Control: Private												
Sector: For-profit												
HBCU												
FTE												
% FTFT Degree seeking UG's												
Tuition & fees (in 1000s)												
Offers remedial services												
Avg SAT score (in 100s)												
% Undergraduate women												
Avg fed. grant amt (in 1000s)												
% Fed. grant recipients	-0.3	*	-0.4	**	-0.4	**	-0.4	**	-0.4	**	-0.4	**
Avg loan amt (in 1000s)	2.4	*	2.3	*	2.3	*	2.3	*	2.3	*	2.2	*
% Loan recipients												
____ (Diversity measure)											-0.2	*
Intercept	1.728	***	1.694	***	1.663	**	1.755	***	1.754	***	1.711	***
HS Variance Component	.001		.001		.001		.001		.001		.001	
PSI Variance Component	.064	*	.052	*	.053	*	.061	*	.059	*	.044	*
-2 Log Likelihood	4425.0		4435.8		4439.3		4423.9		4430.2		4445.7	

*p<.05, **p<.01, ***p<.001

College climate measures. A separate subset of analyses was conducted to determine the effects of college climate, based on aggregate measures of students' beliefs and attitudes about diversity. Select variables representing possible climate measures were taken from the 2000 through 2009 administrations of the CIRP Freshman Survey (TFS). This range of years was selected based on item availability and survey sample size, as well as the logic that TFS participants during these years would most likely overlap with this study's cohort at their respective institutions and therefore reflect the campus climate during the time framed by ELS:2002/2012 data. These data were then analyzed to identify variables that would capture students' diversity attitudes while maximizing institutional overlap between the ELS and CIRP datasets. After analysis of missing data, and both exploratory and confirmatory factor analyses, three final climate measures were selected for multilevel analyses. Student-level scores were then averaged to create institution-level aggregate measures of their students' predicted likelihood of socializing with someone of another racial/ethnic group, belief that racial discrimination is no longer a problem in America, and factor scores measuring social and pluralistic goals. Variable coding schemes and factor loadings are available in Appendices A1-A2.

Deletion of institutions with missing data yielded a final analytic sample of 2,090 students from 500 high schools and 390 colleges (for descriptive statistics, see Appendix C7). Table 4.18 shows the coefficient estimates for two cross-classified models: one analogous to the final, main effects model predicting degree completion among the larger CCHGLM sample, and one with the addition of the three level-2 climate measures discussed above. It should be noted that, for both of these models, the for-profit indicator was omitted because the reduced sample did not contain any for-profit institutions.

Table 4.18

CCHGLM with Addition of College Climate Measures (2,090 Students, 500 HS's, 390 PSI's)

	Final CCHGLM Variables				With PSI Climate Measures			
	Coeff.	S.E.	Sig.	Δ*P*(pp)	Coeff.	S.E.	Sig.	Δ*P*(pp)
Student Characteristics								
Sex: Female	.228	.130			.221	.130		
Race: AAPI (Ref.= White)	-.243	.212			-.238	.213		
Race: AIAN	-1.382	1.001			-1.347	1.002		
Race: Black	-.209	.240			-.211	.240		
Race: Latino	.167	.270			.169	.271		
Race: Multiracial	-.344	.304			-.335	.306		
SES	.252	.101	*	4.5	.245	.101	*	4.4
School place to meet friends	.107	.093			.108	.093		
HPW: Extracurriculars	.098	.034	**	1.8	.097	.034	**	1.8
Social Agency factor	-.170	.072	*	-3.4	-.166	.072	*	-3.3
Math Self-Efficacy factor	-.111	.062			-.110	.063		
# Friends in diff. grade	-.048	.080			-.051	.080		
Academic GPA	1.023	.144	***	14.8	1.022	.144	***	14.8
SAT comp. score (in 100s)	.025	.048			.020	.048		
Took SAT (vs. imputed)	-.012	.256			-.015	.257		
# Life stresses	-.138	.063	*	-2.7	-.134	.063	*	-2.7
Job earnings (in 1000s)	-.038	.000	**	-0.7	-.037	.000	**	-0.7
Greatest selectivity of applied PSI	.358	.133	**	7.5	.357	.133	**	7.4
Enrolled mostly or all full-time	1.001	.279	**	14.6	1.005	.280	**	14.6
# High impact ed. activities	.330	.047	***	5.8	.332	.047	***	5.9
Met advisor re: academic plans	.158	.110			.145	.110		
# PSIs attended	-.959	.122	***	-10.3	-.958	.122	***	-10.3
SES transition	.172	.119			.191	.120		
Diversity transition	.227	.146			.239	.146		
Academic transition	.219	.134			.218	.135		
School Characteristics								
Control: Private	.083	.293			.105	.294		
% Total enr is HS (in 10s)	.227	.439			.279	.441		
% FT teachers certified	.000	.003			.000	.003		
# FT guidance counselors	.061	.031	*	1.2	.060	.031		
% Excellent teachers	-.004	.002			-.004	.002		
% LEP/non-Eng. proficient	-.018	.010			-.018	.010		
% SPED	-.024	.011	*	-0.5	-.024	.011	*	-0.5
% Grads to 4yr PSI (in quartiles)	.107	.117			.099	.118		
% Free lunch	.004	.006			.005	.006		
Diversity index	.010	.007			.010	.007		
PSI Characteristics								
Control: Private	-.309	.384			-.478	.405		
HBCU	.193	.508			.544	.639		
FTE	.000	.000			.000	.000		
% FTFT Degree seeking UG's	.030	.020			.028	.020		
Tuition & fees (in 1000s)	.000	.000			.009	.000		
Offers remedial services	.196	.148			.193	.150		
Average SAT score (in 100s)	-.209	.121			-.224	.126		

Table 4.18, continued

CCHGLM with Addition of College Climate Measures (2,090 Students, 500 HS's, 390 PSI's)

	Final CCHGLM Variables				Add PSI Climate Measures			
	Coeff.	S.E.	Sig.	Δ*P*(pp)	Coeff.	S.E.	Sig.	Δ*P*(pp)
% Undergraduate women	-.007	.008			-.007	.008		
Avg fed. grant amount (in 1000s)	.047	.000			.045	.000		
% Fed. grant recipients	-.022	.010	*	-0.4	-.022	.010	*	-0.4
Avg loan amount (in 1000s)	.090	.000			.084	.000		
% Loan recipients	.005	.006			.007	.006		
Diversity index	.000	.008			.000	.009		
Social/Pluralistic Goals factor					.529	.682		
Racism not problem					1.364	.988		
Likely to socialize w/ diff. race					.356	.822		
Intercept	2.803	.702	***		3.056	.729	***	
PSI Variance Component (S.D.)	.001	(.032)			.001	(.031)		
HS Variance Component (S.D.)	.001	(.025)			.001	(.025)		
-2 Log Likelihood	3013.4				3008.4			

*p<.05, **p<.01, ***p<.001

Comparison of the two models suggests that while the model with climate measures is slightly better fitting of the data, it does not explain—and cannot, given the amount already explained—any more level-2 variance. Also, while none of the climate measures entered significantly, their addition coincided with the effect of high school guidance counselors becoming non-significant (p=.051). It is possible then, that the effect of high school counseling services manifests in students choosing a better fitting college with respect to diversity climate.

Time to degree: CCHLM analysis. The final set of analyses for this study involved the use of cross-classified multilevel modeling to predict a *continuous* measure of degree attainment: time to degree, in months. While not of primary interest, this continuous variable was chosen in order to provide a supplementary understanding of factors that might influence degree completion and perhaps allow more nuanced relationships among variables to emerge, as compared to a simple binary outcome. For these models, the CCHGLM sample used previously (n=3,080) was reduced to include only those students who completed a bachelor's degree within

the ELS study timeframe. As in other analyses, this sample was then reduced to include only high schools and postsecondary institutions with at least two student cases each. The final analytic sample from this reduced dataset consists of 2,430 students from 550 high schools and 640 colleges. Appendix D1 contains a table of descriptive statistics for this final CCHLM sample.

A null model was constructed for this sample, from which level-1 and level-2 coefficients were used to determine the ICC (see Equation 9 in Methods chapter). The ICC was calculated as 0.174, signifying that 17.4% of the variance in students' time to degree could be attributed to level-2 effects, and warranting the use of multilevel modeling. Furthermore, 28.5% of the level-2 variance could be attributed to high school effects, and 71.5% to college-level effects.

CCHLM results. In building a final CCHLM model, variables were added to the null model in blocks, corresponding to the sequence used in constructing the cross-classified models used to predict overall degree attainment. A complete table with all intermediate models is available in Appendix D2.

Table 4.19 shows the coefficients and their corresponding significance for models 1) with only student-level demographics, 2) with the complete set of student-level variables, 3) with all student and high school-level variables, and 4) with all student, high-school, and college-level predictors (note: delta-*p* estimates are not used in interpreting effects based on continuous outcome variables). While it is not appropriate to directly compare the CCHLM and CCHGLM models, given their different outcomes and samples, it is perhaps worth noting that relatively few variables significantly predict time to degree as compared to overall completion within six years. It might be concluded from this difference, then, at the point that the sample has been constrained to only those students who eventually earn a bachelor's degree after attending only

one or two postsecondary institutions, few factors significantly affect the amount of time it takes to obtain that degree. Furthermore, students included in this analysis likely demonstrate relatively little variance with respect to their experiences and environment. This limited variance might also apply to the outcome measure since, at some elite or private institutions, degrees may be awarded only on a yearly basis.

Looking across the models, and specifically at their deviance statistics, it appears that each addition of variables contributes to better model fit. The final CCHLM model accounts for 67.0% of college-level variance and 50.0% of high school-level variance. Based on this model, which predicts 49.1 months-to-degree for the "average" student, few student-level variables predict time to degree. Gender is the only demographic characteristic associated with a significant effect. Women, on average, complete bachelor's degrees in 1.2 fewer months than their male counterparts. Race and SES-effects, which entered in early models, can be explained by students' high school and college experiences. Both high school GPA and standardized test scores predict shorter time to degree, which makes sense given that they generally serve as indicators of academic ability. However, neither of the college academic behavior variables—engaging in "high impact" educational activities or meeting with one's advisor—affect students' time-to-degree. Finally, students who attend two (as opposed to one) postsecondary institutions tend to take an additional month in earning their degrees.

Table 4.19

CCHLM Predicting Time to Bachelor's Degree (N=2,430 students, 550 HS's, 640 PSI's)

	Student Demographics			Full Level-1			HS Variables			PSI Variables		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics												
Sex: Female	-2.024	.461	***	-1.396	.479	**	-1.367	.477	**	-1.284	.481	**
Race: AAPI (Ref.= White)	.338	.773		.717	.750		.690	.790		.583	.786	
Race: AIAN	4.528	5.589		.934	5.348		.474	5.334		1.714	5.341	
Race: Black	3.748	.912	***	.593	.921		.328	.937		.467	1.015	
Race: Latino	2.451	.942	*	1.327	.913		.932	.930		.750	.931	
Race: Multiracial	1.201	1.239		1.104	1.188		1.097	1.199		.841	1.192	
SES	-1.630	.357	***	-.576	.365		-.492	.370		-.404	.370	
School place to meet friends				-.216	.348		-.149	.347		-.191	.346	
HPW: Extracurriculars				-.445	.127	**	-.459	.127	**	-.425	.127	**
Social Agency factor				.314	.261		.294	.261		.294	.260	
Math Self-Efficacy factor				.179	.234		.202	.233		.234	.232	
# Friends in diff. grade				.190	.306		.141	.306		.157	.305	
Academic GPA				-3.941	.555	***	-4.147	.562	***	-4.104	.558	***
SAT comp. score (in hundreds)				-.665	.172	***	-.615	.176	**	-.575	.181	**
Took SAT (vs. imputed)				-.930	.924		-.995	.927		-.964	.922	
# Life stresses				.322	.243		.311	.242		.260	.241	
Job earnings (2005)				.177	.000	**	.168	.000	**	.145	.000	*
Greatest sel. of applied PSI				-1.556	.469	**	-1.336	.491	**	-.946	.496	
Enrolled mostly or all FT				-4.612	1.369	**	-4.799	1.365	**	-4.818	1.360	**
# High impact ed. activities				-.088	.157		-.063	.156		.038	.157	
Met advisor re: academic plans				-.486	.409		-.408	.408		-.162	.409	
# PSIs attended				1.145	.438	**	1.139	.438	*	1.116	.436	*
SES transition				.823	.297	**	.462	.363		1.005	.492	*
Diversity transition				.100	.270		.186	.322		-.252	.588	
Academic transition				-.402	.324		-.368	.396		.208	.537	
School Characteristics												
Control: Private							.153	1.230		.281	1.213	
% Total enr is HS (in tens)							-.217	1.859		-.246	1.822	
% FT teachers certified							.027	.014	*	.023	.014	
# FT guidance counselors							-.323	.115	**	-.294	.113	*
% Excellent teachers							-.014	.010		-.014	.010	

Table 4.19, continued

CCHLM Predicting Time to Bachelor's Degree (N=2,430 students, 550 HS's, 640 PSI's)

	Student Demographics			Full Level-1			HS Variables			PSI Variables		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
% LEP/non-Eng. proficient							.074	.040		.072	.039	
% SPED							-.018	.046		.005	.046	
% Grads to 4yr PSI (in quartiles)							-.064	.418		.439	.475	
% Free lunch							.037	.022		.015	.025	
Diversity index							.017	.017		-.010	.027	
PSI Characteristics												
Control: Private										2.440	1.309	
Sector: For-profit										6.149	6.357	
HBCU										-.552	2.007	
FTE										.000	.000	
% FTFT Degree seeking UG's										-.168	.074	*
Tuition & fees (in 1000s)										-.132	.000	
Offers remedial services										.618	.599	
Average SAT score (in 100s)										-.512	.471	
% Undergraduate women										-.066	.031	*
Avg fed. grant amt (in 1000s)										.270	.000	
% Fed. grant recipients										.047	.040	
Avg loan amt (in 1000s)										.002	.000	
% Loan recipients										-.048	.022	*
Diversity index										.015	.033	
Intercept	55.014	.797	***	53.393	1.310	***	53.609	1.344	***	49.147	2.399	***
Level-1 Variance Comp. (S.D.)	108.016	(10.393)		101.516	(10.076)		101.200	(10.060)		101.780	(10.089)	
HS Variance Comp. (S.D.)	5.196	(2.279)	***	5.415	(2.327)	***	4.112	(2.028)	***	3.276	(1.810)	***
PSI Variance Comp. (S.D.)	14.422	(3.798)	***	7.624	(2.761)	***	7.756	(2.785)	***	5.432	(2.331)	***
Deviance	18616.1			18389.9			18362.3			18321.8		
-2 Log Likelihood	9308.0			9194.9			9181.1			9160.9		

*p<.05, **p<.01, ***p<.001

Interestingly, a single transition pattern emerged as significant: SES transition. Graduating from a relatively low-SES high school but matriculating at a relatively high-SES college tends to slightly delay degree completion. Based on the significance of this transition, an additional model was specified, with an interaction term to test for whether SES transition patterns differentially impacted students' outcomes based on their own socioeconomic status. However, this level-1 interaction effect was not significant.

As in the CCHGLM models, greater availability of high school guidance counseling—measured by the number of full-time counselors—is positively associated with degree completion. While again, this relationship may actually reflect the benefits of greater high school resources in general, there is also the possibility that high school counseling services may impart students with skills to better select a college that "fits," or to navigate their transition to postsecondary education. At the college-level, the proportion of first-time full-time degree seeking students relative to all undergraduates, the proportion of women, and the proportion of students with loans all predict quicker bachelor's degree completion. These college-level effects make sense when considering that on the student-level, first-time full-time undergraduates and women finish their degrees before their part-time or male counterparts. Additionally, students who take out loans for college and, relatedly, likely have high tuition costs, have more incentive to graduate and work full-time so that they are then able to repay those loans.

Diversity measures. As in previous analyses, alternative measures of racial composition were modeled, in lieu of the college diversity index. (See Appendix D3 for comparison of all diversity models.) Relative to a full cross-classified model with no diversity measure, the "% Black" model demonstrates slightly better model fit, and more explained level-2 variance, as compared to the base model.

Table 4.20 presents a comparison of the base, diversity index, and proportion black students models. Among diversity measures, only the proportion of black students entered as a significant predictor, and is associated with longer time-to-degree. However, other variables also entered significantly, namely institutions' status as an HBCU. Thus the slowing effect of an above average proportion of black students should be understood only when also considering whether the institution is an HBCU, which predicts shorter time to degree. Compared to HBCU's, students at predominantly white institutions, or even other minority serving institutions, with greater proportions of black students tend to have longer average times to degree. Based on these results, cross-level interaction terms were then added to the "% Black" model, to test whether this effect of racial composition varied by students' own race. However, none of these interaction terms was significant.

Table 4.20

CCHLM with Alternative PSI Diversity Measures (N=2,430 Students, 550 HS's, 640 PSI's)

	No Div. Measure			Diversity Index			% Black		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics									
Sex: Female	-1.274	.480	**	-1.284	.481	**	-1.286	.480	**
Race: AAPI (Ref.= White)	.604	.785		.583	.786		.742	.786	
Race: AIAN	1.704	5.342		1.714	5.341		1.968	5.335	
Race: Black	.481	1.014		.467	1.015		.235	1.018	
Race: Latino	.776	.930		.750	.931		.904	.930	
Race: Multiracial	.853	1.191		.841	1.192		1.053	1.193	
SES	-.405	.370		-.404	.370		-.431	.370	
School place to meet friends	-.196	.345		-.191	.346		-.183	.345	
HPW: Extracurriculars	-.424	.127	**	-.425	.127	**	-.419	.127	**
Social Agency factor	.294	.260		.294	.260		.287	.260	
Math Self-Efficacy factor	.235	.232		.234	.232		.202	.232	
# Friends in diff. grade	.157	.305		.157	.305		.145	.305	
Academic GPA	-4.104	.558	***	-4.104	.558	***	-4.075	.557	***
SAT comp. score (in 100s)	-.574	.181	**	-.575	.181	**	-.574	.180	**
Took SAT (vs. imputed)	-.950	.922		-.964	.922		-1.141	.924	
# Life stresses	.260	.241		.260	.241		.258	.241	
Job earnings (in 1000s)	.145	.000	*	.145	.000	*	.145	.000	*
Greatest sel. of applied PSI	-.938	.496		-.946	.496		-.929	.495	
Enrolled mostly or all FT	-4.817	1.360	**	-4.818	1.360	**	-4.849	1.359	**
# High impact ed. activities	.037	.157		.038	.157		.050	.157	
Met advisor re: acad. plans	-.159	.409		-.162	.409		-.209	.409	
# PSIs attended	1.116	.436	*	1.116	.436	*	1.119	.436	*
SES transition	.964	.484	*	1.005	.492	*	1.015	.481	*
Diversity transition	-.040	.364		-.252	.588		-.242	.368	
Academic transition	.205	.538		.208	.537		.232	.533	
School Characteristics									
Control: Private	.238	1.208		.281	1.213		.294	1.201	
% Total enr is HS (in 10s)	-.250	1.818		-.246	1.822		-.253	1.808	
% FT teachers certified	.023	.014		.023	.014		.024	.013	
# FT guidance counselors	-.291	.113	*	-.294	.113	*	-.288	.112	*
% Excellent teachers	-.014	.010		-.014	.010		-.014	.010	
% LEP/non-Eng. proficient	.072	.039		.072	.039		.087	.040	*
% SPED	.005	.046		.005	.046		.003	.045	
% Grads to 4yr PSI (in 25%s)	.426	.474		.439	.475		.370	.471	
% Free lunch	.016	.025		.015	.025		.011	.025	
Diversity index	-.001	.018		-.010	.027		-.013	.019	

Table 4.20, continued
CCHLM with Alternative PSI Diversity Measures (N=2,430 Students, 550 HS's, 640 PSI's)

	No Div. Measure			Diversity Index			% Black		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
PSI Characteristics									
Control: Private	2.402	1.308		2.440	1.309		2.519	1.294	
Sector: For-profit	6.185	6.359		6.149	6.357		6.393	6.335	
HBCU	-.706	1.978		-.552	2.007		-8.892	3.792	*
FTE	.000	.000		.000	.000		.000	.000	
% FTFT Degree seeking UG's	-.172	.074	*	-.168	.074	*	-.156	.073	*
Tuition & fees (in 1000s)	-.126	.000		-.132	.000		-.130	.000	
Offers remedial services	.619	.600		.618	.599		.587	.592	
Average SAT score	-.510	.471		-.512	.471		-.470	.466	
% Undergraduate women	-.065	.031	*	-.066	.031	*	-.073	.030	*
Avg fed. grant amt (in 1000s)	.273	.000		.270	.000		.249	.000	
% Fed. grant recipients	.047	.040		.047	.040		.033	.040	
Avg loan amt (in 1000s)	.003	.000		.002	.000		.018	.000	
% Loan recipients	-.050	.022	*	-.048	.022	*	-.047	.022	*
____ (Diversity measure)				.015	.033		.110	.044	*
Intercept	49.218	2.394	***	49.147	2.399	***	49.567	2.379	***
Level-1 Var. Comp. (S.D.)	101.775	(10.088)		101.780	(10.089)		102.151	(10.107)	
HS Var. Comp. (S.D.)	3.237	(1.799)	***	3.276	(1.810)	***	3.059	(1.749)	***
PSI Var. Comp. (S.D.)	5.493	(2.343)	***	5.432	(2.331)	***	4.844	(2.201)	***
Deviance	18322.0			18321.8			18315.8		
-2 Log Likelihood	9161.0			9160.9			9157.9		

*p<.05, **p<.01, ***p<.001

College climate measures. A final subset of analysis was used to model the effects of college climate variables, using the same approach as detailed previously for the CCHGLM analyses. A final sample of 1,650 students, from 480 high schools and 380 colleges, was used to predict whether climate measures impact students' time to degree. The addition of the three climate measures helped to explain additional level-2 variance, reducing both the high school and college variance components. Additionally, their addition coincided with the effect of number of colleges attended becoming non-significant. Thus, students who attend multiple institutions may

have shorter times to degree if their reasons for transfer or concurrent enrollment are not related to experiencing negative climate. The climate measures themselves, however, did not yield any significant effects. Model results are available in Appendix D4.

