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Examining the Effects of High School Contexts on Postsecondary Enrollment

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Abstract The present study is organized around the central hypothesis that the high school context affects students' postsecondary outcomes. Drawing on a nationally representative sample of high school seniors from the Educational Longitudinal Survey (ELS:2002), this study broadens our empirical understanding of how students' acquisition of human, social, and cultural capital at the individual and school level affects 2- and 4-year college attendance. Results highlight the normative role of high schools in promoting college enrollment, particularly the role of socioeconomics, academic preparation, and access to parent, peer, and college-linking networks. This study advances our understanding of the secondary-postsecondary nexus and has implications for policies and practices aimed at realizing the current administration's promise of providing greater access to postsecondary education for all students.

Keywords High school context · College choice · Postsecondary enrollment · Access · Human capital · Social capital · Cultural capital

In recent decades, Americans have paid witness to dramatic growth in educational aspirations, postsecondary participation rates, and the types of educational alternatives available to students. Today, roughly two out of every three high school graduates enroll in one of approximately 4,000 higher education institutions (Gerald and Hussar 2002; NCES 2007). Educational disparities, however, continue to persist across racial and socioeconomic lines, with considerably lower percentages of Black, Hispanic, and low income students continuing their education at a postsecondary institution (NCES 2007). Thus,

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despite the progress we have made toward providing greater access to all students, our educational system continues to reproduce the social and economic inequalities that reflect the stratified nature of American society.

In response to the disproportionate rates of postsecondary attendance and the individual and societal benefits derived from participation, the current administration has called on every American to "commit" to attending at least 1 year of postsecondary education (Obama 2009). At the center of this call is the need to better understand the secondary-postsecondary nexus and the structures and organizational norms that are most conducive in enabling students to make the journey from high school to college. Without such attention to this critical nexus, the majority of research will continue to exist within educational silos, providing only partial solutions to a complex problem that extends beyond the traditional boundaries of K-12 and postsecondary education. If we are to realize the current administration's goal to have the highest postsecondary participation rates in the world by 2020, we must continue to explore the ways in which the structures, resources, and organizational norms of high schools facilitate college enrollment.

For over 40 years social scientists have generally accepted that high school resources have appreciable effects on academic outcomes, but are smaller in magnitude than the effects of student and family resources (Coleman et al. 1966; Entwisle et al. 1997; Jencks and Phillips 2000). Researchers have also demonstrated that the organizational and status characteristics of high schools affect orientations and activities related to college transition (Alexander and Eckland 1977; Alwin and Otto 1977; Coleman and Hoffer 1987; Falsey and Heyns 1984; Karabel and Astin 1975). Recent studies focusing on institutional networks and historical feeder patterns have shown that the high school context may structurally determine students' academic orientations and educational choices, and that these effects may differ by racial and socioeconomic groups (Engberg and Wolniak 2009; Hill 2008; McDonough 1997; Perna and Titus 2005; Rosenbaum 1978; Wolniak and Engberg 2007a, in press). Taken together, this body of research suggests that both students and organizational structures are critical antecedents in fostering pathways to postsecondary education.

Drawing on a nationally representative sample of high school seniors from the Educational Longitudinal Survey (ELS), this study seeks to broaden our empirical understanding of how high schools influence attendance at 2- and 4-year postsecondary institutions. Based on the central hypothesis that the high school context exerts an important influence on postsecondary enrollment, our research questions address the interdependent relationships among students, their high schools, and postsecondary enrollment. In doing so, we examine the critical role that human, cultural, and social capital exert on college outcomes, emphasizing both the acquisition of these resources at the individual level and the availability at the school level.

Given the current administration's call to reclaim our country's mantle as the best educated nation in the world, our study provides timely empirical evidence based on a recent, nationally representative sample of American students and high schools. Our findings add to the extant literature by extending our understanding of the saliency of the high school context in college choice research. We do so by utilizing a range of theoretically-derived constructs to operationalize key aspects of the high school context, including institutional characteristics, the environment for learning and instruction, and the availability of human, cultural, and social capital. We also employ advanced hierarchical modeling techniques to account for the nested nature of our data, as well as multivariate hypothesis testing to identify the extent to which the high school context influences enrollment above and beyond individual attributes. While a number of studies have

examined the college choice process using national datasets (e.g., NELS: 88), this is one of the first studies to investigate postsecondary enrollment using the ELS:2002 data, providing a means to both substantiate past findings (cf., Perna and Titus 2005) and test new relationships identified in the current research literature on college choice.

Theory and Evidence

In order to examine the impacts of high school contexts on postsecondary enrollment, we draw from theories and perspectives centered on the notion that an individual's behavior is determined and best understood within the context in which the behavior is situated (Bourdieu 1986; Lin 2001). Although researchers have proposed a number of theories and stage models to understand college choice and enrollment patterns (Hossler and Gallagher 1987; Terenzini et al. 2001), our conceptualization is largely shaped by perspectives related to human capital formation, status attainment, and social and cultural resources (Hossler et al. 1989; Paulsen 1990; Perna 2006).

Theoretical Perspectives

From an economic perspective, human capital theory lends itself to our understanding of postsecondary enrollment by grounding the decision to attend college in the language of productivity-enhancement and investment returns (Becker 1993; Paulsen 2001). One of the strongest human capital predictors of college enrollment is academic preparation (Cabrera and La Nasa 2001; Catsiapis 1987; Perna and Titus 2005), which has been defined and operationalized according to numerous constructs (e.g., enrollment in college preparatory tracks, highest level of mathematics coursework completed, standardized test scores, and grade point averages). In addition to academic preparation during high school, evidence suggests that exposure to information resources also influences college choice decisions (Ellwood and Kane 2000; Perna 2000). Limited access to information and a lack of understanding of college choice may disadvantage certain students (Hill 2008), and these differences in information resources may partially explain disparities in college enrollment among low-income, Black, and Hispanic students (Perna 2006).

