Published in final edited form as:
Sociol Educ. 2009 October 1; 82(4): 287–314. doi:10.1177/003804070908200401.

High School Classmates and College Success

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Abstract

This paper uses administrative data from the University of Texas-Austin to examine whether the number of same high school classmates at college entry influences college achievement, measured by grade point average (GPA) and persistence. For each freshman cohort from 1993 through 2003 we calculate the number and ethnic makeup of college freshmen from each Texas high school. Empirical specifications include high school fixed effects to control for unobservable differences across schools that influence both college enrollment behavior and academic performance. Using an instrumental variables/fixed effects estimation strategy, we also evaluate whether "marginal" increases in the number of high school classmates influence college grades. Results show that students who arrive on campus with a larger number of high school classmates outperform their counterparts from smaller high school cohorts. Average effects of larger high school cohorts on college achievement are small, but a marginal increase in the number of same-race classmates raises GPA by 0.1 point. Results provide suggestive evidence that minority academic benefits from larger high school cohorts are greater for minority compared with white students.

I. Introduction

A voluminous literature about the determinants of college success shows that academic ability, school inputs, family background and students' ascribed characteristics as well as college "match quality" are important predictors of college performance (Cameron and Heckman 1998; Cameron and Heckman 2001; Fuller, Manski, and Wise 1982; Light and Strayer 2000; McDonough 1997). Social influences on college performance have received less research attention. Yet, there is ample evidence that peers influence academic performance in elementary school (Ammermueller and Pischke 2006; Cooley 2007; Hanushek et al. 2003; Hoxby 2000; Lavy and Schlosser 2007); in middle school (Lavy and Schlosser 2007; McEwan 2003; Summers and Wolfe 1977); and in high school (Ding and Lehrer 2007; Ream and Rumberger 2008). Therefore, it is highly likely that social factors, such as peer groups and friendship networks, also influence post-secondary academic achievement (Hallinan and Williams, 1990; Ryan 2000).

Building on Mayer and Puller's (2008) finding that attending the same high school influences membership in college peer networks, we consider whether, and in what ways, the number of high school classmates who begin college together influences college success. Specifically, we hypothesize that freshmen who begin college with more high school classmates achieve higher first semester GPA and are more likely to remain enrolled beyond the freshman year compared with students from smaller cohorts.[1] Because high school

The usual disclaimers apply.

[1]We use the terms high school classmates, high school cohort, and peer cohort interchangeably.

friendships are predominantly formed along racial lines (Weinberg 2007; Joyner and Kao, 2000; Kao and Joyner, 2006), we specifically consider whether having more same-race high school classmates at college entry promotes college achievement. Using an instrumental variables/fixed effects estimation strategy that exploits the introduction and expansion of a scholarship program that targets students attending low income high schools with low college-going traditions (Longhorn Scholars Program), we also examine whether marginal increases in the size of high school cohorts of relatively disadvantaged students is associated with higher college achievement, and whether such effects are uniform among ethno-racial groups.

Our results indicate that students from larger high school cohorts outperform their collegiate classmates who enter college with fewer high school peers. Specifically, a marginal increase in the number of same-race high school peers is associated with a 0.11 point higher first-year GPA. Furthermore, black and Hispanic students appear to reap larger academic benefits from co-matriculating with more high school classmates compared with similarly situated white freshmen. The relationship between high school cohort size and college persistence also is positive, statistically significant, and unequal across racial groups.

To motivate the empirical analysis, the following section reviews recent empirical literature about peer influences on academic achievement. Section III provides an overview of changes in higher education in Texas that make it an appealing case to study high school peer influences on postsecondary achievement. Subsequently, Section IV describes the unique administrative data and empirical estimation strategy used to evaluate the hypothesis that high school peer influences carry over to postsecondary achievements. Following a presentation of descriptive and multivariate results in Section V, the concluding section highlights key findings and outlines productive directions for future research.

II. Background

In *The Adolescent Society* (1961), James Coleman revealed the importance of schools as contexts for socialization and friendship formation, and his insights spawned research about the myriad ways peer social relations shape adolescent socialization. Both experimental and non-experimental empirical studies conclude that peers are powerful models for socialization of school engagement and academic achievement (Sewell, et al., 1969; Sewell and Hauser, 1980). There remains considerable disagreement, however, about the mechanisms through which peers influence academic outcomes (Ryan, 2000). Several studies show that high school attended influences college choice (Niu and Tienda, 2008, Alvarado and Lopez Turley, 2008; Fletcher, 2006), but because most research about social influences on academic outcomes is based on primary, middle and high school contexts, considerably less is known about whether high school peer influences persist through college.

Building on Coleman's (1961) insights about schools as contexts of adolescent socialization and peer social interaction, Hallinan and Williams (1990) examine how track placement in high school and friendship preferences influence educational aspirations and college enrollment. They theorize that peer influence requires trust, which is more likely among same gender or same race classmates. Hallinan and Williams use friendship dyads to define peers and implement several statistical controls to deal with selection bias resulting from peer preferences for attribute similarity among their friends. Not surprisingly, they find that peer influences on college aspirations depend on sex and race. Importantly, they show that interracial friendships benefit both blacks and whites and that cross-race friendships influence college expectations more than same race friendships. Cross-race friendship dyads are typically rare, however, even in multi-ethnic schools both because of large variation in the size of specific groups and strong tendencies for students to sort themselves along racial, ethnic, and class lines in their friendship networks (Coleman, 1961; Kao and Joyner, 2004; 2006; Frost, 2008).