Summary of Findings

In addition to two general research questions and their subsidiary questions, this study was framed by several hypotheses with respect to college enrollment and completion. Hence, the following section summarizes the results of descriptive and multilevel modeling analyses presented throughout this chapter, but as they pertain to hypothesized findings originally presented in Chapter 3.

College Enrollment: Patterns and Predictors

As predicted, AAPI and white students tend to demonstrate the greatest academic expectations, and highest rates of enrollment at four-year institutions. Moreover, they matriculate at generally more academically competitive colleges and universities than their URM peers. Similarly, students' postsecondary outcomes tend to correspond with their socioeconomic status, with higher SES students enrolling at four-year and more selective institutions at higher rates. However, these patterns are explainable, in part, by factors including significant others (i.e., family and peers) and academic experiences, which likely shape the academic aspirations and performance that then determine if and where students go to college. Additionally, high school characteristics related to structure and student composition play a role in students' postsecondary outcomes. It is prudent to bear in mind though, that when compared by race and SES, students are not distributed equally across high schools, particularly with regard to their quality.

With regard to key student predictors, race and SES both matter, even after accounting for several student and school-level variables, and they do so independently of each other. However,

the relationships between these characteristics and college enrollment are rather nuanced. SES and race are related both within the student-level, and between the student and school-levels, with URM students tending to be lower in SES, and attending racially diverse but lower SES schools. Thus, as suggested by their positive final coefficient estimates, being black or AIAN does not necessarily predict lower likelihood of attending a four-year school. Rather, if black and AIAN students within this sample had the same life experiences and educational opportunities as their average white peers, they would be relatively more likely to enroll in four-year colleges and universities.

School context—here, measured by high school graduates' college enrollment rates, racial diversity, and socioeconomic composition of peers—also matters, and does so across the board. High schools' diversity and proportion of low SES students have the same negative predictive effect on four-year college enrollment for students regardless of their own demographic characteristics. Similarly, attending a high school with academically low performing peers reduces a student's likelihood of attending a four-year college regardless of his/her own academic performance, as measured by either standardized test scores or grades. Therefore, after controlling for other experiences and school contexts, numerical minority status with regard to academics, race, and SES does not significantly impact students' likelihood of enrollment. Tests of alternative measures of racial composition, and their corresponding interaction terms, further support this non-effect.

College Completion: Patterns and Predictors

On the whole, students demonstrate relatively little change in context between high school and college. The largest proportions of students transition from low to low, from medium to medium, and from high to high diversity and socioeconomic contexts. However, what has been

termed here “zero change” does not necessarily mean that students’ colleges look like their high schools. Considering that four-year college-going rates are disproportionately reflected across student race and SES groups (with URM and low SES students more likely to fall out of samples taken from further along the education pipeline) and that high school and postsecondary contexts are measured by different indicators, these transition patterns serve merely as rough estimates. Moreover, after accounting for who students are, what they do, and key characteristics of both the high schools and colleges they attend, the effects of these transition patterns are rendered non-significant.

True to prediction, considerably more variation in students’ likelihood of degree attainment is due to differences across colleges rather than differences across high schools. Furthermore, some high school-level predictors share explanatory power with college composition measures. Yet, while colleges may appear to explain more of students’ college success, it is important to remember that these samples consist of students who have already made it to a four-year institution, and that their being there owes at least in part to their high school experiences and environment.

Contrary to prediction, when controlling for student and high school-level predictors, college peer composition—including peer academic performance—does not impact students’ likelihood of graduating within six years. However, among those students who eventually do complete their degrees, fellow undergraduates’ degree-seeking status and both gender and socioeconomic status of peers can shape degree timeframes. Additionally, an institution’s proportion of black students and whether or not that institution is an HBCU, on average, bear effects across all students regardless of their own race. Thus, while numerical minority status does not measurably support this study’s hypotheses, peer composition—including specific measures

of racial composition—does matter. Whether compositional effects are actually peer effects or reflections of institutional structures and supports, however, remains unclear. Finally, with regard to campus climate, proposed as an influential factor in students' experience of their peer composition, aggregate measures of diversity-oriented goals and beliefs, and anticipated likelihood of interactions across race do not measurably explain students' degree attainment when accounting for key structural and compositional measures of students' college environment.

CHAPTER 5: DISCUSSION AND CONCLUSION

The following chapter presents a brief overview of this study's objectives, a summary of the theoretical and empirical frameworks used to guide the study, and a review of the research design and analyses employed. Findings from the study are then discussed in response to the study's research questions. Implications for practice and policy are then presented based on key findings and in relation to extant literature. Finally, the chapter presents a review of the study's limitations as well as suggested directions for future research.

Overview of the Study

In recent years, several prominent organizations—including The White House—have issued education initiatives that have since pointed the national spotlight on increasing college enrollment. Additionally, scholarship (Turner, 2004) has highlighted the need to pair understandings of postsecondary access with success in the form of degree completion. Yet these goals cannot be met without specific attention to lower socioeconomic status and racial minority students, who are less likely to attend four-year institutions, less likely to attend selective institutions, and less likely to complete college degrees than their higher SES and white or Asian peers. Similar to overall degree completion rates, class and race-based gaps in postsecondary education attainment have remained relatively stagnant for several decades. Furthermore, these outcome disparities persist in spite of students now demonstrating similar college aspirations across SES and race.

This study attempted to address race and class-related disparities in postsecondary enrollment and graduation. In so doing, it builds on previous research demonstrating the effects of individual-level factors such as race, class, and academic experiences (Bowen et al., 2009; Chen, 2005), and high school or college characteristics such as average test scores or selectivity (Titus,

2004), on postsecondary outcomes. Peer contexts—namely, students' college-going rates or average standardized test scores, and school socioeconomic and racial composition—were also considered per findings from previous studies (Goldsmith, 2011; Palardy, 2003). Unlike previous research, however, this study sought to determine the relationships between student and school-level variables and college outcomes as well as among each other. These multilevel and cross-level relationships were framed by social psychological theory and analyzed through the use of hierarchical modeling techniques and comprehensive data from multiple sources. Thus, this study contributes to the literature in its use of advanced statistical methods and data that are relatively new to the field and intended to consider the wide range of factors that realistically contribute to student outcomes. Furthermore, by considering both high school and college environments and students' transitions between these environments, this study serves to bridge often disconnected veins of research and contextualize analyses within the larger K-16 education pipeline.

In light of extant literature identifying disparities in postsecondary outcomes based on student demographics, and the need to consider students' individual-level factors within the context of their institutions, this study examined the effects of high school contexts (i.e., peer academic performance, racial diversity, and socioeconomic composition) on students' likelihood of matriculation at four-year colleges and universities, and whether any such effects moderate the effects of student-level demographic characteristics. Additionally, this study sought to describe students' transitions between high school and college with respect to institutional contexts and identify the effects of both high school and college contexts on students' chances of completing a bachelor's degree within six years.

Theoretical and Empirical Frameworks

Davis's (1966) metaphor of the campus as a frog pond—an application of relative deprivation theory—and stereotype threat theory (Steele & Aronson, 1995) both describe the effects of social context on individual-level outcomes, and suggest that students consciously and unconsciously consider peers as frames of reference. Frog pond studies, in particular, have investigated the relationship between peer ability, or *perceived* ability, and academic performance and self-concept: for either outcome, K-12 and higher education research have shown negative correlations with perceived peer ability or academic competitiveness. Stereotype threat theory further suggests that non-academic measures of peer environments can influence academic outcomes. Several of this study's hypotheses were based on prior research documenting race, class, and gender-based effects attributed to stereotype threat, whereby underrepresented racial minority, low-income, and female students performed worse in academic domains after the introduction of an identity prime or threat. Finally, Jones and McEwen's (2000) Model of Multiple Dimensions of Identity provides an understanding of the fluidity of identity and identity salience. The model further contributed to this study's focus on context and its rationale in examining students' experiences as they transition between different contexts—namely, from their high schools to colleges.

This study's empirical model was based on Nora's (2003) student-level engagement model and Berger and Milem's (2000) model of college-level effects. Nora's model of student/institution engagement is particularly useful to this study in that it considers factors that may be especially salient for racial minority and non-traditional postsecondary students, including perceptions of the social environment and influences of significant others. Berger and Milem's College Impact Model lent institution-level factors to this study's conceptual framework,

suggesting that organizational characteristics and peer climates influence students' postsecondary experiences.

Findings

Outcome 1: Four-Year College Enrollment

This study used descriptive analyses and hierarchical generalized linear modeling to determine predictors of enrollment at four-year colleges. Results from descriptive analyses showed that overall, AAPI, white, and multiracial students demonstrate the highest rates of four-year college application, enrollment, and completion. Similarly, high SES students consistently applied to, matriculated at, and graduated from four-year institutions at higher rates than their middle and low SES peers. The same race and SES trends were also observed with regard to institutional selectivity. Moreover, ANOVA results confirmed that race and SES are correlated at the student-level such that URM students also tend to be lower SES students. Based on these results and extant literature (e.g., Aud, Fox, & KewalRamani, 2010; Baum & Ma, 2007; Massey et al., 2002), it was expected that race—specifically being black, Latino, or AIAN—and lower socioeconomic status would negatively predict both college enrollment and completion.

Descriptive analyses were also conducted to determine whether the types of high schools students attended varied based on student-level race and SES. ANOVA results confirmed that white students tend to attend high schools with the least racial diversity and lowest proportions of low-SES students—the latter characteristic serving as a proxy for academic quality in previous research (e.g., Niu & Tienda, 2013). AIAN students, on the other hand, tend to attend high schools with relatively high proportions of students who participate in free lunch programs. School-level academic performance, or quality, was also explicitly compared by student-level race and SES, and was measured by the proportion of high schools' graduates who go on to four-

year colleges. In general, AIAN students tend to attend the lowest performing high schools, whereas white and multiracial students tend to attend the highest performing schools. All other racial groups (i.e., AAPI, black, Latino) demonstrate similar patterns of distribution with respect to school quality. SES-based trends were much clearer than those for race, with SES demonstrating a consistent, positive relationship with high school quality. The results from this subset of descriptive analysis thus suggested that white and high-SES students would have the highest likelihoods of enrolling at a four-year college, in part because they tend to attend high schools that send their graduates to such institutions.

HGLM analyses were conducted using a sample of approximately 8,050 students at 650 high schools. Independent variables were added to the model in blocks, in line with Nora's (2003) model of student persistence: demographics, parental influences, perceptions of and social experiences within the school environment, sociocognitive factors, friends' influences, college choice behaviors, and academic indicators. Among these variables, race (i.e., being AIAN or black) and SES were significant predictors of college enrollment, even after the addition of all level-1 and level-2 variables. The final positive association between being either AIAN or black and college enrollment speaks perhaps to differences in educational opportunities and experiences between AIAN or black, and white students. In other words, the relatively low college-going rates of AIAN and black students, as compared to white students, may be attributable to the fact that their high schools tend to be lower performing and under-resourced, as demonstrated by this and previous studies (e.g., Adelman, 2006; The College Board, 2008). SES's positive association with college enrollment, even after controlling for academic performance, supports others' (Hoxby & Avery, 2012) findings that even high-achieving low-income students tend to apply to more selective college at much lower rates than higher income peers.

School-level measures, based on Berger and Milem's (2000) model were also considered and included structural features, staff characteristics, learning and social climate, and peer composition. Controlling for student-level characteristics and experiences, including grades and standardized test scores, high school quality positively predicts the average student's likelihood of enrolling at a four-year postsecondary institution. While this finding makes sense in the context of previous research connecting school quality and student achievement (e.g., Black et al., 2015; The College Board, 2008) and on the effects of college-going culture (McDonough, 2005), it counters this study's hypothesis based on frog pond studies (e.g., Espenshade et al., 2005) that low-performing peers would enable high-performing individual students to stand out in admissions processes and thus increase their chances of enrolling at a four-year college. Hence, it underscores the general importance of high school quality since a student at a high-performing high school is more likely to enroll at a four-year college than his or her equally academically able counterpart at a low-performing high school. Whether this difference might be explained by students' college choice processes as opposed to colleges' admissions processes, though, is not clear. This study's finding regarding school locale—that urbanicity is positively associated with college enrollment—is consistent with recent reports based on National Student Clearinghouse (2014) data, which provide some evidence of differences in four-year college enrollment rates between rural and urban high schools, particularly among higher income schools. However, the effect of school urbanicity is also somewhat surprising in light of NCES (2013) findings that high school students in rural districts demonstrate higher graduation rates than their counterparts in cities or in towns. Together, these findings suggest that students in rural schools may require more support in translating their high school success to college outcomes, compared to their peers in urban and suburban districts.

Schools' proportion of high school students among all enrolled students, and—consistent with previous research (Goldsmith, 2011; Palardy, 2013)—proportion of students participating in free lunch, and racial diversity index all negatively predict enrollment. Alternative racial composition measures were also modeled, but did not yield any significant predictors. Thus, in response to Research Question 1, peer context predicts matriculation at a four-year institution: higher academic performance and aggregate socioeconomic status are positive predictors, and racial diversity is a negative predictor. The finding that high school socioeconomic and racial composition both affect students' college enrollment supports previous studies that point to the role of neighborhood and school segregation in limiting the availability of academic resources and supports for students (Charles et al., 2009; McDonough, 1997). Cross-level interaction terms were then added to the final HGLM model to test for moderating effects of the three context measures. Separate models were run to test hypotheses based on relative deprivation and stereotype threat theories, to determine whether school quality—considered the peer academic context—moderates the effect of individual GPA or standardized test scores, whether the proportion of low-income peers moderates the effect of individual SES, and whether school diversity moderates the effects associated with being an AAPI, AIAN, black, Latino, or multiracial student, as compared to being a white student. None of these interaction terms yielded significant effects. Thus, in response to Research Question 1a, the effects of peer academic, socioeconomic, or racial diversity contexts do not differ for students based on their own race or SES.

Considering that—contrary to theory—the negative effects of low-SES and racially diverse peers are consistent for students regardless of their own SES or race, these findings perhaps suggest tension between psychosocial and structural influences. Since multilevel analyses accounted for student-level academic performance among a wide range of individual factors,

stereotype threat theory would suggest that the presence of peers with shared characteristics could improve low-SES and racial minority students' outcomes so that they resemble their higher-SES and white peers' within the academic domain. However, in the case of four-year college enrollment, this study found the opposite effect. Assuming that demographic characteristics are a correlate, and not the cause, of student and school quality, these school-level main effects of SES and race may then demonstrate the power of structural forces such that high schools can influence college access beyond individual ability, aptitude, or psychology. Hence, with respect to college access, this study's significance may be particularly salient for school-level implications.

Outcome 2: Bachelor's Degree Completion

Descriptive analyses and multiple hierarchical modeling techniques were used to identify students' transition patterns between high school and college and to determine predictors of students' likelihood of degree completion within six years of beginning postsecondary education. Transition patterns, and their corresponding numeric scores, were determined for students based on their direction and degree of "pond hopping" from their high schools to colleges with respect to their academic, socioeconomic and diversity contexts. The descriptive analyses for this research question were exploratory in nature, examining the prevalence of these transition scores among all students, and the degree completion rates associated with transition patterns across the three different school contexts. In response to Research Question 2a, students generally demonstrate little change in context, with the most prevalent transition scores reflecting zero change in aggregate socioeconomic status and diversity from high school to college. Among academic transition patterns, students are slightly more likely to demonstrate moderate (scores of 1 or -1), rather than zero change. Degree attainment rates demonstrated a consistent positive association with diversity transition scores, and slightly less consistent but positive association

with socioeconomic transition scores. Thus, students who attend colleges with peers who are more affluent or diverse, relative to their high school peers, tend to complete their degrees at higher rates. The overall relationship between degree attainment and academic transition was not definitive. However, findings pointed to a general benefit of attending higher performing high schools as well as to a lack of detrimental effect of institutional mismatch, as suggested by fairly high degree completion rates among students who matriculated at more competitive college relative to their high school.

High school to college transition patterns were then disaggregated by student race and socioeconomic status. Latino, multiracial, and white students generally exhibit similar patterns, and little change, in their diversity, socioeconomic, and academic contexts. AIAN, AAPI, and black students, however, demonstrate larger differences between high school and college. Most notably, AIAN and black students most commonly experience downward academic transition, while AAPI students more often experience upward academic transition. This finding is in line with others' (McDonough et al., 1998) that among racial minority students, AAPI's generally tend to enroll in more selective institutions. Disaggregated by student-level SES, all students generally demonstrate upward and downward transition at low rates, relative to no change. For high SES students in particular, the small proportions of students who go on to relatively less diverse, more wealthy, or academically higher performing colleges relative to their high school is in part reflective of the fact that these students start off at the least diverse, wealthiest, and highest performing high schools.

Guided by the results of parallel multilevel models predicting college enrollment and degree completion, as well as preliminary logistic and multilevel regression models specific to degree completion, cross-classified models were built to predict the likelihood of degree

completion within six years, among students whose first postsecondary institution was a four-year college or university. The final sample used for cross-classified hierarchical generalized linear modeling (CCHGLM) analysis consisted of approximately 3,080 students representing 540 high schools and 590 (first-attended) colleges.

Based on the full level-1 model, and in comparison to a separate model that considered only demographics at the student-level, none of the three types of transition patterns was significant. Thus, without controlling for high school and college characteristics, the effects of pond-hopping for all three measured contexts appear to be mitigated by major life events as well as by academic and co-curricular experiences. Interaction terms for each of the transition patterns were tested for moderating effects on students' academic performance, SES, and race. Among these level-1 interaction terms, only AAPI*Diversity transition was significant. However, the lack of significance for either constituent main effect indicates an overall lack of effect for either AAPI status or diversity transition. Thus, in response to Research Question 2b and contrary to several hypotheses guided by relative deprivation and stereotype threat theory, students' transition patterns from their high schools' academic, socioeconomic, and diversity contexts to college do not significantly predict degree attainment; nor do these patterns moderate student-level effects of race or SES. However, the relationship between academic transition and students' grades suggests that high academic achievement, even when demonstrated at a low performing high school, can help students adjust to and persist at a competitive college. In the context of relative deprivation theory, this finding may then highlight the malleability of academic outcomes through explicit academic preparation in spite of even implicit psychological environments.

The CCHGLM analysis also accounted for a reduced set of high school characteristics including structural, staffing, and peer composition measures. College-level measures then

accounted for structural characteristics (e.g., control, type, cost) and key composition measures with regard to undergraduate students' gender, financial aid, and racial diversity. After controlling for all student-level characteristics and experiences, only one high school-level predictor was significant. The number of high school guidance counselors positively predicts college degree completion above and beyond student-level factors, with each additional counselor corresponding with an average 1.0 percentage point increased likelihood of degree attainment. While college-level predictors account for substantial level-2 variance, only the average loan amount significantly—and positively—predicted degree completion beyond student and high school-level variables. However, there is no significant interaction effect between colleges' average loan amount and students' SES.

A subset of analyses, controlling for only student and college-level variables, compared the effects of alternative racial diversity measures. Compared to a model with no college diversity measure, only the proportion of white undergraduate students added significantly in terms of both effect and overall model fit. Furthermore, the effect associated with above-average proportions of white students is negative, and consistent for all students regardless of their own race. Considering that this relationship is significant even after controlling for both student- and college-level academic performance and wealth, this effect of diversity—or rather, lack thereof—may support previous research connecting racial composition to perceived campus support (Pike & Kuh, 2006) and student learning (Terenzini et al., 2001), factors that were not measured in this study but that might encourage student persistence. Another subset of analysis, using a reduced sample of 2,090 students from 500 high schools and 390 colleges, additionally considered college climate measures. These three variables were chosen in line with Berger and Milem's (2003) block of psychological peer group characteristics, and reflected institutional averages of students'

beliefs with regard to diversity. However, none of these variables significantly entered their respective model; nor did they explain any additional level-2 variance when compared to their base model. These findings may suggest that any effects associated with these particular climate variables share explanatory power with measures of college structure and composition (Chang et al., 2004; Umbach & Kuh, 2006).

In response to Research Question 2, few high school or college-level variables significantly predict degree completion beyond student-level effects. Furthermore, these variables do not include the posited academic, socioeconomic, and diversity context measures. In response to Research Question 2c, the non-significant effects of the three key context measures suggest that there are neither main, nor moderating effects associated with postsecondary institutions' average SAT score, proportion of federal grant recipients, or racial diversity. Furthermore, the statistically significant effect of institutions' average student loan amount did not yield a significant moderating effect on student-level SES. Thus, this study's key postsecondary peer contexts demonstrate the same effect (or lack of effect) on students' likelihood of completing college regardless of their own academic performance, SES, or race. Similar to the case of college enrollment, findings in response to this research question may therefore suggest implications that are particularly relevant for institutions.

Time to degree. An additional set of analyses used cross-classified hierarchical linear modeling (CCHLM) to examine time to degree for students who started their postsecondary education at a four-year school and earned their bachelor's degrees by the end of data collection for ELS:2002/2012. Controlling for all other level-1 predictors, students' transitions from lower SES high schools to more affluent postsecondary institutions predict longer time to degree. In other words, students who attended a relatively low-SES high school but then enroll at a relatively

high-SES college tend to take longer to obtain their bachelor's degree. However, in response to Research Question 2b, the student-level interaction term, SES*SES transition was not significant. Thus, the sole significant main effect of transition—between the socioeconomic context of high school and college—does not moderate the (non-significant) effect of students' SES.

After controlling for student and high school-level effects, three college-level variables demonstrated significant effects: institutions' proportion of first-time full-time degree seeking students relative to all undergraduates, their proportion of women, and proportion of students with loans all predict quicker bachelor's degree completion for their students. A comparison of racial composition measures additionally showed that institutions' proportion of black students is negatively associated with time to degree. However, in response to Research Question 2, these significant postsecondary institutional characteristics do not include the variables posited as key context measures. Thus, there is no measured effect of college academic, racial diversity, or socioeconomic context. Correspondingly, in response to Research Question 2c, postsecondary context does not moderate the (non-significant) effects of race or SES.