From a sociological perspective, students' pathways to college exist within more general models of status attainment and social mobility. From this point of view, relatively greater focus is placed on how millions of high school students every year find their way into, or get sorted among, the existing array of higher education institutions, and the extent to which shortages among socioeconomic and educational resources within a high school may have lasting effects on students' postsecondary educational plans (e.g., Grodsky 2007; Karen 1990; Lucas 2001; Rosenbaum 1978; Turner 1960).

Central to understanding the impact of students' high schools on their postsecondary proclivities are the constructs of cultural and social capital (Bourdieu 1986; Coleman 1988). Cultural capital represents a range of attributes, such as language skills, cultural knowledge, and other mannerisms that are typically acquired from one's parents, which define and situate one within a particular class status (Bills 2003; Bourdieu 1986). Social capital is based on resources accessed through social networks and is therefore dependent on the size and strength of the network and availability of different capital resources (Bourdieu 1986; Lin 1999). Educational achievement and social ties partially determine the levels of social capital accessible to students, which in turn provides assistance in obtaining additional education and making effective educational choices (Coleman 1988;

Lin 1999). The related concept of *habitus* has been used in college choice research to explain how an internalized system of thoughts, beliefs, and perceptions acquired through one's parents or immediate community shapes the college choice process for students (McDonough 1997; Perna and Titus 2005). Paulsen and St. John (2002) effectively summarize the importance of *habitus* in college choice research in writing that "each student's *habitus* serves to 'situate' and 'contextualize' their choices" (p. 196).

High School Contexts and Postsecondary Outcomes

Early research examining postsecondary access in relation to high school characteristics includes Alexander and Eckland's (1977) examination of linkages between high school status composition and college selectivity, and Coleman and Hoffer's (1987) work that attributed the college success of Catholic high school students to the course-taking and academic behaviors that define the Catholic high school experience. More recently, McDonough's (1997) research emphasized the important role high schools play in shaping students' college choice decisions. Based on data collected from twelve White girls attending one of four California high schools, McDonough demonstrated that students' college decisions are circumscribed not only by individual characteristics, such as their academic performance or socioeconomic background, but also by structural characteristics of their high schools. The structure and organization of guidance counseling, for instance, revealed distinct differences across high schools, including the resources available to counselors, time allotted for college counseling, types of colleges recommended, and the nature of the counseling relationship.

Analyzing ongoing enrollment patterns among other students in their social network, Person and Rosenbaum (2006) found that for Latino students, established networks of social contacts are particularly important in acquiring information about college, but information gaps often remain as obstacles for these students in obtaining widespread access and success in college. Applying a similar chain migration perspective, Perez and McDonough (2008) argue that access to strong networks and social capital provides greater exposure to a range of college choice options, whereas social networks that are limited in scope can significantly reduce a student's postsecondary options. Ultimately, they call for increased education and resources throughout the Latino community to affect students' support networks.

Recent work has also provided evidence that high school feeder networks influence matriculation decisions (Engberg and Wolniak 2009; Wolniak and Engberg 2007a), and that high school structures and environments (e.g., quality and availability of resources and the frequency of school violence) influence students' academic performance well beyond high school graduation (Wolniak and Engberg 2007b, Wolniak and Engberg in press). While the results offer important evidence about the lasting effects of high school contexts, these studies were limited by the lack of generalizability and non-nested characteristics of the data.

Hill (2008) recently introduced a typology of "college-linking" strategies used by high schools to promote college enrollment. Analyzing a subset of NELS:88 data, Hill empirically identified a classification scheme for grouping high schools according to two dimensions associated with students' college transitions: one dimension was defined according to organizational resources and behaviors, while the other dimension reflected organizational norms. Considering high schools according to this typology proved effective in explaining how different combinations of organizational structures, resources, and practices differentially affect college enrollment. Interestingly, the effectiveness of

college-linking efforts differed for enrollment in 2-year versus 4-year colleges, suggesting that combinations of resources and practices within any given high school may not only influence college enrollment generally, but may also influence the type of institution students are most likely to enroll in.

Conceptual Framework

Together, the above theoretical perspectives identify a range of human, cultural, and social networking resources that influence students' educational development (e.g., Bourdieu 1986; Coleman 1988; Hill 2008; Lin 2001; Perna and Titus 2005). Additionally, the past research suggests a central role of the high school context in providing opportunities for students to access various forms of capital (e.g., Alexander and Eckland 1977; Bain and Anderson 1974; Coleman et al. 1966; Davis 1966; Hill 2008; Khattab 2005; Perna 2006, Perna and Titus 2005). Building on existing evidence and theoretical frameworks that highlight the interdependent nature of college choice decisions (see Perna 2006), our conceptual framework places the high school at the foundation of the college decision-making process. We operationalize the high school context by identifying the saliency of institutional characteristics, the environment for teaching and learning, and the availability of human, cultural, and social capital. Nested within various high school contexts, students' decisions regarding college enrollment are based on the confluence of demographic and socioeconomic characteristics and their acquisition of various forms of capital (see Fig. 1). Thus, the present study empirically substantiates the interdependent relationships between students, high school contexts, and postsecondary enrollment.

Research Questions

Building on past research, our study is organized around the central hypothesis that the high school context affects students' postsecondary enrollment. To test this hypothesis, we address research questions that identify relationships between students, high schools contexts, and postsecondary enrollment. Throughout this study, we operationalize postsecondary enrollment according to whether students are attending 4-year institutions, 2-year institutions, or not attending any postsecondary institution following high school graduation.

Question 1

In what ways do student-level characteristics influence the likelihood of enrolling in a 2- or 4-year postsecondary institution versus no enrollment, controlling for differences across school-level measures of the high school context?

Question 2

In what ways do school-level characteristics influence the likelihood of enrolling in a 2- or 4-year postsecondary institution versus no enrollment, controlling for differences in student-level characteristics?

Question 3

Do school-level measures have an effect above and beyond their corresponding student-level measures?