Implications for K–12 Policy and Practice

In examining predictors of college enrollment, race emerged as a significant variable. However, the effects associated with race were often explained by correlated variables in intermediate models. For example, when controlling for only student demographic characteristics, being a Latino or black student is negatively associated with enrollment at a four-year college. However, the negative effect of being black can be attributed instead to SES. Moreover, it was determined that if Latino and black students demonstrated the same academic performance as their white peers, they would actually be as likely and more likely, respectively, to enroll at a four-year college. These findings suggest that while race matters, students' URM status should

not be taken for granted as a sentence for negative educational outcomes. Rather, K-12 policy and high school administrators should seek to integrate supports that can boost academic performance for all, but particularly for black and Latino, students. Thus, in addition to exposure to college options and admissions requirements (e.g., ACT/SAT scores, personal statement), encouragement of college readiness should emphasize academic preparation throughout all of high school—or as some (Carnevale & Desrochers, 2003) might argue, as early as in preschool—in order to improve students' cumulative GPA and participation in advanced level coursework. Moreover, school practices geared toward academic preparation (e.g., tutoring, extending school days) should be implemented within the context of a school-wide culture of high expectations (Fryer, 2014).

Given the pervasive positive effect of socioeconomic status as well as the risk of sticker shock that can deter low-income but otherwise qualified students from even considering competitive four-year institutions, practitioners should make concerted efforts to inform their students about financial resources that can help to offset the cost of college. Moreover, considering that lower income students tend to have additional responsibilities outside of school, such as childcare or work (see Dodson, Albelda, Coronado, & Mtshali, 2012), high school administrators and teachers should consider providing financial aid information during school time, perhaps in the context of generally building students' financial literacy. As one example of resources available to educators, the National Endowment for Financial Education (n.d.) offers curricular modules designed to engage students in planning both their general and college-specific finances. High schools' use of this or similarly themed curriculum during homeroom or a college preparatory period can expand students' access to money management skills beyond what might otherwise be limited to business-themed electives. Ideally, college preparation—including financial aid awareness—would be integrated in informal classroom conversations at every grade

level, while scholarship essays might be formally assigned in class or for homework. Alternatively, college financial aid information might come in the form of scholarship search and FAFSA workshops during lunch. By providing food, these workshops could attract more students overall. More importantly, for low-SES students, who are more likely to participate in free lunch programs, providing lunch would mean that these students do not have to choose between waiting in line for their meal and attending a separate workshop within the short lunch break (NPR, Robert Wood Johnson Foundation, & Harvard School of Public Health, 2013; School Nutrition Association, 2014).

Parents/guardians are also significant influences on students' likelihood of matriculating at a four-year college. Based on comparisons of intermediate models, parental support and academic expectations of their children likely manifest in students' academic performance and course-taking patterns, which can translate to their own aspirations to and acceptance at a four-year institution. Previous research has shown that many racial minority, low-income, and non-college educated families defer to counselors and teachers to provide advice regarding academic decisions (Lareau, 2015), including course selection. Yet studies have also found that high school educators can function as gatekeepers to college preparation and awareness and that their perceptions of students' abilities and potential are shaped by embedded (mis)beliefs about race and class (see George & Aronson, 2002). Thus, it is important that parents be empowered to support and advocate for their students, especially during the high school years, when courses and grades affect students' chances of college acceptance.

High schools (as well as elementary and middle schools) might encourage this engagement by reaching out to parents and communicating their importance in their students' education, as well as the availability of academic resources in the case that parents cannot provide

certain kinds of support (e.g., homework help). Moreover, school staff should be mindful of the ways in which their actions and behaviors might privilege white, middle class norms and consequently marginalize parents who care about their children's education but may not demonstrate certain forms of parent involvement (Auerbach, 2007; Lareau & Horvat, 1999). Considering the effect of SES on both college enrollment and completion, high school administrators should also implement early and regular communication about financing college, as well as the long-term benefits of a bachelor's degree in spite of the more immediate costs that might deter families from considering a four-year institution (Baum & Ma, 2007). This information might be presented in multilingual newsletters and phone calls, as well as in regularly scheduled workshops planned in conjunction with college access programs or with local college outreach offices.

Several high school characteristics predict students' college outcomes even after accounting for student characteristics and experiences. The number of full-time guidance counselors, for example, is positively associated with degree completion. Previous research has demonstrated the influence of counselors in students' college choice processes (see McDonough, 2005; Stephan & Rosenbaum, 2013), and it is interesting to see here that those effects might extend beyond college application or enrollment. Thus, there is perhaps something to be said for the role of guidance counselors in helping students to select a college at which they "fit" and can succeed. That the effect of guidance counselors might be mediated by college diversity climate further supports this possibility. That is, high school counselors may play a role in their students' degree completion by directing them towards colleges with positive diversity climates, which might then translate to better adjustment and likelihood of persistence. Yet it is unclear from this study whether the positive effect of counselors is uniquely attributable to the services they

provide, or perhaps rather to a high school's general investment in student services. The latter case, though, also suggests a model of student-centeredness that can help students reap benefits beyond the high school setting.

High schools located near a city center or with grade levels in addition to 9th through 12th grades tend to have higher likelihoods of their students enrolling at a four-year college. Regarding school urbanicity, while there is realistically little that can be done about where students attend high school, K-12 policymakers and administrators should investigate if and how resources differ between urban and rural high schools. Furthermore, if students' college aspirations are indeed shaped by their proximity to four-year institutions, K-12 districts should consider allocating funds to create opportunities for their students to visit area colleges. To that end, it should be noted that campus tours have been identified as a factor in prospective students' determination of psychosocial fit with an institution, which then contributes to students' persistence in college (Nora, 2004). In facilitating these campus visits, colleges should consider expanding their outreach efforts to partner with schools that might not ordinarily be considered local, but whose students might not otherwise have exposure to postsecondary options.

Finally, students who attend multilevel schools for their 9th through 12th grades are more likely to enroll at a four-year college, regardless of the control of the school or quality of its teachers. This effect may be due to students' early exposure to older, college-going peers and relatedly, a college-going culture. Thus, if possible, parents and guardians might consider sending their students to multilevel schools, or those with alternative grade configurations, in order to reap similar benefits. Moreover, while this study looked specifically at students' transitions from secondary to postsecondary education environments, others have examined transitions between elementary and secondary schools with various grade configurations. Such K-12 studies have

determined that students who remain in the same setting from elementary through junior or senior high school grades demonstrate better academic outcomes such as standardized test scores (Franklin & Glasscock, 1998; Wihry, Coladarci, & Meadow, 1992) and social and psychological outcomes such as self-image, self-esteem (Simmons & Blyth, 1987; Weiss & Kipnes, 2006) and perceived school violence (Weiss & Bearman, 2007), as well as higher rates of participation in extracurricular activities (Simmons & Blyth, 1987). Many alternatively configured schools are available within the private sector; more than one third of students in private K-12 education attend combined elementary/secondary schools (NCES, n.d. d). However, in light of the growing school choice movement (Grady & Bielick, 2010), families who cannot afford private school might best access a combined elementary/secondary education through charter schools, of which 18.2 percent have alternative grade configurations, compared to 4.2 percent of traditional public schools (NCES, 2014). School and district administrators who are constrained to traditional grade configurations might apply this finding by encouraging college aspirations well before the high school years, an increasingly prevalent approach among middle and even elementary schools (for program examples see Adams, 2010; for specific district recommendations for elementary school activities see LAUSD, 2006).

Implications for Postsecondary Policy and Practice

After controlling for other variables, student-level race did not significantly predict either students' likelihood of degree attainment within six years or their time to degree. However, socioeconomic status was positively associated with degree completion, whereas job earnings, which may reflect students' need for additional income in order to afford college, demonstrated a negative relationship. On the one hand, these findings might support class, rather than race-based, admissions considerations; but, on the other hand, this study demonstrated the inextricable ties

between race and class. Moreover, "the correlation between race and family income…is not strong enough to permit the latter to function as a useful proxy for race in the pursuit of diversity" (Krueger, Rothstein, & Turner, 2006, p. 13). Thus, rather than college admissions implications, these student-level effects may suggest implications for financial aid. While not examined directly, financial aid packages that include sufficient grant and loan support could allow students to work less and spend more time engaging in academic endeavors or, as shown in this study, co-curricular activities that increase their likelihood of degree completion. Current research (Allen & Wolniak, 2015) also suggests that higher college costs are associated with lower racial diversity, a relationship that administrators should consider in setting their tuition and aid packages, and that policy makers should consider in outlining financial aid reform.

On the state and federal policy level, these findings translate to the need for overall better alignment between financial aid awards (e.g., grants, low interest loans, and relatively high wage work-study) and the cost of college, which might be especially helpful in increasing Latino and black students' college attendance (Santiago, 2007) and completion rates. Considering that the cost of college increased at twice the rate of inflation between 2000 and 2005 alone (DesJardins, Ahlburg, & McCall, 2006), this study's sample may be particularly illustrative of the effects of socioeconomic status. That is, financial factors may be particularly salient for this cohort's outcomes as a result of the relative unaffordability of college during the years that these students considered and attended college. Furthermore, given the myriad benefits associated with a four-year degree, it is especially concerning that even recent reports show that the average Pell Grant award does not sufficiently cover the average costs associated with a year of study at even the community college level (The College Board, 2013a).

While student-level race did not demonstrate effects on either postsecondary outcome, racial composition did: colleges' proportion of white students tends to negatively predict degree completion. Together, these student and institution-level findings suggest the benefits of considering student demographics in the context of crafting a class. In other words, rather than supporting the use of individual characteristics to predict students' strengths or challenges in college, this study's findings vis-à-vis race suggest the utility of considering student characteristics in the aggregate to encourage positive outcomes for all students. As discussed, the effect of undergraduate racial composition might also be reflective of an underlying institutional focus on racial diversity. That is, colleges that strive to enroll a racially diverse student body may be more likely to develop the campus practices and climate that encourage positive outcomes for that body. In line with previous research (Hurtado, 2005), such persistence-promoting practices might include offering diversity curriculum through either a separate (and perhaps required) course or integration in existing courses.

Several college experiences influence students' likelihood of attaining their bachelor's degree within six years. For example, confirming extant literature (Adelman, 2006), enrolling full-time and remaining at the same institution (i.e., not transferring or concurrently enrolling at another college) both increase degree completion rates. Interestingly, preliminary analysis showed that taking time off before beginning college does not significantly impact likelihood of degree completion. This non-significance runs counter to the negative effect that might be expected based on Adelman's (2006) findings about delaying college entry. Considering this lack of effect as well as the negative effects of life stresses and job earnings (as measured during a year when most of the sample was already enrolled in college), students who have already been accepted at, or who otherwise plan to attend, a four-year college might be encouraged to consider gap years as

an opportunity to attend to personal development or family obligations, or to save money for college. Colleges can support this time off by honoring their admissions and financial aid offers beyond the year in which they were decided, and by remaining in contact with students during their gap year(s) so as to keep them abreast of important information and convey a sense of welcome or community. Several elite institutions, including Harvard College (2015), already "encourage admitted students to defer enrollment for one year to travel, pursue a special project or activity, work, or spend time in another meaningful way," with some colleges offering their own gap year programming for credit and/or with funding opportunities (Loftus, 2014; Snider, 2014). State schools and less selective private institutions should consider following suit with their admitted students, who represent a much larger proportion of the college-bound population. Additionally, regular communication with students who choose to defer, specifically via social media, may simplify both colleges' access to a large body of students and students' access to college information, and promote entering students' self-efficacy and perceptions of support (DeAndrea, Ellison, LaRose, Steinfield, & Fiore, 2012).

Additional positive college experiences include participating in "high impact educational activities" (e.g., internship, study-abroad, or mentoring), and meeting with an advisor about academic plans. These effects perhaps lend support to existing general persistence models, which posit that academic and social engagement, "involvement," or "integration" promote student persistence (Astin, 1999; Tinto, 1994). Considered in conjunction with the negative effect of independent job earnings and the positive effect of time spent in high school extracurricular activities, the effect of participating in high impact educational activities may also reflect students' ability to balance their academic, co-curricular, and personal responsibilities. This finding then supports previous research demonstrating that students might benefit from better

time management skills, particularly as they transition to their first year of college (Hurtado, Carter, & Spuler, 1996). Practitioners might thus consider developing such skills through workshops and bridge programming for entering students. Alternatively, in order to support students with responsibilities that cannot be rescheduled or delegated (e.g., affordable family care), institutions might consider alternative class schedules or online courses for general education requirements that could otherwise hold busy students back from advancing in their degree programs.

As mentioned, attending multiple institutions reduces students' likelihood of graduating in six years. However, subsidiary analysis suggests that the negative effects of transfer or concurrent enrollment vis-à-vis degree completion can be mitigated by a positive diversity climate. Thus, in counseling their students, practitioners should consider whether they are planning to attend another institution for the "right" reasons, as opposed to feeling like they are being pushed out by negative climate. For example, completing credits at a nearby comprehensive or community college can help students who cannot find certain courses to fit their schedules, and can likely do so at a cost savings. Furthermore, administrators might consider these findings as further evidence of the benefits of positive campus diversity climate, the effects of which can impact students' degree completion even after they transfer to a different institution. In so doing, they might also be encouraged to reconceptualize educational outcomes as broader than graduation from a specific institution, and expand college-going models beyond the currently inadequate paradigm of uninterrupted single-institution attendance (McCormick, 2003).

Multilevel models showed that standardized test scores and high school academic quality do not predict degree completion any more than high school GPA does. These findings are interesting in light of the prevailing notion that SAT scores offer a valid and objective measure of

academic performance or ability, and reliably predict several postsecondary outcomes (Mattern & Patterson, 2014). Moreover, admissions test scores might be construed as more objective than high school grades based on the argument that student grades can be assigned rather arbitrarily or scaled varyingly across schools, or that high grades merely reflect strong performance relative to poorly performing peers. However, descriptive analysis suggested that students who graduate from low performing high schools and matriculate at relatively competitive colleges fare no worse—and perhaps even better—in terms of graduation rates than their peers who enroll at arguably better fitting, non-competitive institutions. Thus, this study's findings call into question admissions offices' reliance on standardized test scores as a metric of ability which, in addition to not predicting college completion, may unfairly penalize low income or racial minority students as a result of cultural and statistical bias (Freedle, 2003). That is, the common use of standardized test scores is both unsupported and likely perpetuates inequitable education opportunities. Additionally, the general emphasis on standardized tests for college admissions can perpetuate students' flawed assumptions that "acceptable" scores are reflective of their readiness for college level coursework once they matriculate (Deil-Amen & Tevis, 2010). Institutions might thus shift toward holistic admissions reviews, which would consider other academic indicators such as grades, class rank, and course difficulty (in the context of course availability), as well as personal factors such as work experience, family circumstance, and greater emphasis on letters of recommendation. Finally, considering that high school quality does not significantly predict graduation rates, postsecondary institutions should consider increased outreach efforts among high schools that may not have strong academic reputations in order to recruit high performing and likely low-income students who may not otherwise aspire or consider applying to a competitive four-year degree program.

Limitations and Directions for Future Research

In considering the implications of this study it is important to note several limitations, many of which might be addressed by future research. First, the analyses are limited by the availability of certain data, including measures of students' academic experiences and context. Most notably, college transcript data would have provided students' grades and course histories, and allowed for consideration of students' academic performance, a key factor in college persistence (Nora, 2003). Thus, as discussed in Chapter 3, effects that would have been attributed to college academic performance may have instead been associated with correlated predictors. Additionally, transcript data would contextualize students' academic performance by identifying course content and difficulty, as well as the institutions at which these courses were taken. Both extant literature and this study's descriptive analyses point to a substantial proportion of students who attend more than one college in the course of their postsecondary education, including multiple four-year schools (Adelman, 2006; Ruiz Alvarado, 2014). Germane to this study's theoretical framework, institutional identifiers from student transcripts would allow for modeling the socioeconomic, racial diversity, and academic contexts of institutions beyond students' first-attended college. Students who attended more than one or two postsecondary institutions might then also be considered in multilevel analyses predicting degree completion. In addition to this study's frameworks, previous research has demonstrated the utility of accounting for the institution-level effects of multiple colleges by weighting those effects by the duration of a student's enrollment, and thus more accurately estimating level-2 variance (Herrera, 2013). Therefore, as transcript data become available, particularly for the ELS:2002/2012 cohort, future research should consider accounting for students' mobility within postsecondary education in

order to more accurately estimate effects that might be attributable to college academic performance or institutional characteristics.

At the institution-level, data were retrieved from ELSi and IPEDS, national repositories which include basic measures of structure and composition for a comprehensive set of secondary schools and postsecondary institutions. In the absence of appropriate data from ELSi, this study utilized a rough approximation of high school academic quality (the proportion of graduates who enroll at four-year institutions) taken from ELS administrator surveys. However, a better measure would have more directly and finely gauged students' academic performance. Future research might therefore consider incorporating aggregate performance measures such as average standardized test scores, school-wide grades, or Academic Performance Index (API) scores. For college-level data, IPEDS provides several measures of student composition and institution-wide expenditures. However, IPEDS data are limited in that they do not include measures of academic support staff, faculty composition, and availability of curricular (e.g., first-year seminar, linked classes) or co-curricular (e.g., student leadership, diversity workshops) programming. Future research might thus consider an analogous, though likely smaller-scale, study using alternative data sources that can provide more detailed measures of school and college context, and college experiences.

A second general limitation is that of generalizability. In order to control for students' exposure to their high school and college environments, samples were limited to ELS:2002/2012 sophomore cohort members who did not transfer to a different school during high school, and who demonstrated minimal transfer or concurrent enrollment during college. College student samples were reduced yet again for those subsets of analyses involving survey items from CIRP, whose participating institutions tend to be private and traditionally white (Pryor et al., 2007).

Thus, even though samples were weighted—when possible—for their respective multilevel models, they represent students whose educational pathways are decreasingly common among the general student population (Adelman, 2006; McCormick, 2003; Shapiro et al., 2012).

Another general limitation of this study is that it does not consider the broader context of the data, specifically with regard to the financial and political landscape of higher education. This study's sample members generally began their postsecondary education in 2004 and 2005, with smaller proportions entering college each year thereafter through 2012. The majority of these students thus attended college in the years leading up to, and during, the Great Recession, which affected both the demand and affordability of postsecondary education (Long, 2015). Moreover, these effects differed for students based on their age, financial equity, family composition, and location—factors that were not completely represented by the variables used in this study. Additionally, these students attended college in the wake of two Supreme Court decisions, *Grutter v. Bollinger* (2003) and *Gratz v. Bollinger* (2003), that shaped admissions and financial aid policies, and arguably campus climate and enrollment behaviors in response (Zusman, 2005). Considering that institutions' awareness and application of these rulings varied by state or region (Deardorff & Jones, 2007; Zusman, 2005)—neither of which was directly controlled for in this study's analyses—or that resultant campus climate may have varied over time, this study's findings may insufficiently consider the rulings' differential effects. For example, racial diversity may have dropped as campuses began to adopt race-blind admissions policies, resulting in different peer environments between years. However, this study's institution-level measures of racial composition were based on averages across multiple years' worth of IPEDS data, which obfuscates variability from year to year. Similarly, in order to maximize the representation of institutions and students in CIRP data, campus climate measures were also averaged across

multiple years. Hence, this study could not account for changes in campus climate, such as if students tended to view cross-racial interactions as less likely or racial discrimination as less of a problem over time and/or concurrently with changes in campus racial composition.

Finally, with regard to suggestions for future research, this study relied on analyses that were limited by "objective" measures of aggregate student characteristics, experiences, and environments. However, as suggested by several of this study's guiding theoretical frameworks, outcomes are determined by individuals' perceptions of their environments as much as they are by the environments themselves. Thus, for example, a racially diverse campus may be less instructive for determining a student's risk for stereotype threat than that student's perception that the campus is indeed racially diverse. Moreover, this perception might be determined by specific environments, those within the campus, in which students spend their time or by some scale inherent to each individual student. Similarly, institutional characteristics, as measured by supports and services, are perhaps only as informative as students' successful use thereof. For example, this study considered whether students' outcomes might be affected by their availability of guidance counselors and "excellent" high school teachers, or by whether their colleges offered remedial education. However, these resources may only benefit students if they believe them to be accessible and actually use them. Thus for either peer composition or institutional characteristics, the link between objective measures and students' perception thereof may be best explored through qualitative methods, which can more explicitly connect students' beliefs and experiences to their outcomes.

Conclusion

This study sought to identify relationships among students' background characteristics, experiences, and context, and to determine the effects of these factors on college enrollment and

completion. In general, demographic characteristics—namely race and SES—and institutional characteristics were associated with a greater number of significant effects with respect to students' likelihood of matriculating at a four-year college, compared to completing a four-year degree. For college enrollment, in particular, high school academic quality and peer racial and socioeconomic composition demonstrated effects regardless of students' own academic performance, race, or SES. Among students who begin their postsecondary education at a four-year college, peer wealth and racial composition (though operationalized differently than the key measures posited in this study) were shown to influence degree completion rates, while additional peer composition measures predicted students' time to degree. Thus, in sum, context matters, demonstrating effects on multiple college outcomes even after accounting for individual-level factors.

This study also predicted that the effects of school context are conditional upon student characteristics; however, several findings suggest that such may not actually be the case. In some ways this general lack of moderating effects is encouraging, suggesting that changes in policy and practice can yield benefits for students across the board. However, this is not to say that students should be considered in the aggregate. Indeed, doing so would likely only serve to perpetuate the disparities that motivate this research. Thus, a final general implication of this study may be of the importance of policy, practice, and research that move K-12 and postsecondary education toward equity-oriented frames. "If patterns of inequality are invisible, they will not be discussed," much less addressed (Bensimon, 2005, p. 100). Thus, if individual educators and education institutions are to meaningfully engage with an increasingly diverse society, it stands to reason that we must consider the needs specific to different students. Moreover, we must question the structures that determine the differential allocation of educational opportunities by race and socioeconomic

status. This study therefore follows in the tradition of scholarship aimed toward asking these questions, in the hopes of promoting equitable postsecondary—and thus, life—outcomes for all students.

APPENDICES

Appendix A: Variables and Coding Schemes for Multilevel Models

Table A1
Variable Coding Schemes

	RQ1	RQ2	Coding Scheme
Outcomes			
Enrolled at 4-year PSI	X		Dichotomous: 1=Yes, 0=No
Bachelor's degree within 6 years		X	Dichotomous: 1=Yes, 0=No
STUDENT-LEVEL			
Demographics			
Sex: Female	X		Dichotomous: 1=Male, 2=Female
Race: AAPI (Ref.= White)	X		Dichotomous: 1=Yes, 0=No
Race: AIAN	X		Dichotomous: 1=Yes, 0=No
Race: Black	X		Dichotomous: 1=Yes, 0=No
Race: Latino	X		Dichotomous: 1=Yes, 0=No
Race: Multiracial	X		Dichotomous: 1=Yes, 0=No
SES	X		Continuous: -2 to 2
# Parents/Guardians	X		Continuous: 0 to 2
# Parent(s)' dependents	X		Continuous: 0 to 8 or more
Parental Influence			
Parent(s)' aspirations for students' ed.	X		1= Less than HS graduation to 7= Obtain PhD, MD or other advanced degree
Parents expect success in school	X		1=Strongly disagree to 4=Strongly agree
Parents help with homework	X		1= Never to 4= Often
Social Environment			
School Safety factor	X		Continuous factor: -3.07 to 1.28, mean=0.00
Students friendly with other racial groups	X		1=Strongly disagree to 4=Strongly agree
Neg. perc. of teacher-student relationships	X		Continuous factor: -1.83 to 3.35, mean=0.00
HPW: Extracurriculars	X	X	1=None to 8=25 or more hours/week
School is place to meet friends		X	1=Strongly agree to 4=Strongly disagree
Sociocognitive Factors			
Social Agency factor	X	X	Continuous factor: -2.12 to 1.58, mean=0.00
Math Self-Efficacy factor	X	X	Continuous factor: -2.08 to 1.85, mean=0.00
Impt: Good grades	X		1=Not important to 3=Very important
HPW: Homework	X		0=Zero to 26=26 or more hours
Impt: Good education	X		1=Not important to 3=Very important
Impt: Good job	X		1=Not important to 3=Very important
Degree aspirations	X		1=Less than HS graduation to 8=Obtain PhD, MD or other advanced degree
Friends' Influence			
# Friends who consider grades impt.	X		Continuous: 0 to 3
# Friends who plan to attend 4-yr PSI	X		1=None to 5=All
# Friends of different sex	X		Continuous: 0 to 3
# Friends in different grade	X	X	Continuous: 0 to 3
College-Going Behavior			
# SAT prep methods	X		Continuous scale: 0 to 6
Social Capital scale	X		Continuous scale: 0 to 7
External Help scale	X		Continuous scale: 0 to 6

Table A1, continued
Variable Coding Schemes

	RQ1	RQ2	Coding Scheme
Academic Indicators			
Academic GPA	X	X	Continuous: 0 to 4
# AP/IB courses	X		Continuous: 0 to 18
SAT comp. score (in 100s)	X	X	Continuous: 4 to 16
Took SAT (vs. imputed)	X	X	Dichotomous: 1=Yes, 0=No
College & Transition Experiences			
# Life stresses		X	Continuous: 0 to 7
Job earnings (in $1000s)		X	Continuous: 0 to 76
Greatest selectivity of applied PSI		X	1=Selectivity not classified, less than 2yr to 6=Highly selective, 4-yr
Enrolled mostly or all full-time		X	Dichotomous: 1=Yes, 0=No
# High impact ed. activities		X	Continuous scale: 0 to 6
Met advisor re: academic plans		X	1=Never to 3=Often
# PSIs attended		X	Continuous: 0 to 7
SES transition		X	Continuous: -2 to 2
Diversity transition		X	Continuous: -2 to 2
Academic transition		X	Continuous: -2 to 2
SCHOOL-LEVEL			
High School Characteristics			
Control: Private	X	X	Dichotomous: 1=Yes, 0=No
Total enrollment	X		Continuous: 25 to 4,441
% Total enrollment is HS (in tens)	X	X	Continuous: 0 to 10
Urbanicity	X		1=Rural to 3=Urban
Coed	X		Dichotomous: 1=Yes, 0=No
Student/Teacher ratio	X		Continuous: 5 to 57
% FT teachers certified	X	X	Continuous: 0 to 100
# FT guidance counselors	X	X	Continuous: 0 to 16
P/FT teacher ratio	X		Continuous: 0.0 to 1.5
% Excellent teachers	X	X	Continuous: 0 to 100
% LEP/non-English proficient	X	X	Continuous: 0 to 100
% SPED	X	X	Continuous: 0 to 100
Racial climate (How often racial tension among students is a problem at school)	X		2= At least once a week to 5=Never
Academic Climate factor	X		Continuous factor: -3.94 to 1.57, mean of 0.00
% Grads to 4yr PSI (in quartiles)	X	X	0=None to 4=75–100%
% in AP	X		Continuous: 0 to 100
% Free lunch	X	X	Continuous: 0 to 100
Diversity index	X	X	Continuous: 0 to 100
% AAPI, AIAN, Black, Latino, or White	X		Continuous: 0 to 100
PSI Characteristics			
Control: Private		X	Dichotomous: 1=Yes, 0=No
Sector: For-profit		X	Dichotomous: 1=Yes, 0=No
HBCU		X	Dichotomous: 1=Yes, 0=No
FTE		X	Continuous: 347 to 132,825
% FTFT Degree seeking undergrads		X	Continuous: 0 to 100
Tuition & fees (in $1000s)		X	Continuous: 0 to 42,295
Offers remedial services		X	Dichotomous: 1=Yes, 0=No

Table A1, continued
Variable Coding Schemes

	RQ1	RQ2	Coding Scheme
Average SAT score (in 100s)		X	Continuous: 4 to 160
% Undergraduate women		X	Continuous: 0 to 100
Avg fed. grant amount (in $1000s)		X	Continuous: 568 to 18,313
% Fed. grant recipients		X	Continuous: 0 to 100
Avg loan amount (in $1000s)		X	Continuous: 506 to 27,462
% loan recipients		X	Continuous: 0 to 100
Diversity index		X	Continuous: 0 to 100
% AAPI, Black, Latino, or White		X	Continuous: 0 to 100
Social/Pluralistic Goals factor		X	Continuous factor: -2.10 to 1.58 , mean=0.03
Racism not a problem		X	1=Disagree strongly to 4=Agree strongly
Likelihood socialize different race		X	1=Not Important to 4=Essential
EXCLUDED VARIABLES (BASED ON PRELIMINARY ANALYSES)			
English is student's native language			Dichotomous: 1=Yes, 0=No
How safe is neighborhood			1=Very safe to 4= Very unsafe
# Friends of different race			Continuous: 0 to 3
# Postsecondary schools applied to			Continuous: 1 to 18
Whether applied for financial aid			Dichotomous: 1=Yes, 0=No
Offered financial aid usable at more than one school			Dichotomous: 1=Yes, 0=No
Whether 1st PS institution was out-of-state			Dichotomous: 1=Yes, 0=No
# Months between HS exit and PS entry			Continuous: 0 to 87
Residence when first enrolled in PSI: With parents or guardians (Ref.= On-campus)			Dichotomous: 1=Yes, 0=No
Residence when first enrolled in PSI: Other, off-campus			Dichotomous: 1=Yes, 0=No
# Remedial courses to improve reading, writing, or math skills			Continuous: 0 to 3
Talk with faculty about academic matters outside of class			1=Never to 3=Often
Extent to which PSE prepared for life			Continuous factor: -1.11 to 2.50, mean=0.00

Table A2

Factor Loadings and Scale Items

Item	Loading	Coding Scheme
Factors		
Social Agency factor (α=0.733)		
Importance of helping others in community	0.576	1= Not important to 3=Very important
Importance of working to correct inequalities	0.645	1= Not important to 3=Very important
Importance of being an active/informed citizen	0.642	1= Not important to 3=Very important
Importance of supporting environmental causes	0.693	1= Not important to 3=Very important
Math Self-Efficacy factor (α=0.916)		
Can do excellent job on math tests	0.835	1=Almost never to 4=Almost always
Can understand difficult math texts	0.842	1=Almost never to 4=Almost always
Can understand difficult math class	0.833	1=Almost never to 4=Almost always
Can do excellent job on math assignments	0.801	1=Almost never to 4=Almost always
Can master math class skills	0.831	1=Almost never to 4=Almost always
School Safety factor (α=0.690)		
Does not feel safe at this school	0.532	1=Strongly agree to 4= Strongly disagree
There are gangs in school	0.719	1=Strongly agree to 4= Strongly disagree
Racial/ethnic groups often fight	0.716	1=Strongly agree to 4= Strongly disagree
Neg. perception of teacher-student relationships (α=0.698)		
Students get along well with teachers	0.517	1=Strongly agree to 4= Strongly disagree
The teaching is good	0.725	1=Strongly agree to 4= Strongly disagree
Teachers are interested in students	0.745	1=Strongly agree to 4= Strongly disagree
High School Academic Climate factor (α=0.868)		
Students expected to do homework	0.677	1= Not accurate at all to 5= Very accurate
Learning is high priority for students	0.802	1= Not accurate at all to 5= Very accurate
Teacher morale is high	0.713	1= Not accurate at all to 5= Very accurate
Teachers press students to achieve	0.854	1= Not accurate at all to 5= Very accurate
Student morale is high	0.735	1= Not accurate at all to 5= Very accurate
Social/Pluralistic Goals factor (α=0.687)		
Helping others who are in difficulty	0.507	1=Not Important to 4=Essential
Helping to promote racial understanding	0.760	1=Not Important to 4=Essential
Improving my understanding of other countries and cultures	0.692	1=Not Important to 4=Essential

Table A2, continued

Factor Loadings and Scale Items

Item	Loading	Coding Scheme
Scales		
# SAT Prep Methods (α=0.902)		
Took or plans to take SAT/ACT course at high school		1=Yes, 0=No
Took or plans to take commercial SAT/ACT preparation course		1=Yes, 0=No
Received or plans to receive private tutoring for SAT/ACT		1=Yes, 0=No
Studied or plans to study from SAT/ACT preparation books		1=Yes, 0=No
Used or plans to use SAT/ACT preparation video tape		1=Yes, 0=No
Social Capital scale (α=0.627)		
Has gone to _____ for college entrance information		
-Counselor		1=Yes, 0=No
-Teacher		1=Yes, 0=No
-Coach		1=Yes, 0=No
-Parent		1=Yes, 0=No
-Sibling		1=Yes, 0=No
-Other relative		1=Yes, 0=No
-Friend		1=Yes, 0=No
External Help scale (α=0.565)		
Has gone to _____ for college entrance information		
-College representatives		1=Yes, 0=No
-College publications/websites		1=Yes, 0=No
-College search guides		1=Yes, 0=No
-School library		1=Yes, 0=No
-Public library		1=Yes, 0=No
-College library		1=Yes, 0=No
High Impact PSE Activities (α=0.676)		
Participated in _____ while in college		
-Internship/co-op/field experience/student teaching/clinical assignment		1=Yes, 0=No
-Research project with faculty member outside course/program requirements		1=Yes, 0=No
-Study abroad		1=Yes, 0=No
-Community-based project		1=Yes, 0=No
-Culminating senior experience		1=Yes, 0=No
-Mentoring		1=Yes, 0=No

Appendix B: Tables for Multilevel Models Predicting Four-Year College Enrollment[5]

Table B1

Step-by-Step Results for HGLM Predicting Enrollment at 4-Year Institution: Level-1 (N=8,050 students, 650 schools)

	Step 1				Step 2				Step 3				Step 4			
	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*
Demographics																
Sex: Female	.152	.062	*	3.7	.231	.062	***	5.7	.163	.065	*	4.0	.223	.069	**	5.5
Race: AAPI (Ref.= White)	.308	.130	*	6.7	.399	.137	**	8.8	.176	.139			.305	.142	*	6.8
Race: AIAN	-.535	.377			-.255	.417			-.231	.454			-.155	.438		
Race: Black	-.301	.113	**	-7.2	-.111	.119			-.303	.122	*	-7.2	-.239	.127		
Race: Latino	-.918	.107	***	-22.5	-.654	.117	***	-16.1	-.831	.117	***	-20.4	-.718	.118	***	-17.6
Race: Multiracial	-.273	.154			-.148	.158			-.218	.159			-.133	.162		
SES					.945	.059	***	19.1	.827	.060	***	17.1	.764	.060	***	16.0
# Parents/Guardians					.123	.076			.154	.079			.094	.081		
# Parent(s)' dependents					-.034	.026			-.025	.027			-.033	.027		
Parental Influence																
Parent(s)' asp for students' ed.									.414	.033	***	9.3	.363	.034	***	8.2
Parents expect success in school									.196	.048	***	4.5	.131	.049	**	3.1
Parents help w/ homework									-.120	.035	**	-2.9	-.201	.036	***	-4.9
Social Environment																
School Safety factor													.277	.045	***	6.4
Students friendly w/ other racial grps													-.192	.057	**	-4.6
Neg. perc. of teacher-student rel.													-.237	.043	***	-5.8
HPW: Extracurriculars													.271	.020	***	6.2
Sociocognitive Factors																
Social Agency factor																
Math Self-Efficacy factor																
Impt: Good grades																
HPW: Homework																
Impt: Good education																
Impt: Good job																
Degree aspirations																
Friends' Influence																
# Friends who consider grades impt.																
# Friends who plan to attend 4-yr PSI																
# Friends of diff. sex																
# Friends in diff. grade																
College-Going Behavior																
# SAT prep methods																
Social Capital scale																
External Help scale																
Academic Indicators																
Academic GPA																
# AP/IB courses																
SAT comp. score (in 100s)																
Took SAT (vs. imputed)																
Intercept	.139	.112			-.018	.115			.182	.119			.156	.124		
Variance Component (S.D.)	.915	(.957)***			1.072	(1.035)***			1.002	(1.001)***			.950	(0.957)***		
Reliability	0.680				.699				.677				.650			
-2 Log Likelihood	11428.1				11394.8				11390.0				11358.2			

[5] For this and all subsequent appendix tables of multilevel modeling results, *p<.05, **p<.01, ***p<.001.

Table B1, continued

Step-by-Step Results for HGLM Predicting Enrollment at 4-Year Institution: Level-1 (N=8,050 students, 650 schools)

	Step 5				Step 6				Step 7				Step 8			
	Coeff.	S.E.	Sig.	ΔP	Coeff.	S.E.	Sig.	ΔP	Coeff.	S.E.	Sig.	ΔP	Coeff.	S.E.	Sig.	ΔP
Demographics																
Sex: Female	.071	.074			.037	.077			-.049	.078			-.200	.086	*	-4.5
Race: AAPI (Ref.= White)	.070	.152			.064	.148			.036	.151			-.105	.183		
Race: AIAN	-.165	.441			.063	.467			.139	.474			.722	.530		
Race: Black	-.280	.127	*	-6.7	-.171	.125			-.225	.131			.402	.140	**	9.1
Race: Latino	-.759	.125	***	-18.6	-.604	.126	***	-14.8	-.536	.126	***	-13.1	-.167	.139		
Race: Multiracial	-.220	.166			-.154	.172			-.165	.170			.049	.203		
SES	.656	.064	***	14.1	.587	.066	***	12.8	.574	.066	***	12.5	.201	.072	**	4.7
# Parents/Guardians	.103	.086			.079	.087			.079	.091			-.080	.097		
# Parent(s)' dependents	-.048	.028			-.046	.029			-.033	.029			.023	.031		
Parental Influence																
Parent(s)' asp for students' ed.	.229	.034	***	5.3	.206	.035	***	4.8	.175	.036	***	4.1	.062	.038		
Parents expect success in school	.054	.054			.045	.055			.032	.055			.056	.060		
Parents help w/ homework	-.237	.041	***	-5.8	-.234	.042	***	-5.7	-.227	.043	***	-5.5	-.053	.046		
Social Environment																
School Safety factor	.265	.049	***	6.1	.253	.050	***	5.8	.244	.050	***	5.6	.221	.053	***	5.1
Students friendly w/ other racial grps	-.199	.061	**	-4.8	-.184	.062	**	-4.5	-.189	.064	**	-4.6	-.128	.067		
Neg. perc. of teacher-student rel.	-.105	.046	*	-2.5	-.074	.046		-1.8	-.072	.047			-.018	.052		
HPW: Extracurriculars	.217	.020	***	5.0	.182	.020	***	4.2	.162	.020	***	3.8	.110	.022	***	2.6
Sociocognitive Factors																
Social Agency factor	-.078	.041			-.060	.042			-.092	.043	*	-2.2	-.025	.048		
Math Self-Efficacy factor	.253	.037	***	5.8	.241	.038	***	5.5	.207	.038	***	4.8	.052	.041		
Impt: Good grades	.357	.061	***	8.1	.364	.066	***	8.2	.320	.068	***	7.3	-.028	.077		
HPW: Homework	.032	.007	***	0.8	.030	.007	***	0.7	.022	.007	**	0.5	.003	.008		
Impt: Good education	.583	.125	***	12.7	.537	.124	***	11.8	.424	.126	**	9.5	.379	.141	**	8.6
Impt: Good job	-.310	.145	*	-7.6	-.298	.148	*	-7.3	-.260	.151			-.014	.177		
Degree aspirations	.312	.026	***	7.1	.275	.026	***	6.3	.256	.027	***	5.9	.176	.030	***	4.1
Friends' Influence																
# Friends who consider grades impt.					-.139	.037	***	-3.3	-.129	.038	**	-3.1	-.095	.041	*	-2.3
# Friends who plan to attend 4-yr PSI					.524	.043	***	11.5	.477	.044	***	10.6	.370	.047	***	8.4
# Friends of diff. sex					-.004	.058			-.037	.058			-.056	.063		
# Friends in diff. grade					-.114	.044	*	-2.7	-.086	.045			-.001	.050		
College-Going Behavior																
# SAT prep methods									.069	.031	*	1.6	.065	.032	*	1.5
Social Capital scale									-.025	.023		-0.6	.003	.026		
External Help scale									.346	.031	***	7.9	.192	.033	***	4.5
Academic Indicators																
Academic GPA													.548	.091	***	1.5
# AP/IB courses													.247	.049	***	0.1
SAT comp. score (in 100s)													.262	.000	***	4.5
Took SAT (vs. imputed)													1.088	.102	***	26.4
Intercept	.464	.136	**		.537	.139	***		.682	.142	***		.048	.180		
Variance Component (S.D.)	.984	(0.992)***			.809	(0.900)***			.794	(0.891)***			1.232	(1.110)***		
Reliability	.639				.588				.576				.641			
-2 Log Likelihood	11374.3				11394.5				11456.7				11357.9			

Table B2

Step-by-Step Results for HGLM Predicting Enrollment at 4-Year Institution: Level-2 (N=8,050 students, 650 schools)

	HS Structure				HS Staff Measures				HS Peer Learning Environment				HS Quality				Threat Contexts			
	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*
Demographics																				
Sex: Female	-.191	.086	*	-4.3	-.193	.087	*	-4.3	-.192	.087	*	-4.3	-.181	.087	*	-4.1	-.186	.087	*	-4.2
Race: AAPI (Ref.= White)	-.195	.187			-.177	.188			-.122	.192			-.087	.193			-.032	.195		
Race: AIAN	.801	.514			.815	.515			.919	.485			.975	.479	*	20.0	.998	.497	*	20.6
Race: Black	.381	.144	**	8.6	.409	.145	**	9.2	.453	.144	**	10.2	.489	.146	**	11.0	.653	.146	***	14.4
Race: Latino	-.259	.142			-.219	.143			-.115	.142			-.046	.143			.049	.142		
Race: Multiracial	.018	.206			.035	.206			.053	.206			.110	.209			.137	.210		
SES	.201	.073	**	4.7	.206	.073	**	4.8	.218	.073	**	5.1	.245	.075	**	5.6	.252	.075	**	5.8
# Parents/Guardians	-.086	.097			-.095	.097			-.106	.097			-.117	.097			-.134	.097		
# Parent(s)' dependents	.022	.032			.024	.032			.028	.032			.035	.032			.037	.032		
Parental Influence																				
Parent(s)' aspirations for students' ed.	.050	.038			.045	.039			.039	.039			.031	.039			.031	.039		
Parents expect success in school	.058	.060			.061	.060			.060	.060			.070	.062			.080	.062		
Parents help with homework	-.044	.046			-.041	.046			-.042	.046			-.044	.046			-.044	.046		
Social Environment																				
School Safety factor	.225	.055	***	5.2	.223	.055	***	5.2	.210	.056	***	4.9	.199	.056	**	4.6	.180	.056	**	4.2
Students friendly w/ other racial grps	-.140	.068	*	-3.4	-.141	.068	*	-3.4	-.137	.069	*	-3.3	-.129	.070			-.119	.070		
Neg. perc. of teacher-student rel.	-.002	.052			-.001	.053			.002	.053			.003	.053			.009	.053		
HPW: Extracurriculars	.113	.022	***	2.7	.115	.022	***	2.7	.115	.022	***	2.7	.120	.022	***	2.8	.118	.022	***	2.8
Sociocognitive Factors																				
Social Agency factor	-.023	.048			-.023	.048			-.024	.048			-.018	.049			-.008	.049		
Math Self-Efficacy factor	.050	.041			.047	.041			.042	.041			.042	.041			.037	.042		
Impt: Good grades	-.017	.077			-.016	.077			-.014	.078			.004	.078			.006	.078		
HPW: Homework	.000	.008			.000	.008			.000	.008			-.001	.008			-.003	.008		
Impt: Good education	.371	.142	**	8.4	.383	.142	**	8.6	.397	.143	**	8.9	.408	.144	**	9.2	.417	.144	**	9.4
Impt: Good job	.003	.179			-.003	.180			-.012	.181			.002	.184			.008	.184		
Degree aspirations	.171	.030	***	4.0	.170	.030	***	4.0	.168	.030	***	3.9	.165	.030	***	3.8	.164	.030	***	3.8
Friends' Influence																				
# Friends who consider grades impt.	-.099	.041	*	-2.4	-.098	.042	*	-2.3	-.093	.041	*	-2.2	-.087	.042	*	-2.1	-.082	.042	*	-2.0
# Friends who plan to attend 4-yr PSI	.356	.048	***	8.1	.348	.048	***	7.9	.341	.048	***	7.8	.316	.048	***	7.2	.312	.048	***	7.1
# Friends of diff. sex	-.048	.063			-.048	.063			-.054	.063			-.059	.064			-.055	.064		
# Friends in diff. grade	.008	.049			.011	.050			.017	.050			.028	.050			.034	.050		
College-Going Behavior																				
# SAT prep methods	.060	.032			.060	.032			.058	.032			.052	.032			.059	.032		
Social Capital scale	.000	.026			-.001	.026			-.002	.026			-.002	.027			-.002	.027		
External Help scale	.193	.033	***	4.5	.192	.033	***	4.5	.194	.033	***	4.5	.189	.033	***	4.4	.187	.033	***	4.4