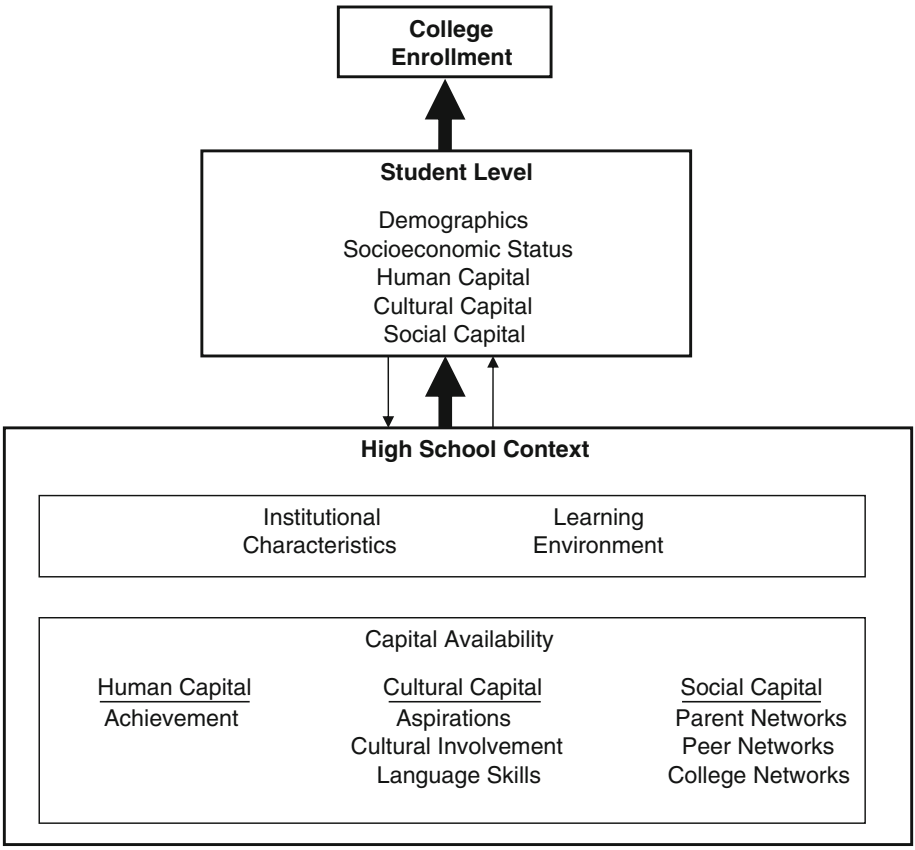

Fig. 1 Conceptual framework of college enrollment

Methods

Dataset and Sample

Our study uses data collected through the Education Longitudinal Study (ELS) of 2002, a survey research project funded by U.S. Department of Education designed to explore students' transitions from secondary school into postsecondary education or the workforce. The ELS study is both longitudinal, surveying the same group of students over time, and multi-level, collecting information from multiple respondent pools that include students, parents, teachers, librarians, and school principals. The ELS incorporated a multi-stage sampling frame in which schools were stratified across region, urbanicity, and school control and the probability of selection was proportional to school size. Approximately 26 students were then randomly selected within each school, with some oversampling of Asian/Pacific Islanders. The analytic sample for this study is based on the 2004 panel of students who were seniors in high school and followed up again in 2006 (for more information, see http://nces.ed.gov/surveys/ELS2002/).

In compliance with standard analytic procedures for multilevel modeling, we removed those schools containing fewer than five students. Because our sample was limited to

students for whom we had complete data on our outcome variable (college enrollment), our final analytic sample contained 11,940 students from one of 740 high schools. Applying the panel and school weights resulted in a weighted sample of approximately 2.9 million students from 22,661 schools.

Variables in the Study

Our dependent variable for the study is a multinomial measure of postsecondary attendance containing three distinct categories: enrolled in a 2-year institution; enrolled in a 4-year institution; not enrolled in either a 2- or 4-year institution. We have organized the remaining independent variables according to their placement within student or school levels.

Student-Level Variables

At the student level, we incorporated four groups of variables corresponding to our conceptualization of college enrollment, including demographic and socioeconomic factors, and various forms of human, cultural, and social capital (see Table 1).

Demographics and Socioeconomics In terms of student demographics and socioeconomics, we included dummy variables for gender (male as referent group) and race (White students as referent group). We used the SES composite index provided by the ELS dataset as a means of broadly capturing aspects of students' economic and cultural capital. The SES composite incorporates measures of parental attainment, parental occupation, and total income. Finally, we used a two-item factor scale to capture parents' perceived ability to pay for college (Paulsen and St. John 2002). The two items contained in this scale measure the importance of the availability of postsecondary financial aid and low postsecondary school expenses ($\alpha = .700$).

Human Capital In examining aspects of human capital acquisition, we included three different continuous variables related to students' academic preparation: highest level of mathematics, total number of AP course taken, and high school grade point average. The highest level of mathematics included eight different levels that progressed from no math to advanced Calculus (Adelman 1999). Both AP course taking and high school grade point average were taken directly from the student's official high school transcript contained in the restricted ELS dataset.

Cultural Capital We also included four different scales representing the acquisition of cultural capital. The first scale examined the aspirations of the student's family and friends for the student to attend college ($\alpha = .858$), whereas the second scale examined the desires of the student's school counselors, teachers, and coaches ($\alpha = .909$). The third scale included five items examining the frequency in which students and their parents were involved in different cultural activities, such as concerts, plays, hobbies, and sporting events ($\alpha = .737$). We also included a control for whether English was the student's native language as an additional proxy for cultural capital acquisition (Perna and Titus 2005).

Social Capital In order to operationalize the influence of social capital acquisition on postsecondary enrollment, we examined the roles of parent, peer, and college-linking

Table 1 Weighted means for student-level variables by enrollment classifications

Student-level variables	Min	Max	Two-year enrollees	Four-year enrollees	No enrollment
Demographics and socioeconomics					
Female	0	1	0.52	0.54	0.43
Male	0	1	0.48	0.46	0.57
Asian	0	1	0.04	0.06	0.03
Black	0	1	0.13	0.12	0.17
Hispanic	0	1	0.20	0.09	0.22
White	0	1	0.59	0.69	0.52
Biracial	0	1	0.04	0.05	0.06
SES	−2.12	1.87	−0.11	0.33	−0.35
Importance of college affordability	1	3	2.58	2.37	2.66
Human capital					
Highest level of math	1	8	5.08	6.40	4.44
Total AP courses taken	0	18	0.28	1.45	0.14
Final high school GPA	0	4	2.44	3.06	2.12
Cultural capital					
Family/friends desire for student to attend college	0	4	2.59	3.06	1.77
School desire for student to attend college	0	3	1.43	1.89	1.00
Parent involved in cultural activities with student	1	4	2.82	2.93	2.67
English is native language	0	1	0.82	0.90	0.83
Social capital: parent networks					
Parent contacts school	1	4	1.35	1.37	1.35
Parent involved in school-based organizations	0	1	0.26	0.36	0.21
Parent knows parents of students' friends	0	1	0.69	0.75	0.65
Social capital: peer networks					
Number of friends planning to attend 2-year college	1	5	2.91	2.28	2.78
Number of friends planning to attend 4-year college	1	5	3.11	3.80	2.78
Social capital: college-linking networks					
Student seeks out college entrance information	0	13	4.55	5.42	3.71
Student discusses school and college plans with parents	1	3	2.21	2.34	2.01
Unweighted sample size			2,920	6,500	2,520
Weighted sample size			760,658	143,1204	716,553

Source: ELS: 2002 Restricted Data

networks. We examined patterns of parental involvement based on previous conceptual and empirical work that links such involvement to college enrollment (Coleman 1988; Perna and Titus 2005). Our first scale included seven items examining the frequency in which the student's parents contacted the school about general issues, including school

programs, plans after high school, volunteer work, and helping with homework ($\alpha = .741$). The second scale included five items representing how involved the student's parents were in parent-teacher organizations and other school-based organizations ($\alpha = .723$). Finally, the last scale was designed to understand the importance of intergenerational closure on college-going behaviors (see Coleman 1988; Perna and Titus 2005) and included six items measuring how well the student's parents knew their friends' mothers and fathers ($\alpha = .695$).

Given the strong influence of peer networks on students' college destinations (Perez and McDonough 2008; Person and Rosenbaum 2006), we included two continuous measures of the number of the student's friends planning on attending either 2- or 4-year colleges. Additionally, we included two different scales representing students' college-linking networks in order to capture how these self-initiated actions influenced college-going decisions. The first scale examined the extent to which students sought out college entrance information from thirteen different individuals, including counselors, teachers, coaches, parents, friends, college representatives, and other influences ($\alpha = .679$). The second scale included six items ascertaining the frequency in which students discussed school and college related issues with their parents, such as grades, school activities, preparation for the ACT/SAT, and going to college ($\alpha = .799$).

School-Level Variables

In addition to student-level variables, we have included a number of school-level variables reflecting our conceptualization of the high school context as an important moderator of college-going behavior (Alexander and Eckland 1977; Bain and Anderson 1974; Coleman et al. 1966; Davis 1966; Hill 2008; Khattab 2005). Such a conceptualization is closely aligned with the work of Bourdieu (1986) and Lin (2001), emphasizing the importance of the social context in understanding an individual's actions. Our school-level variables represent the structures and environments that influence students' access to various forms of capital, which ultimately shape their college-decision making process.

Institutional Characteristics Our first set of variables reflects the various institutional characteristics that define the sector, region, structural diversity, and socioeconomic status of each school's environment. We define sector and region through two sets of dummy variables representing Catholic, other private, and public (referent group) school sectors and suburban, rural, and urban (referent group) regional associations. Structural diversity represents the percentage of minority students at a particular school, which has previously been used to measure the likelihood of interactions across race and the concomitant access to previously unavailable resources (Perna and Titus 2005). Additionally, we included an aggregate measure of the average socioeconomic status of the students attending a particular high school.

Learning Environment We included five different measures to capture and explore the effects of the school learning environment on college enrollment. First, we constructed a five-item scale measuring the overall morale and emphasis on learning within a particular school ($\alpha = .866$). Next, we incorporated two different variables measuring the student–teacher and student-guidance counselor ratios. The guidance counselor ratio, in particular, has been shown qualitatively to have an influence on college enrollment decisions (McDonough 1997). Additionally, we included a five-item scale measuring the extent to

which schools provide different experiential-based programming, such as community service, internships, job shadowing, and school-based enterprise ($\alpha = .654$). Finally, we included a scale comprised of nineteen items reflecting the extent to which students were exposed to school violence, drug abuse, and disorder ($\alpha = .885$). Previous research has indicated that the level of exposure to violence during high school can have lasting effects on postsecondary academic performance (Wolniak and Engberg in press).

Human, Cultural, and Social Capital In order to gage the availability of human, cultural, and social capital at particular schools, we aggregated all of the student-level constructs identified above. We expanded our understanding of peer networks by including the school-level percentages of 2003 graduates who attended both 2- and 4-year colleges. We similarly extended our knowledge of college-linking networks by creating a scale of five different variables related to the percentage of 12th graders involved in various college preparation programs, including college application programs, programs on financial aid, SAT/ACT courses, college fairs, and meetings with college representatives ($\alpha = .815$).

Analytic Design

Our first analytic step involved running a missing value analysis on several of the variables and constructs noted above. This analysis identified several student-level variables with missing values not randomly distributed. Based on the recommendations of Cohen and Cohen (1983), we created a single independent variable reflecting the number of missing items per student in our sample. According to Allison (2002), we then imputed missing values using the EM algorithm.

For our second analytic step, we employed exploratory factor analysis to construct each of the scales used in this study using principal axis factoring and a Varimax rotation. We only selected items with loadings above .35 and with Cronbach's Alpha reliabilities above .65. Scales were created either using the mean of each of the corresponding items or as a composite index. Factor loadings for each of the scales are available from the authors upon request.