Table B2, continued

Step-by-Step Results for HGLM Predicting Enrollment at 4-Year Institution: Level-2 (N=8,050 students, 650 schools)

	HS Structure				HS Staff Measures				HS Peer Learning Environment				HS Quality				Threat Contexts			
	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*
Academic Indicators																				
Academic GPA	.565	.092	***	12.3	.574	.092	***	12.5	.585	.092	***	12.7	.598	.092	***	13.0	.607	.092	***	13.2
# AP/IB courses	.236	.049	***	5.4	.233	.049	***	5.4	.224	.049	***	5.2	.216	.049	***	5.0	.216	.048	***	5.0
SAT comp. score (in 100s)	.271	.036	***	6.2	.277	.037	***	6.4	.288	.037	***	6.6	.306	.038	***	7.0	.318	.038	***	7.2
Took SAT (vs. imputed)	1.080	.102	***	26.2	1.066	.101	***	25.8	1.050	.101	***	25.5	.997	.101	***	24.2	.986	.100	***	23.9
School Characteristics																				
Control: Private	.366	.304			.512	.310			.180	.335			-.240	.330			-.555	.337		
Total enrollment	.000	.000	*	0.0	.000	.000			.000	.000			.000	.000			.000	.000		
% Total enr is HS (in 10s)	-.116	.417	**	-2.8	-.122	.413	**	-2.9	-.127	.409	**	-3.0	-.131	.411	**	-3.1	-.145	.420	**	-3.4
Urbanicity	.177	.110			.138	.108			.193	.107			.135	.102			.252	.104	*	5.8
Coed	-.521	.265	*	-9.3	-.462	.285			-.454	.269			-.239	.249			-.241	.251		
Student/Teacher ratio					.011	.013			.009	.013			.023	.016			.018	.016		
% FT teachers certified					.009	.004	*	0.2	.008	.004			.004	.004			.002	.004		
#FT guidance counselors					.098	.038	*	2.3	.077	.039	*	1.8	.039	.033			.032	.035		
P/FT teacher ratio					.540	.643			.418	.626			.070	.607			-.466	.611		
% Excellent teachers					.005	.002	*	0.1	.002	.002			.001	.002			.002	.002		
% LEP/non-Eng. proficient									-.014	.006	*	-0.3	-.007	.006			.006	.007		
% SPED									-.008	.010			-.001	.010			.002	.010		
Racial climate									-.092	.099			-.145	.088			-.122	.088		
Academic Climate factor									.238	.072	**	5.5	.070	.066			.053	.067		
% Grads to 4yr PSI (in quartiles)													.614	.073	***	13.3	.535	.076	***	11.8
% in AP													-.003	.005			-.005	.005		
% Free lunch																	-.018	.004	***	-0.4
Diversity index																	-.007	.003	*	-0.2
Intercept	1.147	.559			.996	.601			1.040	.568			.712	.535			.749	.540		
Variance Component (S.D.)	1.166	1.080			1.144	1.070			1.118	1.058			.907	.953			.849	.922		
% Variance explained	5.4%				7.1%				9.2%				26.3%				31.1%			
Reliability	.619				.614				.608				.559				.543			
-2 Log Likelihood	11453.1				11502.9				11527.0				11484.6				11514.3			

Table B3

Cross-Level Interaction Terms for HGLM Predicting Enrollment at 4-Year PSI (N=8,050 students, 650 schools)

	Full HGLM Model			Racial Diversity Interactions			SES Interactions			Academics Interactions		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Demographics												
Sex: Female	-.186	.087	*	-.186	.087	*	-.186	.087	*	-.187	.087	*
Race: AAPI (Ref.= White)	-.032	.195		-.203	.195		-.032	.195		-.028	.195	
Race: AIAN	.998	.497	*	.995	.517		.999	.497	*	.992	.491	*
Race: Black	.653	.146	***	.631	.178	**	.654	.147	***	.645	.146	***
Race: Latino	.049	.142		.013	.156		.051	.142		.047	.142	
Race: Multiracial	.137	.210		.144	.217		.136	.210		.141	.209	
SES	.252	.075	**	.255	.075	**	.252	.075	**	.248	.075	**
# Parents/Guardians	-.134	.097		-.135	.097		-.135	.097		-.137	.097	
# Parent(s)' dependents	.037	.032		.035	.032		.037	.032		.036	.032	
Parental Influence												
Parent(s)' aspirations for students' ed.	.031	.039		.031	.039		.031	.039		.031	.039	
Parents expect success in school	.080	.062		.079	.062		.081	.062		.080	.062	
Parents help with homework	-.044	.046		-.043	.046		-.044	.046		-.045	.046	
Social Environment												
School Safety factor	.180	.056	**	.179	.057	**	.181	.056	**	.179	.056	**
Students friendly w. other racial grps	-.119	.070		-.119	.070		-.119	.070		-.120	.070	
Neg. teacher-student relationships	.009	.053		.010	.053		.009	.053		.010	.053	
HPW: Extracurriculars	.118	.022	***	.118	.022	***	.118	.022	***	.118	.022	***
Sociocognitive Factors												
Social Agency factor	-.008	.049		-.007	.049		-.008	.049		-.008	.049	
Math Self-Efficacy factor	.037	.042		.036	.042		.037	.042		.035	.042	
Impt: Good grades	.006	.078		.006	.078		.006	.078		.008	.078	
HPW: Homework	-.003	.008		-.003	.008		-.003	.008		-.003	.008	
Impt: Good education	.417	.144	**	.417	.144	**	.418	.144	**	.415	.144	**
Impt: Good job	.008	.184		.008	.185		.007	.184		.013	.185	
Degree aspirations	.164	.030	***	.165	.030	***	.164	.030	***	.161	.030	***
Friends' Influence												
# Friends who consider grades impt.	-.082	.042	*	-.081	.042		-.082	.042	*	-.083	.042	*
# Friends who plan to attend 4-yr PSI	.312	.048	***	.310	.048	***	.312	.048	***	.309	.048	***
# Friends of diff. sex	-.055	.064		-.054	.065		-.055	.064		-.057	.064	
# Friends in diff. grade	.034	.050		.033	.050		.034	.050		.033	.050	
College-Going Behavior												
# SAT prep methods	.059	.032		.059	.032		.059	.032		.059	.032	
Social Capital scale	-.002	.027		-.002	.027		-.002	.027		-.004	.027	
External Help scale	.187	.033	***	.187	.033	***	.187	.033	***	.189	.033	***
Academic Indicators												
Academic GPA	.607	.092	***	.607	.093	***	.608	.093	***	.636	.094	***
# AP/IB courses	.216	.048	***	.216	.048	***	.216	.048	***	.218	.048	***
SAT comp. score (in 100s)	.318	.038	***	.319	.038	***	.318	.038	***	.318	.038	***
Took SAT (vs. imputed)	.986	.100	***	.989	.100	***	.986	.100	***	.998	.101	***

Table B3, continued

Cross-Level Interaction Terms for HGLM Predicting Enrollment at 4-Year PSI (N=8,050 students, 650 schools)

	Full HGLM Model			Racial Diversity Interactions			SES Interactions			Academics Interactions		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
School Characteristics												
Control: Private	-.555	.337		-.546	.337		-.556	.338		-.523	.341	
Total enrollment	.000	.000		.000	.000		.000	.000		.000	.000	
% Total enr is HS (in 10s)	-.145	.420	**	-.145	.421	**	-.145	.420	**	-.145	.422	**
Urbanicity	.252	.104	*	.252	.104	*	.252	.103	*	.257	.103	*
Coed	-.241	.251		-.243	.249		-.241	.251		-.255	.256	
Student/Teacher ratio	.018	.016		.018	.016		.018	.016		.018	.016	
% FT teachers certified	.002	.004		.002	.004		.002	.004		.002	.004	
#FT guidance counselors	.032	.035		.034	.035		.032	.035		.033	.035	
P/FT teacher ratio	-.466	.611		-.474	.610		-.464	.611		-.508	.615	
% Excellent teachers	.002	.002		.002	.002		.002	.002		.002	.002	
% LEP/non-Eng. proficient	.006	.007		.005	.007		.006	.007		.006	.007	
% SPED	.002	.010		.001	.010		.002	.010		.001	.010	
Racial climate	-.122	.088		-.121	.088		-.122	.088		-.121	.088	
Academic Climate factor	.053	.067		.055	.068		.053	.067		.056	.067	
% Grads to 4yr PSI (in quartiles)	.535	.076	***	.537	.076	***	.535	.076	***	.545	.076	***
% in AP	-.005	.005		-.005	.005		-.005	.005		-.005	.005	
% Free lunch	-.018	.004	***	-.017	.004	***	-.018	.004	***	-.018	.004	***
Diversity index	-.007	.003	*	-.008	.004	*	-.007	.003	*	-.007	.003	*
Cross-Level Interactions												
AAPI*Diversity index				.014	.010							
AIAN*Diversity index				.005	.020							
Black*Diversity index				.003	.007							
Latino*Diversity index				.004	.007							
Multiracial*Diversity index				.000	.010							
SES*% Free lunch							.001	.004				
GPA*% Grads to 4-yr										.125	.083	
SAT*% Grads to 4-yr										.019	.033	
Intercept	.749	.540		.744	.537		.748	.539		.792	.550	
Variance Component (S.D.)	.849	(.922)		.852	(.923)	***	.849	(.922)	***	.851	(.923)	***
Reliability	.543			.544			.543			.543		
-2 Log Likelihood	11514.3			11534.7			11514.9			11623.7		

Table B4

Comparison of Diversity Measures for HGLM Predicting Enrollment at 4-Year PSI (N=8,050 students, 650 schools)

	No Diversity Measure			Diversity Index			% AAPI			% AIAN			% Black			% Latino			% White		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics																					
Sex: Female	-.184	.087	*	-.186	.087	*	-.184	.087	*	-.185	.087	*	-.184	.087	*	-.184	.087	*	-.184	.087	*
Race: AAPI (Ref.= White)	-.057	.194		-.032	.195		-.075	.201		-.063	.193		-.055	.194		-.058	.194		-.049	.195	
Race: AIAN	.991	.490	*	.998	.497	*	.994	.489	*	1.195	.533	*	.985	.490	*	1.014	.487	*	.997	.490	*
Race: Black	.621	.146	***	.653	.146	***	.621	.146	***	.615	.146	***	.656	.156	***	.625	.146	***	.633	.153	***
Race: Latino	.031	.141		.049	.142		.032	.141		.027	.141		.030	.141		.001	.150		.040	.146	
Race: Multiracial	.118	.209		.137	.210		.113	.210		.123	.210		.123	.209		.116	.209		.123	.211	
SES	.251	.075	**	.252	.075	**	.251	.075	**	.251	.075	**	.251	.075	**	.249	.075	**	.252	.075	**
# Parents/Guardians	-.136	.097		-.134	.097		-.137	.097		-.136	.097		-.138	.097		-.135	.097		-.137	.097	
# Parent(s)' dependents	.037	.032		.037	.032		.037	.032		.038	.032		.037	.032		.038	.032		.037	.032	
Parent(s)' aspirations for students' ed.	.029	.039		.031	.039		.028	.039		.029	.039		.029	.039		.029	.039		.029	.039	
Parents expect success in school	.079	.062		.080	.062		.079	.062		.080	.062		.078	.062		.079	.062		.078	.062	
Parents help with homework	-.044	.046		-.044	.046		-.043	.046		-.044	.046		-.044	.046		-.045	.046		-.044	.046	
School Safety factor	.190	.056	**	.180	.056	**	.190	.056	**	.191	.056	**	.189	.056	**	.191	.056	**	.189	.056	**
Students friendly w. other racial grps	-.126	.070		-.119	.070		-.126	.070		-.128	.070		-.127	.070		-.129	.070		-.126	.070	
Neg. teacher-student relationships	.008	.053		.009	.053		.008	.053		.009	.053		.009	.053		.009	.053		.008	.053	
HPW: Extracurriculars	.118	.022	***	.118	.022	***	.118	.022	***	.118	.022	***	.117	.022	***	.118	.022	***	.118	.022	***
Social Agency factor	-.007	.049		-.008	.049		-.007	.049		-.007	.049		-.006	.049		-.007	.049		-.007	.049	
Math Self-Efficacy factor	.038	.042		.037	.042		.038	.042		.038	.042		.037	.042		.038	.042		.037	.042	
Impt: Good grades	.006	.078		.006	.078		.007	.078		.006	.078		.007	.078		.006	.078		.007	.078	
HPW: Homework	-.003	.008		-.003	.008		-.003	.008		-.003	.008		-.003	.008		-.002	.008		-.003	.008	
Impt: Good education	.415	.144	**	.417	.144	**	.416	.144	**	.414	.144	**	.416	.144	**	.414	.144	**	.416	.144	**
Impt: Good job	.013	.184		.008	.184		.014	.184		.013	.184		.014	.184		.014	.184		.013	.184	
Degree aspirations	.163	.030	***	.164	.030	***	.163	.030	***	.163	.030	***	.163	.030	***	.163	.030	***	.163	.030	***
# Friends who consider grades impt.	-.083	.042	*	-.082	.042	*	-.083	.042	*	-.082	.042		-.082	.042		-.082	.042	*	-.082	.042	*
# Friends who plan to attend 4-yr PSI	.314	.048	***	.312	.048	***	.313	.048	***	.314	.048	***	.314	.048	***	.315	.048	***	.314	.048	***
# Friends of diff. sex	-.056	.064		-.055	.064		-.056	.064		-.057	.064		-.056	.064		-.056	.064		-.056	.064	
# Friends in diff. grade	.030	.050		.034	.050		.030	.050		.030	.050		.030	.050		.030	.050		.030	.050	
# SAT prep methods	.058	.032		.059	.032		.058	.032		.058	.032		.058	.032		.058	.032		.058	.032	
Social Capital scale	-.001	.027		-.002	.027		-.001	.027		-.001	.027		-.001	.027		-.002	.027		-.001	.027	
External Help scale	.187	.033	***	.187	.033	***	.187	.033	***	.187	.033	***	.187	.033	***	.187	.033	***	.187	.033	***
Academic GPA	.605	.092	***	.607	.092	***	.606	.093	***	.608	.093	***	.607	.093	***	.606	.092	***	.606	.093	***
# AP/IB courses	.214	.049	***	.216	.048	***	.214	.049	***	.214	.049	***	.213	.049	***	.214	.049	***	.214	.049	***
SAT comp. score (in 100s)	.317	.038	***	.318	.038	***	.317	.038	***	.317	.038	***	.319	.038	***	.317	.038	***	.318	.038	***
Took SAT (vs. imputed)	.986	.100	***	.986	.100	***	.986	.100	***	.985	.100	***	.983	.100	***	.986	.100	***	.985	.100	***

Table B4, continued

Comparison of Diversity Measures for HGLM Predicting Enrollment at 4-Year PSI (N=8,050 students, 650 schools)

	No Diversity Measure			Diversity Index			% AAPI			% AIAN			% Black			% Latino			% White		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
School Characteristics																					
Control: Private	-.582	.340		-.555	.337		-.573	.342		-.570	.340		-.586	.340		-.616	.347		-.575	.339	
Total enrollment	.000	.000		.000	.000		.000	.000		.000	.000		.000	.000		.000	.000		.000	.000	
% Total enr is HS (in 10s)	-.153	.425	**	-.145	.420	**	-.152	.429	**	-.150	.425	**	-.152	.424	**	-.155	.429	**	-.152	.424	**
Urbanicity	.221	.103	*	.252	.104	*	.220	.103	*	.220	.103	*	.236	.106	*	.221	.103	*	.227	.108	*
Coed	-.194	.252		-.241	.251		-.188	.252		-.198	.252		-.209	.252		-.191	.253		-.203	.253	
Student/Teacher ratio	.021	.017		.018	.016		.021	.017		.021	.017		.020	.017		.022	.017		.021	.017	
% FT teachers certified	.002	.004		.002	.004		.002	.004		.002	.004		.002	.004		.003	.004		.002	.004	
#FT guidance counselors	.034	.035		.032	.035		.034	.035		.034	.035		.034	.036		.034	.036		.035	.036	
P/FT teacher ratio	-.417	.607		-.466	.611		-.427	.608		-.411	.606		-.429	.608		-.387	.607		-.426	.610	
% Excellent teachers	.001	.002		.002	.002		.001	.002		.001	.002		.001	.002		.001	.002		.001	.002	
% LEP/non-Eng. proficient	.003	.006		.006	.007		.002	.007		.004	.006		.002	.007		.000	.007		.003	.007	
% SPED	.002	.010		.002	.010		.002	.010		.002	.010		.002	.010		.002	.010		.001	.010	
Racial climate	-.086	.085		-.122	.088		-.085	.085		-.090	.085		-.083	.085		-.094	.085		-.083	.085	
Academic Climate factor	.029	.067		.053	.067		.028	.067		.035	.067		.031	.067		.032	.067		.030	.067	
% Grads to 4yr PSI (in quartiles)	.559	.074	***	.535	.076	***	.559	.074	***	.552	.074	***	.563	.074	***	.563	.075	***	.558	.075	***
% in AP	-.006	.005		-.005	.005		-.006	.005		-.006	.005		-.006	.005		-.006	.005		-.006	.005	
% Free lunch	-.018	.004	***	-.018	.004	***	-.018	.004	***	-.018	.004	***	-.017	.004	***	-.019	.004	***	-.018	.004	***
Diversity Measures																					
Diversity index				-.007	.003	*															
% AAPI							.002	.006													
% AIAN										-.012	.007										
% Black													-.002	.003							
% Latino																.003	.004				
% White																			.001	.003	
Intercept	.670	.540		.749	.540		.658	.539		.676	.539		.697	.540		.674	.541		.683	.541	
Variance Component (S.D.)	.852	(.923)	***	.849	(.922)	***	.854	(.924)	***	.853	(.924)	***	.856	(.925)	***	.856	(.925)	***	.855	(.925)	***
Reliability	.544			.543			.545			.544			.545			.545			.545		
-2 Log Likelihood	11485.8			11514.3			11490.3			11491.6			11494.3			11484.8			11496.3		

Table B5

Cross-Level Interaction Terms for Alternative Diversity Measures (N=8,050 students, 650 schools)

	Diversity Index			% AAPI			% AIAN			% Black			% Latino			% White		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Demographics																		
Sex: Female	-.186	.087	*	-.185	.087	*	-.185	.087	*	-.184	.087	*	-.185	.087	*	-.185	.087	*
Race: AAPI (Ref.= White)	-.203	.195		-.074	.205		-.049	.195		-.078	.211		-.035	.204		.008	.188	
Race: AIAN	.995	.517		1.118	.506	*	1.564	.646	*	1.050	.454	*	1.035	.454	*	1.190	.522	*
Race: Black	.631	.178	**	.625	.150	***	.546	.181	**	.638	.191	**	.682	.148	***	.661	.190	**
Race: Latino	.013	.156		.042	.143		.019	.141		.017	.142		-.198	.171		-.113	.167	
Race: Multiracial	.144	.217		.090	.216		.117	.212		.121	.208		.191	.216		.173	.215	
SES	.255	.075	**	.251	.075	**	.253	.075	**	.252	.075	**	.262	.075	**	.259	.075	**
# Parents/Guardians	-.135	.097		-.137	.097		-.135	.097		-.140	.097		-.137	.097		-.133	.097	
# Parent(s)' dependents	.035	.032		.037	.032		.038	.032		.038	.032		.037	.032		.037	.032	
Parental Influence																		
Parent(s)' aspirations for students' ed.	.031	.039		.028	.039		.030	.039		.030	.039		.029	.039		.030	.039	
Parents expect success in school	.079	.062		.079	.062		.080	.062		.077	.062		.070	.062		.083	.062	
Parents help with homework	-.043	.046		-.044	.046		-.046	.046		-.044	.046		-.045	.046		-.044	.046	
Social Environment																		
School Safety factor	.179	.057	**	.190	.056	**	.190	.056	**	.190	.056	**	.184	.056	**	.184	.057	**
Students friendly w. other racial groups	-.119	.070		-.125	.070		-.128	.070		-.129	.070		-.123	.070		-.125	.070	
Neg. teacher-student relationships	.010	.053		.009	.053		.010	.053		.008	.053		.011	.053		.012	.053	
HPW: Extracurriculars	.118	.022	***	.118	.022	***	.118	.022	***	.117	.022	***	.119	.022	***	.118	.022	***
Sociocognitive Factors																		
Social Agency factor	-.007	.049		-.007	.049		-.007	.049		-.007	.049		-.008	.049		-.007	.049	
Math Self-Efficacy factor	.036	.042		.038	.042		.038	.042		.038	.042		.038	.042		.039	.042	
Impt: Good grades	.006	.078		.006	.078		.007	.078		.006	.078		.004	.078		.006	.078	
HPW: Homework	-.003	.008		-.002	.008		-.002	.008		-.003	.008		-.003	.008		-.002	.008	
Impt: Good education	.417	.144	**	.418	.144	**	.416	.144	**	.420	.144	**	.422	.145	**	.414	.144	**
Impt: Good job	.008	.185		.011	.183		.015	.184		.008	.183		.018	.185		.019	.184	
Degree aspirations	.165	.030	***	.164	.030	***	.163	.030	***	.163	.030	***	.165	.030	***	.164	.030	***
Friends' Influence																		
# Friends who consider grades impt.	-.081	.042		-.083	.042	*	-.082	.042	*	-.082	.042	*	-.080	.042		-.080	.042	
# Friends who plan to attend 4-yr PSI	.310	.048	***	.315	.048	***	.316	.048	***	.314	.048	***	.310	.048	***	.313	.048	***
# Friends of diff. sex	-.054	.065		-.055	.064		-.057	.064		-.056	.064		-.055	.064		-.056	.064	
# Friends in diff. grade	.033	.050		.030	.050		.030	.050		.030	.050		.029	.050		.032	.050	
College-Going Behavior																		
# SAT prep methods	.059	.032		.058	.032		.058	.032		.058	.032		.056	.032		.056	.032	
Social Capital scale	-.002	.027		-.002	.027		-.002	.027		-.001	.027		-.003	.027		-.002	.027	
External Help scale	.187	.033	***	.186	.033	***	.187	.033	***	.188	.033	***	.189	.033	***	.188	.033	***