In order to answer our three research questions, we used a two-level hierarchical general linear model (HGLM) to identify significant student- and school-based factors that predict college enrollment behavior. HGLM is an appropriate analytic technique to test hypotheses about the relationship between variables at two different levels (Raudenbush and Bryk 2002). HGLM, for instance, allows one to partition the variance components among student-level and school-level factors, thereby isolating how facets of both the individual and high school context contribute to our understanding of the likelihood of attending a particular type of college. HGLM is particularly useful in understanding school-level effects, especially in determining whether structural characteristics and aggregated student characteristics influence college choice decisions. Finally, HGLM corrects for common failures that occur when researchers treat multi-level effects in a non-nested manner; such a process can lead to an "aggregation bias, misestimated standard errors, and heterogeneity of regression" (Raudenbush and Bryk 2002. p. 99). The ELS dataset employed a sampling frame of schools, followed by students randomly selected within schools, to facilitate multi-level modeling.

In using HGLM to answer our research questions, we employed a multinomial logit link function to examine the log-odds of a particular type of enrollment (either 2- or 4-year) against a specified referent group (no enrollment). All student-level and school-level

variables were centered on their respective group means and only the regression coefficients for the intercept were assumed to vary across schools; all other within-school predictors have been constrained to equal one another. We utilized the longitudinal panel weight for the 2004–2006 cohort and made comparisons between the weighted and un-weighted samples to ensure the integrity of our analyses (see Pfefferman et al. 1998). The general multinomial model can be expressed by the following Level 1 (student) and Level 2 (school) equations:

Level 1

$$\eta mij = \beta_{0j(m)} + \beta_{1j(m)} * (\text{Demographics/Socioeconomics})ij + \beta_{2j(m)} * (\text{Human Capital})ij + \beta_{3j(m)} * (\text{Cultural Capital})ij + \beta_{4j(m)} * (\text{Social Capital})ij$$

where i denotes the student, j denotes the school, m denotes the type of enrollment.

Level 2

$$B_{0j(m)} = \gamma_{00} + \gamma_{01(m)} * (\text{Institutional Characteristics})j + \gamma_{02(m)} * (\text{Learning Environment})j + \gamma_{03(m)} * (\text{Human Capital Availability})j + \gamma_{04(m)} * (\text{Cultural Capital Availability})j + \gamma_{05(m)} * (\text{Social Capital Availability})j + u_{0j(m)}$$
$$B_{qj(m)} = \gamma_{q0(m)} \text{ for } q = 1\ldots4 \text{ student-level constructs}$$

where j denotes the school, m denotes the type of enrollment.

In answering our first two research questions, we examined the odds ratios derived from the multinomial coefficients to determine whether the student- or school-level predictors significantly influenced the likelihood of attending either a 2- or 4-year institution (versus no enrollment). In answering our third research question, we examined the differences in the odds-ratios of corresponding student- and school-level constructs to determine whether the school-level effects represented contextual effects above and beyond the student-level effects. In order to determine the effects, we first examined whether the differences between school- and student-level effects were positive and then examined whether the difference was significant by examining the chi-square results of the multivariate hypothesis tests.

Limitations

There are at least four limitations to note before interpreting the results of our study. First, despite the multi-stage design utilized by the ELS dataset, there are several methodological issues that may potentially limit the study's generalizability. For instance, while each school was optimally to include 26 students randomly selected, there is considerable variation in the number of students who survived throughout the 2004–2006 panel, thereby reducing the representativeness of the population and the variation uncovered among schools.

Second, missing data varies across the different items contained in the surveys and many of the later items in the student questionnaire are not missing at random. We have taken numerous steps to counter this potential threat, including the inclusion of a missing values indicator and the use of a sophisticated algorithm to replace missing data. Nevertheless, our estimates may accompany a degree of missing data bias.

Third, we recognize that other researchers may prefer alternative approaches to operationalizing some of the key constructs contained in this study. In order to maintain a degree of model parsimony, which is necessary for the HGLM analysis to converge, we selected variables that had a theoretical rationale for their inclusion and closely

approximated our conceptual framework. Future studies may consider a number of additional school-level variables specified according to particular policy and practice-based issues.

Finally, it is likely that the socioeconomic index and racial categories may interact with many of the other constructs used in the analyses and that important conditional effects were overlooked in this study. While we did not examine conditional effects in the present study, our continuing line of inquiry concentrates specifically on differences by socioeconomic status and racial group membership. However, due to the small number of underrepresented students in some schools, our HGLM analysis precluded running separate models by race. The contextual-based effects we uncovered in this study will be utilized along with different methodological approaches less sensitive to sample attrition at the school level.

Results

Fully Unconditional Model

In examining the fully unconditional multinomial logit model, we noted that for students attending the "typical school", the log odds of attending a 4-year college were substantially greater than not attending college (odds-ratio = 1.96, $p < .001$). However, the effects for 2-year enrollment were not significant, suggesting that without any additional controls added to the model, there is little difference among students in the odds of either attending a 2-year college or not attending college at all.

Unlike hierarchical linear models (HLM), multinomial HGLM models do not provide an interclass correlation to parse the variance at the student-and school-level. Rather, they provide an estimate indicating if the variation between schools is significant. Relative to no attendance, there was statistically significant variation between schools in the log-odds of attending either a 2-year (variance component = .336, $p < .001$) or 4-year college (variance component = .852, $p < .001$).

Student-Level Effects

In examining the student-level model, we uncovered a number of significant findings (see Table 2). In terms of demographic characteristics, we found Black students to be significantly more likely than White students to attend a 4-year college. We also found that students who identified as biracial were less likely to attend a 2-year college than their White counterparts. Socioeconomic status was the only consistent finding across the 2- and 4-year enrollment groups in our first set of variables, suggesting that as socioeconomic status increases, students are significantly more likely to attend a 2- or 4-year college versus not enrolling at any college. We also uncovered an effect for college affordability in the 4-year enrollment group, indicating that as parents become more concerned about college expenses and the availability of financial aid, their children are less likely to attend a 4-year college.