Table B5, continued

Cross-Level Interaction Terms for Alternative Diversity Measures (N=8,050 students, 650 schools)

	Diversity Index			% AAPI			% AIAN			% Black			% Latino			% White		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Academic Indicators																		
Academic GPA	.607	.093	***	.606	.093	***	.608	.092	***	.608	.093	***	.605	.093	***	.608	.093	***
# AP/IB courses	.216	.048	***	.214	.048	***	.214	.049	***	.214	.048	***	.217	.048	***	.215	.049	***
SAT comp. score (in 100s)	.319	.038	***	.318	.038	***	.317	.038	***	.318	.038	***	.320	.038	***	.319	.038	***
Took SAT (vs. imputed)	.989	.100	***	.988	.100	***	.985	.100	***	.983	.100	***	.982	.101	***	.980	.101	***
School Characteristics																		
Control: Private	-.546	.337		-.585	.341		-.565	.341		-.590	.341		-.581	.342		-.578	.338	
Total enrollment	.000	.000		.000	.000		.000	.000		.000	.000		.000	.000		.000	.000	
% Total enr is HS (in 10s)	-.145	.421	**	-.152	.429	**	-.151	.426	**	-.153	.426	**	-.150	.420	**	-.149	.422	**
Urbanicity	.252	.104	*	.223	.103	*	.219	.103	*	.239	.106	*	.246	.101	*	.237	.107	*
Coed	-.243	.249		-.197	.252		-.194	.252		-.196	.254		-.221	.251		-.219	.254	
Student/Teacher ratio	.018	.016		.021	.017		.020	.017		.020	.017		.022	.017		.020	.017	
% FT teachers certified	.002	.004		.002	.004		.002	.004		.002	.004		.002	.004		.002	.004	
#FT guidance counselors	.034	.035		.035	.036		.035	.035		.034	.036		.035	.035		.035	.035	
P/FT teacher ratio	-.474	.610		-.423	.611		-.435	.604		-.394	.603		-.421	.604		-.453	.609	
% Excellent teachers	.002	.002		.001	.002		.001	.002		.001	.002		.001	.002		.002	.002	
% LEP/non-Eng. proficient	.005	.007		.003	.006		.005	.006		.002	.007		.001	.007		.003	.007	
% SPED	.001	.010		.002	.010		.002	.010		.003	.010		.003	.010		.002	.010	
Racial climate	-.121	.088		-.083	.085		-.087	.085		-.085	.086		-.100	.086		-.100	.086	
Academic Climate factor	.055	.068		.031	.067		.035	.067		.030	.067		.047	.066		.046	.067	
% Grads to 4yr PSI (in quartiles)	.537	.076	***	.558	.074	***	.556	.075	***	.568	.074	***	.544	.075	***	.544	.075	***
% in AP	-.005	.005		-.006	.005		-.006	.005		-.006	.005		-.005	.005		-.005	.005	
% Free lunch	-.017	.004	***	-.018	.004	***	-.018	.004	***	-.017	.004	***	-.020	.004	***	-.019	.004	***
____ (Diversity Measure)	-.008	.004	*	.000	.013		-.001	.010		-.001	.005		-.010	.006		.004	.004	
Cross-Level Interactions																		
AAPI*____	.014	.010		.002	.013		.031	.083		-.012	.019		.015	.009		-.004	.007	
AIAN*____	.005	.020		.058	.057		-.024	.015		.006	.018		.007	.025		.020	.015	
Black*____	.003	.007		.001	.021		-.079	.113		-.001	.006		.011	.008		-.004	.006	
Latino*____	.004	.007		-.006	.014		-.008	.018		-.008	.009		.021	.006	**	-.012	.005	*
Multiracial*____	.000	.010		.011	.014		.001	.024		.001	.008		.019	.017		-.011	.008	
Intercept	.744	.537		.674	.539		.674	.540		.682	.542		.663	.538		.666	.542	
Variance Component (S.D.)	.852	(0.923)	***	.854	(0.924)	***	.854	(0.924)	***	.861	(0.928)	***	.845	(0.919)	***	.847	(0.920)	***
Reliability	.544			.544			.544			.546			.542			.542		
-2 Log Likelihood	11534.7						11512.4			11508.5			11521.3			11532.7		

Appendix C: Tables for Multilevel Models Predicting Bachelor's Degree Attainment

Table C1
Descriptive Statistics for Variables Included in HGLM Predicting Degree Completion (N=4,010 Students, 570 High Schools)

	Mean	SD	Min.	Max.
Outcome				
Bachelor's degree within 6 years	0.67	0.47	0.00	1.00
STUDENT-LEVEL				
Demographics				
Sex: Female	1.55	0.50	1.00	2.00
Race: AAPI (Ref.= White)	0.11	0.31	0.00	1.00
Race: AIAN	0.00	0.05	0.00	1.00
Race: Black	0.09	0.28	0.00	1.00
Race: Latino	0.07	0.25	0.00	1.00
Race: Multiracial	0.04	0.20	0.00	1.00
SES	0.48	0.67	-0.99	1.97
# Parents/Guardians	1.83	0.38	0.00	2.00
# Parent(s)' dependents	2.59	1.15	0.00	8.00
Parental Influence				
Parent(s)' aspirations for students' education	5.82	0.93	1.00	7.00
Parents expect success in school	3.51	0.62	1.00	4.00
Parents help with homework	2.47	0.84	1.00	4.00
Social Environment				
School Safety factor	0.20	0.79	-3.07	1.28
Students friendly with other racial groups	3.22	0.61	1.00	4.00
Neg. perception of teacher-student relationships	-0.14	0.80	-1.83	3.35
HPW: Extracurriculars	3.89	1.80	1.00	8.00
Sociocognitive Factors				
Social Agency factor	0.02	0.84	-2.10	1.58
Math Self-Efficacy factor	0.21	0.99	-2.08	1.85
Impt: Good grades	3.61	0.60	1.00	4.35
HPW: Homework	8.06	6.41	0.00	26.00
Impt: Good education	2.93	0.27	1.00	3.15
Impt: Good job	2.92	0.28	1.00	3.08
Degree aspirations	6.89	0.89	2.00	9.00
Friends' Influence				
# Friends who consider grades impt.	1.51	0.99	0.00	3.00
# Friends who plan to attend 4-yr PSI	3.98	0.76	1.00	5.00
# Friends of different sex	0.41	0.62	0.00	3.00
# Friends in different grade	0.44	0.74	0.00	3.00
College-Going Behavior				
# SAT prep methods	1.52	1.22	0.00	6.00
Social Capital scale	3.32	1.70	0.00	7.00
External Help scale	2.45	1.13	0.00	6.00

Table C1, continued

Descriptive Statistics for Variables Included in HGLM Predicting Degree Completion (N=4,010 Students, 570 High Schools)

	Mean	SD	Min.	Max.
Academic Indicators				
Academic GPA	3.18	0.57	0.78	4.30
# AP/IB courses	1.70	2.23	0.00	18.00
SAT comp. score (in hundreds)	10.99	1.79	4.20	16.00
Took SAT (vs. imputed)	0.94	0.24	0.00	1.00
SCHOOL-LEVEL				
Structure				
Control: Private	0.25	0.43	0.00	1.00
Total enrollment	1226.33	813.25	46.75	4391.75
% Total enrollment is HS (in tens)	8.30	2.80	1.10	10.00
Urbanicity	2.15	0.70	1.00	3.00
Coed	1.93	0.25	1.00	2.00
Instructional and Counseling Staff				
Student/Teacher ratio	16.39	4.45	5.28	57.35
% FT teachers certified	91.18	19.41	0.00	101.53
#FT guidance counselors	3.78	2.55	-0.77	16.00
P/FT teacher ratio	0.08	0.13	-0.05	1.00
% Excellent teachers	39.54	25.09	0.00	100.00
Peer Learning Environment				
% LEP/non-English proficient	4.99	8.85	-0.07	50.00
% SPED	10.56	7.31	0.00	31.00
Racial climate	4.32	0.57	2.00	5.00
Academic Climate factor	0.07	0.93	-3.94	1.57
Academic Performance				
% Grads to 4yr PSI (in quartiles)	2.71	1.02	1.00	4.00
% in AP	15.53	14.00	0.00	81.00
Conditions for Stereotype Threat				
% Free lunch	18.25	18.86	0.00	100.00
Diversity index	31.09	20.64	0.00	72.73
% AAPI	4.92	11.45	0.00	100.00
% AIAN	0.97	3.61	0.00	57.91
% Black	13.69	20.41	0.00	99.37
% Latino	11.48	19.40	0.00	98.38
% White	68.94	29.33	0.00	100.00

Table C2

CCHGLM Level-1 Models Predicting Bachelor's Degree Attainment in 6 Years (N=3,080 Students, 540 HS's, 590 PSI's)

	Level-1 Model			Level-1 Interaction Terms		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics						
Sex: Female	.047	.102		.055	.102	
Race: AAPI (Ref.= White)	.027	.163		-.030	.167	
Race: AIAN	-1.067	.839		-.946	.942	
Race: Black	.148	.173		.121	.179	
Race: Latino	.194	.193		.175	.193	
Race: Multiracial	-.187	.245		-.138	.258	
SES	.255	.078	**	.241	.078	**
School place to meet friends	.110	.074		.107	.074	
HPW: Extracurriculars	.084	.027	**	.082	.027	**
Social Agency factor	-.101	.056		-.104	.056	
Math Self-Efficacy factor	-.076	.051		-.072	.051	
# Friends in diff. grade	-.072	.062		-.076	.062	
Academic GPA	.883	.109	***	.883	.110	***
SAT comp. score (in 100s)	.070	.037		.075	.038	*
Took SAT (vs. imputed)	-.095	.189		-.099	.189	
# Life stresses	-.141	.050	**	-.141	.050	**
Job earnings (in 1000s)	-.037	.000	**	-.036	.000	**
Greatest selectivity of applied PSI	.450	.086	***	.452	.086	***
Enrolled mostly or all full-time	.796	.193	***	.806	.193	***
# High impact ed. activities	.356	.037	***	.359	.037	***
Met advisor re: academic plans	.212	.086	*	.212	.087	*
# PSIs attended	-.864	.095	***	-.869	.096	***
SES transition	-.068	.058		-.050	.063	
Diversity transition	.087	.054		.051	.065	
Academic transition	-.021	.063		-.516	.351	
L-1 Interaction Terms						
SES*SES transition				-.037	.075	
SAT*Academic transition				.047	.033	
AAPI*Diversity transition				.406	.202	*
AIAN*Diversity transition				.514	.998	
Black*Diversity transition				.046	.154	
Latino*Diversity transition				.032	.207	
Multi*Diversity transition				-.137	.276	
Intercept	1.132	.241	***	1.139	.242	***
HS Variance Component (S.D.)	.002	(0.041)		.002	(0.042)	
PSI Variance Component (S.D.)	.107	(0.327)	*	.112	(0.335)	
-2 Log Likelihood	4403.9			4419.3		

Table C3

Step by Step Results for CCHGLM Predicting Bachelor's Degree Attainment in 6 Years (N=3,080 Students, 540 HS's, 590 PSI's)

	L1 Gender, Race				L1 SES				L1 Full				L1 Transition			
	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*
Student Characteristics																
Sex: Female	.242	.086	**	5.5	.298	.086	**	6.8	.059	.102			.047	.102		
Race: AAPI (Ref.= White)	.018	.150			.143	.150			.006	.162			.027	.163		
Race: AIAN	-1.648	.755	*	-38.8	-1.517	.757	*	-36.0	-1.096	.821			-1.067	.839		
Race: Black	-.613	.149	***	-13.7	-.471	.148	**	-10.4	.101	.172			.148	.173		
Race: Latino	-.224	.172			-.022	.172			.172	.193			.194	.193		
Race: Multiracial	-.401	.215			-.353	.214			-.180	.244			-.187	.245		
SES					.579	.067	***	10.4	.263	.078	**	5.1	.255	.078	**	5.0
School place to meet friends									.111	.074			.110	.074		
HPW: Extracurriculars									.085	.027	**	1.7	.084	.027	**	1.7
Social Agency factor									-.107	.056			-.101	.056		
Math Self-Efficacy factor									-.070	.051			-.076	.051		
# Friends in diff. grade									-.080	.062			-.072	.062		
Academic GPA									.850	.106	***	14.1	.883	.109	***	14.5
SAT comp. score (in 100s)									.071	.037			.070	.037		
Took SAT (vs. imputed)									-.089	.189			-.095	.189		
# Life stresses									-.140	.050	**	-3.0	-.141	.050	**	-3.0
Job earnings (in 1000s)									-.037	.000	**	-0.8	-.037	.000	**	-0.8
Greatest selectivity of applied PSI									-.425	.083	***	-9.5	.450	.086	***	10.0
Enrolled mostly or all full-time									.795	.192	***	13.4	.796	.193	***	13.4
# High impact ed. activities									.356	.037	***	6.8	.356	.037	***	6.8
Met advisor re: academic plans									.202	.086	*	4.0	.212	.086	*	4.2
# PSIs attended													-.864	.095	***	-11.3
SES transition													-.068	.058		
Diversity transition													.087	.054		
Academic transition													-.021	.063		
School Characteristics																
Control: Private																
% Total enr is HS (in 10s)																
% FT teachers certified																
#FT guidance counselors																
% Excellent teachers																
% LEP/non-Eng. proficient																
% SPED																
% Grads to 4yr PSI (in quartiles)																
Diversity index																
% Free lunch																
PSI Characteristics																
Control: Private																
Sector: For-profit																
HBCU																
FTE																
% FTFT Degree seeking undergrads																
Tuition & fees (in 1000s)																
Offers remedial services																
Average SAT score (in 100s)																
% Undergraduate women																
Avg fed. grant amount (in 1000s)																
% Fed. grant recipients																
Avg loan amount (in 1000s)																
% loan recipients																
Diversity index																
Avg loan amount x SES																
Intercept	.600	.144	***		.514	.142	**		1.114	.241	***		1.132	.241	***	
HS Variance Component (S.D.)	.068	(0.261)			.027	(.163)			.004	(.066)			.002	(.041)		
PSI Variance Component (S.D.)	.432	(0.657)	***		.304	(.551)	***		.123	(.351)	*		.107	(.327)	*	
-2 Log Likelihood	4307.6				4318.7				4382.8				4403.9			

Table C3, continued

Step by Step Results for CCHGLM Predicting Bachelor's Degree Attainment in 6 Years (N=3,080 Students, 540 HS's, 590 PSI's)

	HS Characteristics				HS Context				PSI Characteristics				PSI Context			
	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*	Coeff.	S.E.	Sig.	Δ*P*
Student Characteristics																
Sex: Female	.066	.102			.060	.102			.075	.102			.076	.104		
Race: AAPI (Ref.= White)	.015	.172			-.006	.178			-.020	.178			-.026	.179		
Race: AIAN	-1.014	.846			-.978	.848			-.937	.843			-.783	.834		
Race: Black	.107	.174			.156	.180			.142	.197			.145	.197		
Race: Latino	.163	.197			.176	.202			.191	.203			.239	.205		
Race: Multiracial	-.256	.247			-.286	.249			-.312	.248			-.295	.249		
SES	.234	.079	**	4.6	.211	.080	**	4.1	.225	.080	**	4.4	.224	.080	**	4.4
School place to meet friends	.099	.074			.095	.074			.099	.074			.093	.074		
HPW: Extracurriculars	.089	.027	**	1.8	.090	.027	**	1.8	.090	.027	**	1.8	.090	.027	**	1.8
Social Agency factor	-.110	.056			-.108	.057			-.108	.057			-.104	.057		
Math Self-Efficacy factor	-.087	.051			-.090	.051			-.087	.051			-.088	.051		
# Friends in diff. grade	-.040	.063			-.041	.063			-.040	.063			-.048	.063		
Academic GPA	.961	.112	***	15.5	.966	.112	***	15.5	.990	.112	***	15.8	.990	.112	***	15.8
SAT comp. score (in 100s)	.054	.037			.046	.038			.059	.039			.059	.039		
Took SAT (vs. imputed)	-.082	.190			-.063	.192			-.073	.192			-.063	.193		
# Life stresses	-.142	.050	**	-3.0	-.144	.050	**	-3.1	-.148	.050	**	-3.1	-.151	.050	**	-3.2
Job earnings (in 1000s)	-.035	.000	**	-0.7	-.035	.000	**	-0.7	-.034	.000	**	-0.7	-.035	.000	**	-0.7
Greatest selectivity of applied PSI	.395	.087	***	8.7	.365	.089	***	8.0	.379	.091	***	8.4	.345	.091	***	7.6
Enrolled mostly or all full-time	.782	.193	***	13.3	.786	.193	***	13.3	.791	.193	***	13.4	.790	.194	***	13.4
# High impact ed. activities	.351	.037	***	6.7	.349	.037	***	6.6	.346	.038	***	6.6	.344	.038	***	6.6
Met advisor re: academic plans	.214	.087	*	4.2	.217	.087	*	4.3	.213	.087	*	4.2	.206	.087	*	4.0
# PSIs attended	-.868	.096	***	-11.3	-.871	.096	***	-11.3	-.878	.096	***	-11.4	-.883	.096	***	-11.4
SES transition	-.012	.060			.040	.069			.058	.074			-.001	.095		
Diversity transition	.086	.055			.109	.064			.156	.072	*	3.1	.118	.117		
Academic transition	-.002	.064			.004	.076			.151	.110			.127	.111		
School Characteristics																
Control: Private	.337	.228			.233	.235			.249	.235			.205	.238		
% Total enr is HS (in 10s)	.057	.348			.050	.353			.049	.352			.044	.354		
% FT teachers certified	-.003	.003			-.003	.003			-.003	.003			-.003	.003		
#FT guidance counselors	.063	.023	**	1.3	.056	.024	*	1.1	.053	.024	*	1.1	.048	.024	*	1.0
% Excellent teachers	-.002	.002			-.002	.002			-.002	.002			-.002	.002		
% LEP/non-Eng. proficient	-.013	.007			-.012	.008			-.011	.008			-.011	.008		
% SPED	-.016	.009			-.015	.009			-.016	.009			-.017	.009		
% Grads to 4yr PSI (in quartiles)					.037	.080			.110	.093			.101	.093		
Diversity index					.003	.003			.005	.003			.003	.005		
% Free lunch					-.006	.004			-.007	.004			-.004	.005		
PSI Characteristics																
Control: Private									-.590	.254	*	-13.4	-.486	.258		
Sector: For-profit									-.072	1.419			.017	1.399		
HBCU									.000	.327			.161	.371		
FTE									.000	.000			.000	.000		
% FTFT Degree seeking undergrads									.013	.014			.011	.014		
Tuition & fees (in 1000s)									.031	.000	*	0.6	.010	.000		
Offers remedial services									.140	.118			.094	.120		
Average SAT score (in 100s)									-.162	.095			-.116	.099		
% Undergraduate women													.002	.007		
Avg fed. grant amount (in 1000s)													-.017	.000		
% Fed. grant recipients													-.010	.007		
Avg loan amount (in 1000s)													.114	.000	*	2.3
% loan recipients													.004	.004		
Diversity index													.005	.007		
Avg loan amount x SES																
Intercept	.991	.249	***		.986	.249	***		1.742	.452	***		1.609	.460	**	
HS Variance Component (S.D.)	.001	(.033)			.001	(.034)			.001	(.023)			.001	(.032)		
PSI Variance Component (S.D.)	.074	(.271)	*		.071	(.266)	*		.036	(.189)	*		.020	(.143)	*	
-2 Log Likelihood	4410.4				4410.2				4433.7				4445.8			

Table C4

Comparison of CCHGLM with Student-, High School-, and College-Level Variables (N=3,080 Students, 540 HS's, 590 PSI's)

	Student, HS, & PSI-Level			Student and HS-Level			Student and PSI-Level		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics									
Sex: Female	.076	.104		.060	.102		.052	.103	
Race: AAPI (Ref.= White)	-.026	.179		-.006	.178		.253	.202	
Race: AIAN	-.783	.834		-.978	.848		-.876	.835	
Race: Black	.145	.197		.156	.180		.178	.194	
Race: Latino	.239	.205		.176	.202		-.207	.248	
Race: Multiracial	-.295	.249		-.286	.249		-.006	.173	
SES	.224	.080	**	.211	.080	**	.234	.080	**
School place to meet friends	.093	.074		.095	.074		.103	.074	
HPW: Extracurriculars	.090	.027	**	.090	.027	**	.083	.027	**
Social Agency factor	-.104	.057		-.108	.057		-.097	.056	
Math Self-Efficacy factor	-.088	.051		-.090	.051		-.078	.051	
# Friends in diff. grade	-.048	.063		-.041	.063		-.071	.062	
Academic GPA	.990	.112	***	.966	.112	***	.912	.110	***
SAT comp. score (in 100s)	.059	.039		.046	.038		.064	.039	
Took SAT (vs. imputed)	-.063	.193		-.063	.192		-.074	.190	
# Life stresses	-.151	.050	**	-.144	.050	**	-.144	.050	**
Job earnings (2005)	.000	.000	**	.000	.000	**	.000	.000	**
Greatest selectivity of applied PSI	.345	.091	***	.365	.089	***	.377	.091	***
Enrolled mostly or all full-time	.790	.194	***	.786	.193	***	.799	.193	***
# High impact ed. activities	.344	.038	***	.349	.037	***	.352	.038	***
Met advisor re: academic plans	.206	.087	*	.217	.087	*	.204	.086	*
# PSIs attended	-.883	.096	***	-.871	.096	***	-.876	.096	***
SES transition	-.001	.095		.040	.069		-.145	.065	*
Diversity transition	.118	.117		.109	.064		.045	.064	
Academic transition	.127	.111		.004	.076		-.014	.075	
School Characteristics									
Control: Private	.205	.238		.233	.235				
% Total enr is HS (in 10s)	.044	.354		.050	.353				
% FT teachers certified	-.003	.003		-.003	.003				
# FT guidance counselors	.048	.024	*	.056	.024	*			
% Excellent teachers	-.002	.002		-.002	.002				
% LEP/non-Eng. proficient	-.011	.008		-.012	.008				
% SPED	-.017	.009		-.015	.009				
% Grads to 4yr PSI (in quartiles)	.101	.093		.037	.080				
Diversity index	.003	.005		.003	.003				
% Free lunch	-.004	.005		-.006	.004				

Table C4, continued

Comparison of CCHGLM with Student-, High School-, and College-Level Variables (N=3,080 Students, 540 HS's, 590 PSI's)

	Student, HS, & PSI-Level			Student and HS-Level			Student and PSI-Level		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
PSI Characteristics									
Control: Private	-.486	.258					-.468	.258	
Sector: For-profit	.017	1.399					.184	1.367	
HBCU	.161	.371					.374	.365	
FTE	.000	.000					.000	.000	
% FTFT Degree seeking undergrads	.011	.014					.013	.014	
Tuition & fees (in 1000s)	.010	.000					.011	.000	
Offers remedial services	.094	.120					.060	.122	
Average SAT score (in 100s)	-.116	.099					-.041	.089	
% Undergraduate women	.002	.007					.002	.007	
Avg fed. grant amount (in 1000s)	-.017	.000					-.034	.000	
% Fed. grant recipients	-.010	.007					-.018	.006	**
Avg loan amount (in 1000s)	.114	.000	*				.111	.000	*
% loan recipients	.004	.004					.004	.004	
Diversity index	.005	.007					.008	.004	
Intercept	1.609	.460	**	.986	.249	***	1.694	.458	***
HS Variance Component (S.D.)	.001	(.032)		.001	(.034)		.001	(.035)	
PSI Variance Component (S.D.)	.020	(.143)	*	.071	(.266)	*	.052	(.227)	
-2 Log Likelihood	4445.8			4410.2			4435.8		

Table C5

CCHGLM Using Alternative PSI Racial Composition Measures (N=3,080 Students, 590 PSI's)

	No Div measure			Diversity Index			% AAPI			% Black			% Latino			% White		
Student Characteristics	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Sex: Female	.053	.103		.052	.103		.058	.103		.050	.103		.058	.103		.056	.103	
Race: AAPI (Ref.= White)	.085	.167		-.006	.173		-.025	.177		.096	.167		.065	.167		-.047	.174	
Race: AIAN	-.901	.839		-.876	.835		-.904	.839		-.863	.840		-.888	.836		-.859	.834	
Race: Black	.228	.192		.178	.194		.210	.192		.197	.194		.226	.192		.173	.193	
Race: Latino	.318	.199		.253	.202		.278	.200		.330	.199		.237	.208		.188	.204	
Race: Multiracial	-.142	.245		-.207	.248		-.227	.250		-.136	.245		-.153	.245		-.231	.248	
SES	.234	.080	**	.234	.080	**	.235	.080	**	.231	.080	**	.232	.080	**	.231	.080	**
School place to meet friends	.100	.074		.103	.074		.098	.074		.103	.074		.104	.074		.104	.074	
HPW: Extracurriculars	.082	.027	**	.083	.027	**	.083	.027	**	.082	.027	**	.082	.027	**	.084	.027	**
Social Agency factor	-.092	.056		-.097	.056		-.093	.056		-.094	.056		-.095	.056		-.101	.056	
Math Self-Efficacy factor	-.079	.051		-.078	.051		-.075	.051		-.081	.051		-.076	.051		-.072	.051	
# Friends in diff. grade	-.067	.062		-.071	.062		-.071	.062		-.069	.062		-.065	.062		-.072	.062	
Academic GPA	.896	.110	***	.912	.110	***	.895	.110	***	.902	.110	***	.896	.110	***	.905	.110	***
SAT comp. score (in 100s)	.066	.039		.064	.039		.063	.039		.066	.039		.065	.039		.063	.039	
Took SAT (vs. imputed)	-.090	.190		-.074	.190		-.073	.190		-.098	.190		-.088	.190		-.072	.190	
# Life stresses	-.142	.050	**	-.144	.050	**	-.144	.050	**	-.143	.050	**	-.142	.050	**	-.148	.050	**
Job earnings (in 1000s)	-.037	.000	**	-.037	.000	**	-.037	.000	**	-.038	.000	**	-.037	.000	**	-.037	.000	**
Greatest selectivity of applied PSI	.386	.091	***	.377	.091	***	.383	.091	***	.385	.091	***	.384	.091	***	.377	.091	***
Enrolled mostly or all full-time	.810	.193	***	.799	.193	***	.812	.193	***	.808	.192	***	.807	.193	***	.803	.193	***
# High impact ed. activities	.351	.038	***	.352	.038	***	.349	.038	***	.352	.038	***	.352	.038	***	.352	.038	***
Met advisor re: academic plans	.203	.086	*	.204	.086	*	.213	.087	*	.198	.087	*	.203	.086	*	.208	.087	*
# PSIs attended	-.874	.096	***	-.876	.096	***	-.871	.096	***	-.873	.096	***	-.877	.096	***	-.879	.096	***
SES transition	-.153	.065	*	-.145	.065	*	-.139	.065	*	-.155	.065	*	-.149	.065	*	-.143	.065	*
Diversity transition	.088	.059		.045	.064		.073	.060		.084	.059		.087	.059		.046	.062	
Academic transition	.004	.075		-.014	.075		-.008	.075		.007	.075		-.004	.075		-.015	.075	
PSI Characteristics																		
Control: Private	-.493	.260		-.468	.258		-.456	.259		-.482	.260		-.487	.260		-.458	.257	
Sector: For-profit	.284	1.389		.184	1.367		.314	1.383		.281	1.382		.289	1.381		.227	1.357	
HBCU	.237	.359		.374	.365		.241	.357		-.417	.687		.329	.365		-.396	.440	
FTE	.000	.000		.000	.000		.000	.000		.000	.000		.000	.000		.000	.000	
% FTFT Degree seeking UG's	.005	.014		.013	.014		.008	.014		.007	.014		.006	.014		.014	.014	
Tuition & fees (in 1000s)	.018	.000		.011	.000		.016	.000		.018	.000		.014	.000		.008	.000	
Offers remedial services	.058	.123		.060	.122		.064	.122		.057	.122		.061	.122		.068	.121	
Average SAT score (in 100s)	-.053	.089		-.041	.089		-.062	.089		-.051	.089		-.031	.090		-.024	.089	
% Undergraduate women	.002	.007		.002	.007		.003	.007		.002	.007		.003	.007		.003	.007	
Avg fed. grant amount (in 1000s)	-.030	.000		-.034	.000		-.033	.000		-.032	.000		-.033	.000		-.038	.000	
% Fed. grant recipients	-.016	.006	*	-.018	.006	**	-.017	.006	**	-.018	.007	**	-.018	.007	**	-.021	.007	**
Avg loan amount (in 1000s)	.115	.000	*	.111	.000	*	.114	.000	*	.116	.000	*	.113	.000	*	.109	.000	*
% loan recipients	.001	.004		.004	.004		.003	.004		.002	.004		.003	.004		.005	.004	
Diversity Measure				.008	.004		.013	.007		.009	.008		.008	.006		-.010	.004	*
Intercept	1.728	.460		1.694	.458		1.663	.459		1.755	.459		1.754	.449		1.711	.456	
HS Variance Component (S.D.)	.001	(.036)		.001	(.035)		.001	(.039)		.001	(.035)		.001	(.036)		.001	(.036)	
PSI Variance Component (S.D.)	.064	(.254)	*	.052	(.227)	*	.053	(.230)	*	.061	(.246)	*	.059	(.243)	*	.044	(.209)	*
-2 Log Likelihood	4425.0			4435.8			4439.3			4423.9			4430.2			4445.7		

Table C6

Cross-Level Interaction Effect Models for CCHGLM Using Alternative PSI Racial Composition Measures (N=3,080 Students, 590 PSI's)

	Diversity Index			% AAPI			% Black			% Latino			% White		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics															
Sex: Female	.054	.103		.052	.103		.052	.103		.060	.103		.059	.103	
Race: AAPI (Ref.= White)	-.112	.205		-.008	.195		.268	.206		-.004	.172		-.121	.182	
Race: AIAN	-.843	.873		-.633	1.029		-4.059	5.264		-.963	.935		-.837	.925	
Race: Black	.208	.195		.189	.192		.220	.200		.208	.194		.211	.196	
Race: Latino	.256	.221		.254	.207		.350	.203		.323	.222		.213	.218	
Race: Multiracial	-.336	.281		-.200	.270		-.138	.251		-.208	.250		-.257	.257	
SES	.231	.080	**	.236	.080	**	.232	.080	**	.229	.080	**	.232	.080	**
School place to meet friends	.103	.074		.096	.074		.100	.074		.107	.074		.103	.074	
HPW: Extracurriculars	.084	.027	**	.083	.027	**	.083	.027	**	.083	.027	**	.084	.027	**
Social Agency factor	-.096	.057		-.093	.057		-.093	.057		-.094	.057		-.098	.057	
Math Self-Efficacy factor	-.076	.051		-.077	.051		-.084	.051		-.076	.051		-.070	.051	
# Friends in diff. grade	-.068	.062		-.072	.062		-.069	.062		-.063	.062		-.072	.062	
Academic GPA	.910	.110	***	.898	.110	***	.905	.110	***	.897	.110	***	.904	.110	***
SAT comp. score (in 100s)	.062	.039		.065	.039		.066	.039		.061	.039		.060	.039	
Took SAT (vs. imputed)	-.067	.191		-.080	.190		-.090	.190		-.081	.190		-.057	.190	
# Life stresses	-.143	.050	**	-.145	.050	**	-.141	.050	**	-.143	.050	**	-.149	.050	**
Job earnings (in 1000s)	-.037	.000	**	-.037	.010	**	-.037	.000	**	-.036	.000	**	-.036	.000	**
Greatest selectivity of applied PSI	.382	.091	***	.382	-.091	***	.377	.091	***	.389	.092	***	.378	.091	***
Enrolled mostly or all full-time	.804	.193	***	.814	.193	***	.814	.193	***	.804	.194	***	.812	.194	***
# High impact ed. activities	.351	.038	***	.350	.038	***	.353	.038	***	.351	.038	***	.352	.038	***
Met advisor re: academic plans	.206	.087	*	.217	.087	*	.199	.087	*	.203	.087	*	.209	.087	*
# PSIs attended	-.879	.096	***	-.873	.096	***	-.873	.096	***	-.882	.096	***	-.882	.096	***
SES transition	-.141	.065	*	-.138	.065	*	-.160	.065	*	-.144	.065	*	-.141	.065	*
Diversity transition	.051	.064		.069	.060		.086	.059		.091	.059		.054	.062	
Academic transition	-.017	.075		-.008	.075		.012	.075		-.013	.075		-.015	.075	
PSI Characteristics															
Control: Private	-.460	.259		-.442	.260		-.483	.261		-.468	.261		-.460	.258	
Sector: For-profit	.233	1.376		.310	1.384		.315	1.370		.325	1.378		.275	1.364	
HBCU	.140	.424		.149	.370		-.273	.874		.281	.375		.071	.603	
FTE	.000	.000		.000	.000		.000	.000		.000	.000		.000	.000	
% FTFT Degree seeking UG's	.011	.015		.007	.014		.007	.014		.006	.014		.012	.014	
Tuition & fees	.000	.000		.000	.000		.000	.000		.000	.000		.000	.000	
Offers remedial services	.064	.123		.063	.122		.058	.123		.054	.123		.071	.122	
Average SAT score (in 100s)	-.032	.089		-.065	.089		-.053	.089		-.014	.091		-.017	.090	
% Undergraduate women	.003	.007		.003	.007		.002	.007		.003	.007		.003	.007	
Avg fed. grant amount (in 1000s)	-.032	.000		-.034	.000		-.030	.000		-.034	.000		-.037	.000	
% Fed. grant recipients	-.018	.006	**	-.017	.006	**	-.018	.007	**	-.019	.007	**	-.021	.007	**
Avg loan amount (in 1000s)	.113	.000	*	.113	.000	*	.113	.000	*	.116	.000	*	.112	.000	*
% loan recipients	.004	.004		.003	.004		.002	.004		.004	.004		.006	.004	
Diversity Measures & Interactions															
____ (Diversity Measure)	.007	.005		.018	.013		.005	.009		.009	.010		-.007	.005	
AAPI*____	.009	.010		-.007	.016		.037	.025		.022	.018		-.012	.008	
AIAN*____	.007	.045		.236	.320		-.368	.583		-.045	.164		-.003	.046	
Black*____	-.010	.010		-.030	.032		.002	.011		-.020	.024		.006	.009	
Latino*____	.001	.010		.001	.022		.007	.017		-.007	.013		-.002	.008	
Multiracial*_____	.016	.016		-.009	.020		-.001	.020		.045	.031		-.008	.012	
Intercept	1.668	.459	**	1.666	.459	**	1.731	.462	***	1.681	.461	***	1.673	.459	***
HS Variance Component (S.D.)	.001	(.034)		.001	(.038)		.001	(.036)		.001	(.037)		.002	(.040)	
PSI Variance Component (S.D.)	.057	(.238)	*	.053	(.230)	*	.063	(.252)	*	.067	(.259)	*	.047	(.216)	*
-2 Log Likelihood	4438.8			4437.4			-4415.8			4429.6			4456.4		

Table C7

Descriptive Statistics for Variables Included in CCHGLM Predicting Degree Completion, with Climate Measures (N=2,090 Students, 500 High Schools, 390 PSIs)

	Mean	SD	Min.	Max.
Outcome				
Bachelor's degree within 6 years	0.74	0.44	0.00	1.00
LEVEL-ONE				
Demographics				
Sex: Female	1.53	0.50	1.00	2.00
Race: AAPI (Ref.= White)	0.11	0.31	0.00	1.00
Race: AIAN	0.00	0.05	0.00	1.00
Race: Black	0.08	0.27	0.00	1.00
Race: Latino	0.06	0.24	0.00	1.00
Race: Multiracial	0.04	0.19	0.00	1.00
SES	0.52	0.67	-0.99	1.97
HS Attitudes & Experiences				
HPW: Extracurriculars	3.95	1.79	1.00	8.00
Social Agency factor	0.02	0.84	-2.10	1.53
Math Self-Efficacy factor	0.28	0.99	-2.08	1.85
# Friends in different grade	0.41	0.72	0.00	3.00
HS Academic Indicators				
Academic GPA	3.23	0.54	0.78	4.30
SAT comp. score (in hundreds)	11.24	1.78	4.20	16.00
Took SAT (vs. imputed)	0.94	0.23	0.00	1.00
Transition & College Experiences				
# Life stresses	0.82	0.92	0.00	6.00
Job earnings (2005, in thousands)	3.84	4.57	0.00	76.00
Greatest selectivity of applied PSI	5.66	0.55	1.00	6.00
Enrolled mostly or all full-time	2.96	0.26	1.00	3.00
# High impact ed. activities	1.82	1.48	0.00	6.00
Met advisor re: academic plans	2.21	0.55	1.00	3.00
# PSIs attended	1.48	0.50	1.00	2.00
SES transition	0.01	0.95	-2.00	2.00
Diversity transition	0.17	0.92	-2.00	2.00
Academic transition	-0.04	0.89	-2.00	2.00

Table C7, continued

Descriptive Statistics for Variables Included in CCHGLM Predicting Degree Completion, with Climate Measures (N=2,090 Students, 500 High Schools, 390 PSIs)

	Mean	SD	Min.	Max.
LEVEL-TWO				
High School Characteristics				
Control: Private	0.27	0.44	0.00	1.00
% Total enr is HS (in tens)	8.20	2.80	1.10	10.00
% FT teachers certified	90.88	19.79	0.00	101.53
#FT guidance counselors	3.91	2.55	-0.77	16.00
% Excellent teachers	40.56	25.21	2.00	100.00
% LEP/non-Eng. proficient	4.29	7.72	-0.07	50.00
% SPED	10.10	7.13	0.00	31.00
% Grads to 4yr PSI	2.81	0.99	1.00	4.00
% Free lunch	30.98	20.96	0.00	74.88
Diversity index	16.88	18.18	0.00	100.00
College Structure				
Control: Private	1.53	0.50	1.00	2.00
Sector: For-profit	0.00	0.00	0.00	0.00
HBCU	0.04	0.19	0.00	1.00
FTE	9788.88	9421.38	655.00	47173.67
% FTFT Degree seeking undergrads	20.42	4.86	7.67	35.67
Tuition & fees (in thousands)	15.46	10.30	6.02	36.08
Offers remedial services	0.66	0.47	0.00	1.00
Average SAT score (in hundreds)	11.25	1.42	7.70	15.25
College Composition				
% Undergraduate women	55.56	10.56	0.00	100.00
Avg fed. Grant amount (in thousands)	3.47	1.11	1.36	18.31
% Fed. grant recipients	25.31	13.58	4.33	84.00
Avg loan amount (in thousands)	4.39	1.42	1.76	11.51
% loan recipients	54.69	17.78	4.67	92.67
Diversity index	41.43	17.58	1.48	76.86
College Climate				
Social/Pluralistic Goals factor	-0.01	0.20	-0.50	0.68
Racism not problem	1.89	0.13	1.36	2.21
Likely to socialize w/ students of diff. race	3.59	0.15	3.20	3.93

Appendix D: Tables for Multilevel Models Predicting Time to Degree

Table D1

Descriptive Statistics for Variables Included in CCHLM Predicting Time to Bachelor's Degree (N=2,430 students, 550 HS's, 640 PSI's)

	Mean	SD	Min.	Max.
Outcome				
Time to degree (in months)	52.32	11.48	29.00	105.00
LEVEL-ONE				
Demographics				
Sex: Female	1.55	0.50	1.00	2.00
Race: AAPI (Ref.= White)	0.11	0.31	0.00	1.00
Race: AIAN	0.00	0.04	0.00	1.00
Race: Black	0.07	0.26	0.00	1.00
Race: Latino	0.07	0.25	0.00	1.00
Race: Multiracial	0.04	0.18	0.00	1.00
SES	0.55	0.66	-0.99	1.97
HS Attitudes & Experiences				
HPW: Extracurriculars	4.02	1.75	1.00	8.00
Social Agency factor	0.02	0.85	-2.10	1.53
Math Self-Efficacy factor	0.25	0.99	-2.08	1.85
# Friends in different grade	0.40	0.71	0.00	3.00
HS Academic Indicators				
Academic GPA	3.28	0.52	0.88	4.30
SAT comp. score (in hundreds)	11.25	1.74	4.20	16.00
Took SAT (vs. imputed)	0.94	0.24	0.00	1.00
Transition & College Experiences				
# Life stresses	0.77	0.89	0.00	7.00
Job earnings (2005, in thousands)	3.51	3.98	0.00	76.00
Greatest selectivity of applied PSI	5.66	0.55	1.00	6.00
Enrolled mostly or all full-time	2.98	0.16	1.00	3.00
# High impact ed. activities	1.99	1.44	0.00	6.00
Met advisor re: academic plans	2.23	0.55	1.00	3.00
# PSIs attended	1.45	0.50	1.00	2.00
SES transition	-0.02	0.95	-2.00	2.00
Diversity transition	0.14	0.95	-2.00	2.00
Academic transition	-0.09	0.92	-2.00	2.00

Table D1, continued

Descriptive Statistics for Variables Included in CCHLM Predicting Time to Bachelor's Degree (N=2,430 students, 550 HS's, 640 PSI's)

	Mean	SD	Min.	Max.
LEVEL-TWO				
High School Characteristics				
Control: Private	0.26	0.44	0.00	1.00
% Total enr is HS (in tens)	8.30	2.80	1.10	10.00
% FT teachers certified	91.09	19.46	0.00	100.00
#FT guidance counselors	3.86	2.57	-0.77	16.00
% Excellent teachers	39.79	24.98	0.00	100.00
% LEP/non-Eng. proficient	4.70	8.54	-0.07	50.00
% SPED	10.28	7.27	0.00	31.00
% Grads to 4yr PSI	2.77	1.00	1.00	4.00
% Free lunch	31.40	20.89	0.00	74.88
Diversity index	17.01	17.83	0.00	100.00
College Structure				
Control: Private	1.47	0.50	1.00	2.00
Sector: For-profit	0.00	0.06	0.00	1.00
HBCU	0.04	0.20	0.00	1.00
FTE	9313.72	8990.60	347.00	47173.67
% FTFT Degree seeking undergrads	20.04	5.33	6.33	55.00
Tuition & fees (in thousands)	13.67	9.87	1.71	36.08
Offers remedial services	0.69	0.46	0.00	1.00
Average SAT score (in hundreds)	10.99	1.37	7.70	15.25
College Composition				
% Undergraduate women	55.55	9.89	0.00	100.00
Avg fed. Grant amount (in thousands)	3.33	0.97	1.36	18.31
% Fed. grant recipients	26.85	14.10	4.33	81.33
Avg loan amount (in thousands)	4.24	1.36	1.76	11.51
% loan recipients	54.10	17.77	2.00	92.67
Diversity index	40.52	17.58	4.82	78.56
% AAPI	5.26	7.40	0.00	62.78
% AIAN	0.66	1.47	0.01	29.23
% Black	11.26	18.11	0.25	97.44
% Latino	5.88	9.39	0.07	91.92
% White	68.29	22.08	0.18	97.55
% Non-Resident alien or unknown	8.65	7.84	0.00	53.18