Human capital variables, which consisted of three different aspects of academic preparation, proved very influential for both 2- and 4-year enrollment. As students' highest level of math-taking and high school grade point averages increased, so too did their likelihoods of attending either a 2-or 4-year college, although the effect was considerably stronger for 4-year enrollment. The number of AP courses taken was significant only for

Table 2 Multinomial HGLM representing the odds of enrolling in a 2-year vs. 4-year college relative to not enrolling for high school seniors in 2004

Predictors	Two-year enrollment	Four-year enrollment
Student level fixed effects		
Demographics and socioeconomics		
Female	1.112	0.896
Asian	1.077	1.214
Black	0.889	1.681***
Hispanic	0.812	0.864
Biracial	0.584**	1.159
SES	1.399***	1.783***
Importance of college affordability	0.923	0.767**
Human capital		
Highest level of math	1.229***	1.642***
Total AP courses taken	0.999	1.335***
Final high school GPA	1.475***	4.044***
Cultural capital		
Family/friends desire for student to attend college	1.255***	1.378***
School desire for student to attend college	0.948	0.989
Parent involved in cultural activities with student	1.146*	1.128
English is native language	0.725**	1.088
Social capital: parent networks		
Parent contacts school	0.844	0.983
Parent involved in school-based organizations	0.959	1.313
Parent knows parents of students' friends	1.231	1.626**
Social capital: peer networks		
Number of friends planning to attend 2-year college	1.033	0.746***
Number of friends planning to attend 4-year college	1.072	1.398***
Social capital: college-linking networks		
Student seeks out college entrance information	1.070***	1.134***
Student discusses school and college plans with parents	1.582***	1.768***
Total missing	0.946***	0.929***
School level fixed effects		
Institutional characteristics		
Catholic	1.985***	1.353
Other private	1.221	0.877
Suburban	1.243*	0.872
Rural	1.258	1.022
Structural diversity	0.998	0.998
Average SES	2.397***	3.652***
Learning environment		
School morale is high	1.000	1.030
Student–teacher ratio	1.007	1.022
Student-guidance counselor ratio	0.999	0.999

Table 2 continued

Predictors	Two-year enrollment	Four-year enrollment
Number of experientially-based programs offered	0.971	1.017
Frequency of school violence	0.891	1.033
Human capital availability		
Average level of math course-taking	1.076	1.358**
Average number of AP courses	1.025	1.310**
Average GPA	1.531**	2.580***
Cultural capital availability		
Average family/friends desire for student to attend college	1.763***	1.384**
Average school desire for student to attend college	1.076	1.093
Average parent involved in cultural activities with student	1.024	0.987
Average number students whose native language is English	0.405**	0.445*
Social capital: parent network availability		
Average parent contacts with school	1.005	0.363*
Average parent involved in school-based organizations	2.635	3.665*
Average parent knows students' friends parents	1.546	4.791*
Social capital: peer network availability		
Average number of friends planning to attend 2-year college	1.603***	0.573***
Average number of friends planning to attend 4-year college	0.944	1.959***
Percentage of 2003 students who attend 2-year colleges	1.144**	0.830**
Percentage of 2003 students who attend 4-year colleges	1.037	1.217***
Social capital: college-linking network availability		
Average student seeks out college entrance information	1.078	1.122
Average student discusses school and college plans with parents	0.473*	0.648
Percentage of students in college-related programs	1.063	1.124**
Random effect (variance component of intercept)	0.304***	0.390***
Number of students in analysis (unweighted) = 11,940†		
Number of schools in analysis (unweighted) = 740		

Source: ELS: 2002 Restricted Data

Notes: Due to space limitations, only odds ratios are presented. Beta coefficients and standard errors are available upon request. † Weighted number of students is 2,908,415 using F2F1WT panel weight. * $p < .05$, ** $p < .01$, *** $p < .001$

4-year enrollment. Taken together, these findings highlight the salience of students' academic performance during high school in fostering an increased likelihood of attending a postsecondary institution.

Compared to measures of human capital, the cultural capital variables proved to be less consistent predictors of college enrollment. The only consistent finding was related to the aspirations of family and friends for a student to attend college, which significantly increased the likelihood of 2- and 4-year college attendance. School-based aspirations were not significant, suggesting that the immediacy of one's friends and family carries more substantial weight than more distal influences. The only other cultural effect was based on whether the student's native language was English, which produced a significantly lower odds-ratio in relation to 2-year college attendance.

In examining the various effects of social capital, we found very few effects for 2-year enrollment in relation to parent and peer networks. This was not the case for 4-year enrollment, in which several effects were noted. As parent-to-parent contact increased, for instance, students were significantly more likely to attend a 4-year college. Likewise, as the number of one's friends attending a 4-year college increased, students were more likely to attend a 4-year institution. Interestingly, the number of friends attending a 2-year college exhibited a negative effect on the likelihood of attending a 4-year institution.

College-linking networks proved beneficial in increasing the likelihood of attending both 2- and 4-year colleges, although the effects related to seeking out college information and discussing plans for school and college with one's parents were both higher in terms of 4-year college attendance. Thus, at the student-level, parent and peer networks proved important factors in increasing the chances of attending a 4-year college, but college-linking networks universally increased the odds of college attendance. Finally, it should be noted that the missing value indicator had a significant influence on college enrollment, suggesting that students with higher levels of missing data were less likely to attend either 2- or 4-year institutions.

School-Level Effects

Our school-level model revealed a number of interesting effects related to the high school context, many of which differentially affected 2- and 4-year enrollment (see Table 2). For example, institutional characteristics mainly influenced 2-year enrollment, with students who attended Catholic or suburban high schools more likely to attend 2-year colleges compared to public and urban high schools. The average socioeconomic status of a high school proved to be a very strong indicator of college enrollment, although the effect was more pronounced for 4-year enrollment.

Surprisingly, we found no effects for either 2- or 4-year college enrollment related to the learning environment. We anticipated significant effects for several of these constructs, especially those related to school morale, guidance counselors, and the frequency in which students were exposed to school violence.

In examining the school-level availability of human capital, we found similar effects for high school grade point average as we did at the student level. Alternatively, the effects of math course-taking and AP course-taking only reached significance for 4-year enrollment. The continued influence of academic preparation, particularly for 4-year college enrollment, suggests an important advantage for students attending academically rigorous high schools. In terms of cultural capital availability, as the average level of college aspirations increases for friends and family, so too does the likelihood of college attendance. Interestingly, the school-level effect is more pronounced for 2-year enrollment despite not reaching significance at the student level. Additionally, we uncovered a significant effect related to the proportion of students for whom English is their native language, although the effect decreased students' likelihood of college attendance at both 2- and 4-year colleges. This findings runs counter to our initial assumption that higher percentages of English-speaking students in a particular school may offer greater access to other capital resources that promote college attendance.

Social capital continued to influence college enrollment at the school-level, although the effects were differentially felt across 2- and 4-year colleges. With the exception of parent-to-school contact, the remaining parent networking constructs significantly improved the chances of attending a 4-year college whereas the effects dropped off for 2-year enrollment. Clearly, parents' involvement in school-based organizations and their relationships

Table 3 Multivariate hypothesis tests of the differences among significant school-and student-level odds ratios

Predictors	School-level coefficients	Student-level coefficients	Difference	χ^2	School-level effect
Two-year enrollment					
SES	2.397	1.399	0.998	41.7***	Yes
High school GPA	1.531	1.475	0.056	39.6***	Yes
Family/friends desire for student to attend college	1.763	1.255	0.508	91.0***	Yes
Student discusses school and college plans with parents	0.473	1.582	−1.109	34.9***	No
Four-year enrollment					
SES	3.652	1.783	1.869	95.2***	Yes
Highest level of math	1.358	1.642	−0.284	135.8***	No
Total AP	1.310	1.335	−0.025	16.8***	No
High school GPA	2.580	4.044	−1.464	288.7***	No
Family/friends desire for student to attend college	1.384	1.378	0.006	98.5***	Yes
Parent knows parents of students' friends	4.791	1.626	3.165	13.1***	Yes
Number of friends planning to attend 2-year colleges	0.573	0.746	−0.173	53.9***	No
Number of friends planning to attend 4-year colleges	1.959	1.398	0.561	62.3***	Yes

Source: ELS: 2002 Restricted Data

Notes: *** $p < .001$

with other parents influences the amount of capital available to students in a particular high school, which is especially useful in increasing the odds of attending a 4-year institution.

Peer networks also proved especially important at the school-level in increasing the odds of college attendance. As more peers attended or planned on attending a 2- or 4-year college, the odds of attending a 2- or 4-year college increased, respectively. For 4-year colleges, in particular, high averages of students attending 2-year colleges significantly decreased the odds of attending a 4-year college. In terms of college-linking networks, as the percentage of students enrolled in college-related programs increased, so too did the likelihood of attending a 4-year college although the same was not true for 2-year college enrollment. We also noted a significant decrease in the likelihood of attending a 2-year college for students who discussed school and college plans with their parents.

Table 3 provides an additional understanding of school-level effects through the implementation of multivariate hypothesis testing. In total, we uncovered seven different instances in which the school-based effect went above and beyond that of its student-based equivalent. For 2-year enrollment, we found these pronounced school effects for socio-economic status, high school grade point average, and the college aspirations of family and friends. For 4-year enrollment, we uncovered significant effects related to socioeconomic status, college aspirations of family and friends, parent-to-parent contact, and the number of friends planning on attending a 4-year college. These results provide additional support for the importance of the high school context and the availability of human, cultural, and social capital.

Discussion

Our study addressed research questions centered on improving our understanding of students, their high schools, and their patterns of postsecondary enrollment. Drawing on a nationally representative sample of high school seniors from the Educational Longitudinal Survey, we sought to identify aspects of the high school context that influence the likelihood of attending a postsecondary institution. We concentrated on both student- and school-level effects to understand their unique contributions to postsecondary attendance as well as how the high school context may impact college enrollment above and beyond student-level attributes. From practical and policy-based perspectives, by identifying main effects and their conditionality on contextual aspects of the high school milieu, our results provide important guidance to policy-makers seeking to increase postsecondary access for all students.

With our first research question, we asked if student-level characteristics affect postsecondary enrollment after controlling for differences in school-level measures of the high school context. Our second research question concentrated on modeling the student-level intercept utilizing a range of school-level constructs. Our final research question focused on whether certain school-level effects influenced postsecondary enrollment above and beyond their corresponding student-level effects. Our analysis yielded several important findings addressing each of these questions.

First, race does not influence college enrollment generally, but varies by specific racial group memberships and college destinations. Black students, for instance, demonstrated an increased likelihood of attending 4-year institutions only, which is consistent with other studies examining enrollment patterns based on the NELS:88 dataset (see Perna and Titus 2005). Black students, however, participate at lower overall rates in 4-year institutions compared to White students (NCES 2007), which suggests that other variables in the model may be more influential in explaining these educational disparities.

Second, unlike race, student's socioeconomic status is associated with college enrollment generally, irrespective of a particular postsecondary destination. These results are consistent with previous research (Plank and Jordan 2001) and provide a future avenue to investigate whether school-level constructs moderate the influence of socioeconomic status on college enrollment. Whereas socioeconomic status improved one's chances of college attendance, the importance of college affordability decreased the odds of attending a 4-year college. This finding deviates from previous research that demonstrated a negative effect for 2-year enrollment only (Perna and Titus 2005) and highlights the complicated nature of capturing the influence of financial aid on college choice decisions (Heller 1997). While several options exist with the ELS dataset to capture the impact of financial aid, no information is available for those students who did not attend college, and attempting to impute financial aid awards absent other pertinent information (e.g., FAFSA) can be problematic.