Table D2

Step-by-Step Results for CCHLM Predicting Time to Degree (N=2,430 students, 550 HS's, 640 PSI's

	Sex, Race			SES			Student Experiences			Transition		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics												
Sex: Female	-1.888	.462	***	-2.024	.461	***	-1.287	.479	**	-1.396	.479	**
Race: AAPI (Ref.= White)	.587	.775		.338	.773		.766	.749		.717	.750	
Race: AIAN	4.792	5.615		4.528	5.589		1.904	5.356		.934	5.348	
Race: Black	4.175	.912	***	3.748	.912	***	.815	.919		.593	.921	
Race: Latino	3.093	.936	**	2.451	.942	*	1.341	.914		1.327	.913	
Race: Multi	1.375	1.243		1.201	1.239		1.024	1.192		1.104	1.188	
SES				-1.630	.357	***	-.558	.365		-.576	.365	
School place to meet friends							-.212	.349		-.216	.348	
HPW: Extracurriculars							-.448	.128	**	-.445	.127	**
Social Agency factor							.365	.262		.314	.261	
Math Self-Efficacy factor							.173	.234		.179	.234	
# Friends in diff. grade							.191	.307		.190	.306	
Academic GPA							-3.867	.544	***	-3.941	.555	***
SAT comp. score (in 100s)							-.667	.172	***	-.665	.172	***
Took SAT (vs. imputed)							-.985	.928		-.930	.924	
# Life stresses							.304	.244		.322	.243	
Job earnings (in 1000s)							.177	.000	**	.177	.000	**
Greatest selectivity of applied PSI							1.435	.457	**	-1.556	.469	**
Enrolled mostly or all full-time							-4.761	1.371	**	-4.612	1.369	**
# High impact ed. activities							-.090	.157		-.088	.157	
Met advisor re: academic plans							-.545	.408		-.486	.409	
# PSIs attended										1.145	.438	**
SES transition										.823	.297	**
Diversity transition										.100	.270	
Academic transition										-.402	.324	
School Characteristics												
Control: Private												
% Total enr is HS (in 10s)												
% FT teachers certified												
# FT guidance counselors												
% Excellent teachers												
% LEP/non-Eng. proficient												
% SPED												
% Grads to 4yr PSI (in quartiles)												
% Free lunch												
Diversity index												
PSI Characteristics												
Control: Private												
Sector: For-profit												
HBCU												
FTE												
% FTFT Degree seeking undergrads												
Tuition & fees (in 1000s)												
Offers remedial services												
Average SAT score (in 100s)												
% Undergraduate women												
Avg fed. grant amount (in 1000s)												
% Fed. grant recipients												
Avg loan amount (in 1000s)												
% loan recipients												
Diversity index												
Intercept	54.763	.801	***	55.014	.797	***	54.910	1.183	***	53.393	1.310	***
Level-1 Variance Component (S.D.)	107.932	(10.389)		108.016	(10.393)		101.561	(10.078)		101.516	(10.076)	
HS Variance Component (S.D.)	5.345	2.312	***	5.196	2.279	***	6.226	2.495	***	5.415	(2.327)	***
PSI Variance Component (S.D.)	16.058	4.007	***	14.422	3.798	***	7.651	2.766	***	7.624	(2.761)	***
Deviance	18636.6			18616.1			18404.8			18389.9		
-2 Log Likelihood	9318.3			9308.0			9202.4			9194.9		

Table D2, continued

Step-by-Step Results for CCHLM Predicting Time to Degree (N=2,430 students, 550 HS's, 640 PSI's

	HS Characteristics			HS Peer Contexts			PSI Characteristics			PSI Peer Contexts		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics												
Sex: Female	-1.397	.477	**	-1.367	.477	**	-1.394	.475	**	-1.284	.481	**
Race: AAPI (Ref.= White)	.878	.774		.690	.790		.670	.786		.583	.786	
Race: AIAN	.709	5.330		.474	5.334		2.076	5.352		1.714	5.341	
Race: Black	.715	.918		.328	.937		.450	1.015		.467	1.015	
Race: Latino	1.176	.919		.932	.930		.964	.927		.750	.931	
Race: Multi	1.246	1.191		1.097	1.199		1.005	1.193		.841	1.192	
SES	-.554	.368		-.492	.370		-.432	.370		-.404	.370	
School place to meet friends	-.150	.347		-.149	.347		-.207	.346		-.191	.346	
HPW: Extracurriculars	-.466	.127	***	-.459	.127	**	-.418	.127	**	-.425	.127	**
Social Agency factor	.314	.261		.294	.261		.304	.260		.294	.260	
Math Self-Efficacy factor	.187	.233		.202	.233		.231	.232		.234	.232	
# Friends in diff. grade	.157	.306		.141	.306		.138	.305		.157	.305	
Academic GPA	-4.175	.561	***	-4.147	.562	***	-4.098	.559	***	-4.104	.558	***
SAT comp. score (in 100s)	-.634	.173	***	-.615	.176	**	-.556	.181	**	-.575	.181	**
Took SAT (vs. imputed)	-1.015	.923		-.995	.927		-.905	.921		-.964	.922	
# Life stresses	.321	.242		.311	.242		.248	.241		.260	.241	
Job earnings (in 1000s)	.169	.000	**	.168	.000	**	.145	.000	*	.145	.000	*
Greatest selectivity of applied PSI	-1.476	.477	**	-1.336	.491	**	-1.117	.493	*	-.946	.496	
Enrolled mostly or all full-time	-4.681	1.365	**	-4.799	1.365	**	-4.905	1.361	**	-4.818	1.360	**
# High impact ed. activities	-.062	.156		-.063	.156		.026	.157		.038	.157	
Met advisor re: academic plans	-.414	.408		-.408	.408		-.176	.409		-.162	.409	
# PSIs attended	1.142	.438	**	1.139	.438	*	1.164	.436	**	1.116	.436	*
SES transition	.778	.306	*	.462	.363		.799	.383	*	1.005	.492	*
Diversity transition	.000	.272		.186	.322		.146	.362		-.252	.588	
Academic transition	-.360	.335		-.368	.396		-.015	.536		.208	.537	
School Characteristics												
Control: Private	-.171	1.205		.153	1.230		.100	1.200		.281	1.213	
% Total enr is HS (in 10s)	-.223	1.845		-.217	1.859		-.261	1.816		-.246	1.822	
% FT teachers certified	.026	.014		.027	.014	*	.023	.013		.023	.014	
# FT guidance counselors	-.321	.112	**	-.323	.115	**	-.298	.113	**	-.294	.113	*
% Excellent teachers	-.014	.010		-.014	.010		-.013	.010		-.014	.010	
% LEP/non-Eng. proficient	.100	.038	**	.074	.040		.072	.039		.072	.039	
% SPED	-.016	.046		-.018	.046		-.013	.045		.005	.046	
% Grads to 4yr PSI (in quartiles)				-.064	.418		.248	.473		.439	.475	
% Free lunch				.037	.022		.025	.022		.015	.025	
Diversity index				.017	.017		.008	.018		-.010	.027	
PSI Characteristics												
Control: Private							2.156	1.310		2.440	1.309	
Sector: For-profit							8.170	6.309		6.149	6.357	
HBCU							.401	1.821		-.552	2.007	
FTE							.000	.000		.000	.000	
% FTFT Degree seeking undergrads							-.174	.072	*	-.168	.074	*
Tuition & fees (in 1000s)							-.168	.000	*	-.132	.000	
Offers remedial services							.423	.598		.618	.599	
Average SAT score (in 100s)							-.001	.440		-.512	.471	
% Undergraduate women										-.066	.031	*
Avg fed. grant amount (in 1000s)										.270	.000	
% Fed. grant recipients										.047	.040	
Avg loan amount (in 1000s)										.002	.000	
% loan recipients										-.048	.022	*
Diversity index										.015	.033	
Intercept	53.529	1.344	***	53.609	1.344	***	49.790	2.379	***	49.147	2.399	***
Level-1 Variance Component (S.D.)	101.373	(10.078)		101.200	(10.060)		101.619	(10.081)		101.780	(10.089)	
HS Variance Component (S.D.)	4.267	(2.066)	***	4.112	(2.028)	***	3.177	(1.782)	***	3.276	(1.810)	***
PSI Variance Component (S.D.)	7.626	(2.762)	***	7.756	(2.785)	***	6.422	(2.534)	***	5.432	(2.331)	***
Deviance	18366.8			18362.3			18333.2			18321.8		
-2 Log Likelihood	9183.4			9181.1			9166.6			9160.9		

Table D3

CCHLM with Alternative PSI Diversity Measures (N=2,430 Students, 550 HS's, 640 PSI's)

	No Div Measure			Diversity Index			% AAPI		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics									
Sex: Female	-1.274	.480	**	-1.284	.481	**	-1.286	.480	**
Race: AAPI (Ref.= White)	.604	.785		.583	.786		.872	.801	
Race: AIAN	1.704	5.342		1.714	5.341		1.828	5.339	
Race: Black	.481	1.014		.467	1.015		.494	1.014	
Race: Latino	.776	.930		.750	.931		.830	.930	
Race: Multi	.853	1.191		.841	1.192		1.094	1.200	
SES	-.405	.370		-.404	.370		-.414	.370	
School place to meet friends	-.196	.345		-.191	.346		-.191	.345	
HPW: Extracurriculars	-.424	.127	**	-.425	.127	**	-.428	.127	**
Social Agency factor	.294	.260		.294	.260		.293	.260	
Math Self-Efficacy factor	.235	.232		.234	.232		.222	.232	
# Friends in diff. grade	.157	.305		.157	.305		.165	.305	
Academic GPA	-4.104	.558	***	-4.104	.558	***	-4.083	.558	***
SAT comp. score (in 100s)	-.574	.181	**	-.575	.181	**	-.564	.181	**
Took SAT (vs. imputed)	-.950	.922		-.964	.922		-.971	.921	
# Life stresses	.260	.241		.260	.241		.272	.241	
Job earnings (in 1000s)	.145	.000	*	.145	.000	*	.143	.000	*
Greatest selectivity of applied PSI	-.938	.496		-.946	.496		-.929	.496	
Enrolled mostly or all full-time	-4.817	1.360	**	-4.818	1.360	**	-4.858	1.360	**
# High impact ed. activities	.037	.157		.038	.157		.046	.157	
Met advisor re: academic plans	-.159	.409		-.162	.409		-.200	.409	
# PSIs attended	1.116	.436	*	1.116	.436	*	1.102	.436	*
SES transition	.964	.484	*	1.005	.492	*	.864	.486	
Diversity transition	-.040	.364		-.252	.588		.164	.383	
Academic transition	.205	.538		.208	.537		.203	.535	
School Characteristics									
Control: Private	.238	1.208		.281	1.213		.184	1.203	
% Total enr is HS (in 10s)	-.250	1.818		-.246	1.822		-.260	1.812	
% FT teachers certified	.023	.014		.023	.014		.022	.013	
#FT guidance counselors	-.291	.113	*	-.294	.113	*	-.285	.113	*
% Excellent teachers	-.014	.010		-.014	.010		-.014	.010	
% LEP/non-Eng. proficient	.072	.039		.072	.039		.077	.039	
% SPED	.005	.046		.005	.046		.002	.046	
% Grads to 4yr PSI (in quartiles)	.426	.474		.439	.475		.381	.473	
% Free lunch	.016	.025		.015	.025		.018	.025	
Diversity index	-.001	.018		-.010	.027		.007	.019	
PSI Characteristics									
Control: Private	2.402	1.308		2.440	1.309		2.268	1.305	
Sector: For-profit	6.185	6.359		6.149	6.357		5.927	6.351	
HBCU	-.706	1.978		-.552	2.007		-.720	1.973	
FTE	.000	.000		.000	.000		.000	.000	
% FTFT Degree seeking UG's	-.172	.074	*	-.168	.074	*	-.171	.073	*
Tuition & fees (in 1000s)	-.126	.000		-.132	.000		-.121	.000	
Offers remedial services	.619	.600		.618	.599		.590	.597	
Average SAT score (in 100s)	-.510	.471		-.512	.471		-.419	.472	
% Undergraduate women	-.065	.031	*	-.066	.031	*	-.067	.030	*
Avg fed. grant amount (in 1000s)	.273	.000		.270	.000		.277	.000	
% Fed. grant recipients	.047	.040		.047	.040		.050	.040	
Avg loan amount (in 1000s)	.003	.000		.002	.000		.010	.000	
% loan recipients	-.050	.022	*	-.048	.022	*	-.055	.022	*
Diversity Measure				.015	.033		-.064	.038	
Intercept	49.218	2.394	***	49.147	2.399	***	49.526	2.393	***
Level-1 Variance Component (S.D.)	101.775	(10.088)		101.780	(10.089)		101.962	(10.098)	
HS Variance Component (S.D.)	3.237	(1.799)	***	3.276	(1.810)	***	3.090	(1.758)	***
PSI Variance Component (S.D.)	5.493	(2.343)	***	5.432	(2.331)	***	5.248	(2.291)	***
Deviance	18322.0			18321.8			18319.2		
-2 Log Likelihood	9161.0			9160.9			9159.6		

Table D3, continued

CCHLM with Alternative PSI Diversity Measures (N=2,430 Students, 550 HS's, 640 PSI's)

	% Black			% Latino			% White		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics									
Sex: Female	-1.286	.480	**	-1.270	.480	**	-1.272	.480	**
Race: AAPI (Ref.= White)	.742	.786		.622	.785		.623	.791	
Race: AIAN	1.968	5.335		1.633	5.341		1.702	5.342	
Race: Black	.235	1.018		.452	1.014		.486	1.015	
Race: Latino	.904	.930		.978	.949		.800	.938	
Race: Multi	1.053	1.193		.855	1.191		.865	1.193	
SES	-.431	.370		-.405	.370		-.405	.370	
School place to meet friends	-.183	.345		-.214	.346		-.198	.346	
HPW: Extracurriculars	-.419	.127	**	-.425	.127	**	-.425	.127	**
Social Agency factor	.287	.260		.295	.260		.295	.260	
Math Self-Efficacy factor	.202	.232		.228	.232		.234	.232	
# Friends in diff. grade	.145	.305		.154	.305		.158	.305	
Academic GPA	-4.075	.557	***	-4.084	.558	***	-4.099	.559	***
SAT comp. score (in 100s)	-.574	.180	**	-.575	.180	**	-.574	.181	**
Took SAT (vs. imputed)	-1.141	.924		-.973	.922		-.947	.922	
# Life stresses	.258	.241		.259	.241		.262	.241	
Job earnings (in 1000s)	.145	.000	*	.143	.000	*	.145	.000	*
Greatest selectivity of applied PSI	-.929	.495		-.907	.497		-.935	.497	
Enrolled mostly or all full-time	-4.849	1.359	**	-4.840	1.360	**	-4.819	1.360	**
# High impact ed. activities	.050	.157		.032	.157		.037	.157	
Met advisor re: academic plans	-.209	.409		-.156	.409		-.160	.409	
# PSIs attended	1.119	.436	*	1.116	.436	*	1.117	.436	*
SES transition	1.015	.481	*	.973	.483	*	.956	.486	*
Diversity transition	-.242	.368		.027	.369		.017	.465	
Academic transition	.232	.533		.232	.537		.205	.538	
School Characteristics									
Control: Private	.294	1.201		.287	1.207		.229	1.208	
% Total enr is HS (in 10s)	-.253	1.808		-.243	1.817		-.251	1.817	
% FT teachers certified	.024	.013		.023	.013		.023	.014	
#FT guidance counselors	-.288	.112	*	-.282	.113	*	-.290	.113	*
% Excellent teachers	-.014	.010		-.014	.010		-.014	.010	
% LEP/non-Eng. proficient	.087	.040	*	.074	.039		.072	.039	
% SPED	.003	.045		.003	.046		.004	.046	
% Grads to 4yr PSI (in quartiles)	.370	.471		.425	.474		.424	.474	
% Free lunch	.011	.025		.015	.025		.016	.025	
Diversity index	-.013	.019		.002	.018		.002	.022	
PSI Characteristics									
Control: Private	2.519	1.294		2.416	1.304		2.388	1.310	
Sector: For-profit	6.393	6.335		6.007	6.355		6.169	6.359	
HBCU	-8.892	3.792	*	-1.120	2.011		-.359	2.653	
FTE	.000	.000		.000	.000		.000	.000	
% FTFT Degree seeking UG's	-.156	.073	*	-.173	.073	*	-.174	.074	*
Tuition & fees (in 1000s)	-.130	.000		-.116	.000		-.123	.000	
Offers remedial services	.587	.592		.626	.598		.615	.600	
Average SAT score (in 100s)	-.470	.466		-.593	.476		-.516	.472	
% Undergraduate women	-.073	.030	*	-.066	.030	*	-.065	.031	*
Avg fed. grant amount (in 1000s)	.249	.000		.290	.000		.275	.000	
% Fed. grant recipients	.033	.040		.059	.042		.049	.042	
Avg loan amount (in 1000s)	.018	.000		.003	.000		.004	.000	
% loan recipients	-.047	.022	*	-.057	.023	*	-.051	.023	*
Diversity Measure	.110	.044	*	-.040	.038		.005	.026	
Intercept	49.567	2.379	***	49.218	2.390	***	49.227	2.395	***
Level-1 Variance Component (S.D.)	102.151	(10.107)		101.892	(10.094)		101.795	(10.089)	
HS Variance Component (S.D.)	3.059	(1.749)	***	3.187	(1.785)	***	3.211	(1.792)	***
PSI Variance Component (S.D.)	4.844	(2.201)	***	5.329	(2.309)	***	5.493	(2.344)	***
Deviance	18315.8			18320.8			18321.9		
-2 Log Likelihood	9157.9			9160.4			9161.0		

Table D4

CCHLM with Addition of College Climate Measures (N=1,650 students, 480 HS's, 380 PSI's)

	Base Model			Climate Measures		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Student Characteristics						
Sex: Female	-1.586	.546	**	-1.622	.545	**
Race: AAPI (Ref.= White)	.067	.880		.176	.881	
Race: AIAN	-2.436	6.937		-2.149	6.930	
Race: Black	1.107	1.163		1.199	1.163	
Race: Latino	.499	1.076		.665	1.078	
Race: Multi	1.435	1.332		1.503	1.331	
SES	-.603	.426		-.611	.426	
School place to meet friends	-.668	.388		-.685	.388	
HPW: Extracurriculars	-.364	.144	*	-.373	.143	*
Social Agency factor	.325	.299		.360	.299	
Math Self-Efficacy factor	.194	.258		.182	.258	
# Friends in diff. grade	.523	.347		.513	.347	
Academic GPA	-3.604	.653	***	-3.582	.652	***
SAT comp. score (in 100s)	-.536	.204	**	-.534	.204	**
Took SAT (vs. imputed)	-1.301	1.093		-1.356	1.094	
# Life stresses	.034	.271		.047	.271	
Job earnings (in 1000s)	.094	.000		.091	.000	
Greatest selectivity of applied PSI	-.742	.627		-.716	.628	
Enrolled mostly or all full-time	-6.245	1.774	**	-6.221	1.771	**
# High impact ed. activities	.002	.177		.018	.177	
Met advisor re: academic plans	.284	.470		.271	.471	
# PSIs attended	1.001	.495	*	.958	.496	
SES transition	1.243	.564	*	1.202	.562	*
Diversity transition	-.606	.647		-.554	.642	
Academic transition	-.723	.584		-.632	.582	
School Characteristics						
Control: Private	.443	1.368		.599	1.363	
% Total enr is HS (in 10s)	-.129	2.106		-.117	2.099	
% FT teachers certified	.009	.015		.009	.015	
#FT guidance counselors	-.333	.132	*	-.328	.131	*
% Excellent teachers	-.020	.011		-.020	.011	
% LEP/non-Eng. proficient	.094	.045	*	.091	.045	*
% SPED	.019	.053		.025	.053	
% Grads to 4yr PSI (in quartiles)	.456	.533		.466	.532	
% Free lunch	.009	.028		.008	.028	
Diversity index	-.025	.030		-.023	.030	
PSI Characteristics						
Control: Private	1.557	1.656		1.256	1.753	
HBCU	3.323	2.585		5.264	3.126	
FTE	.000	.000		.000	.000	
% FTFT Degree seeking undergrads	-.360	.090	***	-.371	.090	***
Tuition & fees (in 1000s)	-.053	.000		-.034	.000	
Offers remedial services	-.268	.624		-.414	.621	
Average SAT score (in 100s)	-.208	.496		-.033	.511	
% Undergraduate women	-.046	.031		-.034	.033	
Avg fed. grant amount (in 1000s)	-.003	.000		-.021	.000	
% Fed. grant recipients	.036	.052		.034	.052	
Avg loan amount (in 1000s)	.277	.000		.202	.000	
% loan recipients	-.044	.026		-.036	.027	
Diversity index	.034	.036		.049	.037	
Social/Pluralistic Goals factor				3.002	2.855	
Racism not a problem				6.602	4.244	
Likelihood socialize different race				-3.763	3.657	
Intercept	50.809	3.003	***	51.396	3.112	***
Level-1 Variance Component (S.D.)	88.886	(9.428)		89.090	(9.439)	
HS Variance Component (S.D.)	4.188	(2.047)	***	4.026	(2.006)	***
PSI Variance Component (S.D.)	1.099	(1.048)	**	.760	(.872)	**
-2 Log Likelihood	6090.8			6088.6		
Deviance	12181.5			12177.1		

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