Third, across all student-level measures of human, cultural, and social capital, the variables with the greatest overall impact on college enrollment (2-year *and* 4-year) include academic achievement variables (i.e., highest level of math taken and high school grades), aspirations of family and friends for the student to attend college, and all college-linking activities. Academic achievement, which has been measured in various ways by researchers, has been consistently shown to improve one's likelihood of college enrollment (Cabrera and La Nasa 2001; Catsiapis 1987; Perna and Titus 2005), although few studies have operationalized achievement using a combination of course-taking patterns, high school grade point average, and AP exam exposure. Likewise, our study reaffirms the

cultural value that ensues when students are exposed to family members and friends who encourage college enrollment. While our results mimic earlier studies (e.g., Hamrick and Stage 2004; Hossler and Stage 1992; Perna and Titus 2005), they also extend the typical focus on parents' educational aspirations to include close relatives and friends, thereby encompassing a larger circle of influence.

We also uncovered a number of effects on 4-year enrollment related to students' peer networks, which highlights a growing body of research that has demonstrated the strength of peer networks in facilitating college enrollment (Engberg and Wolniak 2009; Hossler et al. 1999; McDonough 1997; Perez and McDonough 2008; Person and Rosenbaum 2006; Wolniak and Engberg 2007a). Finally, at the school level, students' abilities to develop college-linking networks with a range of individuals (e.g., teachers, counselors, peers, parents, and college representatives) universally increases enrollment at 2- and four-colleges. Only a handful of studies have examined college-linking networks (e.g., McDonough 1997, Perna 2000; Hill 2008) and our findings underscore the importance of motivating students early onto seek out college information and to discuss their school and college plans with family members.

Fourth, in examining school-level effects, we noted a greater number of effects related to 4-year enrollment. In particular, we found that average levels of academic preparation, as well as the availability of parent and peer networks, significantly influenced 4-year college attendance. Several of these peer network findings resonate with earlier studies (e.g., Perna and Titus 2005), although our findings related to parent-to-parent contact and parent involvement in school organizations are unique to this study. We were surprised, however, that the teaching environment revealed no significant effects at the school level, as previous research has highlighted the role of guidance counselors (McDonough 1997) and the level of school violence (Wolniak and Engberg in press) as important considerations of postsecondary outcomes. These previous studies, however, were either qualitative in nature or limited to a more selective group of institutions. Given that a number of studies have identified the importance of teaching credentials (Ferguson 1998; Goldhaber and Brewer 1996) and the rigor of the curriculum (Adelman 1999) in fostering academic achievement, the effects of the teaching and learning environment in our study may have been muted by the inclusion of constructs related to the average level of academic preparation in a particular high school. Future work is needed to isolate additional aspects of the teaching and learning environment and to test whether these effects work indirectly through academic achievement to influence college enrollment patterns.

Lastly, it appears that several measures of the high school context influence college enrollment above and beyond their equivalent student-level measures. The average socioeconomic level of a high school's student-body and a school culture in which students' families and friends aspire for them to attend college significantly contribute to both 2-year and 4-year college enrollment. Further, high schools characterized by a greater degree of parent-to-parent contacts and students aspiring to attend 4-year colleges uniquely promote 4-year college enrollment. Additionally, the average high school grades of a particular school exert a significant influence on 2-year enrollment above and beyond the student-level effects.

Ultimately, the size and significance of school-level effects uncovered in the present study adds a layer of complexity to the earlier work by Coleman et al. (1966), which demonstrated that student and family characteristics exert a greater influence on students' educational development than school-level characteristics. The general implication of Coleman's classic research was that within-school differences have greater effects than between-school differences. However, as researchers have better identified and

operationalized the structural and normative aspects that define the high school context, modest school-level effects have come into view (e.g., Alexander and Eckland 1977; Coleman and Hoffer 1987; Hill 2008). While the present study builds on this body of evidence by identifying numerous school-level effects, we also contribute new evidence that several between-school differences influence college enrollment above and beyond their corresponding within-school effects.

Implications

From a policy perspective, our results highlight the challenges in promoting school environments most conducive for postsecondary enrollment. Resources devoted to the learning environment (student–teacher and student-guidance counselor ratios, and number of experientially-based activities offered) may not necessarily pose a direct influence on postsecondary enrollment at either the 2-year or 4-year level. However, each of these environmental factors and resources are necessary for enhancing academic structures that facilitate student success, increase participation in college-related programs, and promote parent involvement. The challenge, from a policy perspective, is in determining how, when, and where to allocate resources along the educational pipeline in order to address the complexities of achievement, participation, and involvement.

As social networks based on the enrollment patterns and educational aspirations of students' peer groups increase, students are more prone to college participation. The challenging implication of this finding, however, is how to encourage such participation in environments where capital remains relatively scarce. While there are many promising practices and programs at the federal, state, high school, and community levels, more collaborative efforts are needed throughout the educational pipeline in building college-going dispositions (Gándara 2002). Our research findings emphasize the need to address such solutions at both the individual- and school-level, and to incorporate stakeholders at all policy-levels to collectively design and implement promising educational practices.

High schools receive high honors for increasing their share of graduates who go onto college, and colleges are dependent on these students to meet their enrollment and operational demands. Given the mutual benefits that both entities receive in terms of producing and enrolling high school graduates, more collaborative efforts are needed to fulfill the promise of providing postsecondary opportunities for all students. Colleges, for instance, can offer serving-learning opportunities to their current students, who in term help offset resource shortages by offering programs that prepare high school students to engage in the college choice process. Admission offices can also work to develop stronger feeder networks with high schools in their communities, as research has demonstrated the positive effects of established linkages in promoting college enrollment (Engberg and Wolniak 2009; Wolniak and Engberg 2007a). Too often, however, solutions mandated at one level are inconsistent with the environmental demands placed on students at the next level, and more efforts are needed that examine "success" from a holistic perspective that includes postsecondary completion.

As the Obama administration calls attention to our nation's commitment to postsecondary education for all students, results from this study begin to illuminate those characteristics of students and their high school environments that foster college enrollment at 2-year and 4-year institutions. By utilizing the ELS dataset, our results are representative of a national cohort of students who are attending a broad array of 2- and 4-year public and private institutions, and improve our understanding of the college enrollment process by

taking into consideration the interdependent relationships among individuals and their educational contexts. Ultimately, by identifying the normative role of high schools in promoting college enrollment, this study marks an important step towards answering national calls for greater postsecondary attainment for all Americans.

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