Ream and Rumberger (2008) acknowledge that peer influences on high school completion reflect the propensity of academically engaged students to befriend similarly disposed classmates. If, as they concede, Mexican American students are less likely than non-Hispanic white students to participate in activities that promote interaction with academically oriented peers, selective sorting remains a strong threat to their inferences about social determinants of high school graduation. Sokatch's (2006) study about peer influences on college-going decisions of low-income urban youth is also fraught with serious selection bias. Although he acknowledged the sorting process among similarly disposed peers, because he did not implement a statistical strategy to correct for selection, Sokatch's claim that college plans of friends are the single best predictor of post-secondary enrollment may be specious.

Like Hallinan and Williams, Ryan (2000) conceptualizes peer influences as a socialization process motivated by information exchange, by imitation or role modeling, and by norm reinforcement. She emphasizes that self-selection into similar affinity groups is a strong competing explanation for claims about peer influences on academic outcomes.[2] Finally, Ryan notes the diverse definitions of peer influences, which range from a small group of peers based on a specified activity who interact regularly to perceptions and actual reports of social networks. In fact, few studies directly measure specify whether alleged members of a peer group actually share common experiences. Consequently, few studies demonstrate how peer groups *reinforce or change* adolescents' educational trajectories, particularly at the post-secondary level.

Schiller's (1999) study of academic performance provides useful insights about the value of classmates when young people switch schools. She argues that to understand the educational consequences of transitions between institutions, researchers must go beyond characterizations of schools based on size and composition and directly examine how social influences are modified as a result of the transition. Using the National Educational Longitudinal Survey, Schiller implements a clever strategy that exploits the institutional sorting of students in the transition from middle to high school, and examines continuities and discontinuities in educational performance following the move. She finds that students who excelled in middle school benefit academically if they attend a high school with the majority of their prior classmates. Quite surprisingly, many students who struggled academically apparently redefine themselves academically when they attend a school with few prior classmates. This provocative finding raises questions about whether and how the transition from high school to college reinforces or weakens students' links with familiar peers. Put differently, are transitions from high school to college with same-school peers more likely to enhance academic performance, or does the disruption of high school peer groups undermine achievement?

Under the best of circumstances, the transition to college is both a challenging and stressful phase of the academic lifecycle, particularly during the first semester (Shaver, Furman, and Buhrmester 1985; Cutrona 1982). A vast educational research literature shows that strong social support systems are essential for smooth transitions both into and through college, particularly for students from disadvantaged academic backgrounds (Cutrona 1982; Dennis,

[2] Sociologists use the term "significant others" to characterize individuals and groups who exert defining influences on individuals or groups; social psychologists often use the term "reference groups" to draw a distinction between the normative and comparative functional influences. Few researchers distinguish these influences empirically, however.

Phinney, and Chuateco 2005; Massey 2006; Terenzini et al. 1996; Tinto 1993). Presumably social peers can promote college achievement by providing information about successful course strategies, attending classes together, and reinforcing positive study norms (Hallinan and Williams, 1990; Richardson and Skinner, 1992; Ryan, 2000).

Compared with socioeconomic, demographic and achievement correlates of college achievement, social influences on collegiate performance are less well understood. A few recent studies document peer influences on college performance and post-college choices. For example, Sacerdote (2001), Stinebrickner and Stinebrickner (2006), and Zimmerman (2003) show that (randomly assigned) roommates influence college grade point average. Based on a review of studies about peer influences on academic outcomes conducted during the 1970s and 1980s, Bank and associates (1990) conclude that evidence about social influences is essential to better understand college persistence. Although based on a single midwestern university, their case study does not consider whether influential peers attended the same high school.

Using data from West Point, Lyle (2007) shows that peers influence selection of college major, however Sacerdote (2001) finds no evidence that roommates influence selection of college majors at Dartmouth. Marmaros and Sacerdote's (2006) finding that roommates and fraternity members impact occupational choices suggests that influences of college peers persist beyond graduation. Studies that examine the formation of post-secondary friendship groups identify geographic origin, ethno-racial membership, academic background and participation in campus activities as key predictors of college peer networks (Foster 2005; Marmaros and Sacerdote 2006; Mayer and Puller 2008).[3]

Collectively recent studies that focus on the formation of college social networks provide evidence that friends, fraternity members, roommates, and teammates influence college achievement. Several authors have identified geographic proximity as an important correlate of friendship formation in college, but none has considered whether same school classmates influence college achievement. Yet, there are several reasons why secondary school classmates would promote college success. First, students' college choice sets are highly constrained by the high school they attend, which determines high and how broadly students cast their college sights and ultimately their enrollment decisions (Niu and Tienda, 2008). Furthermore, academic tracking in high schools combined with selective sorting by ethno-racial status, as Weinberg (2007) finds, will likely increase solidarity among classmates who attend the same post-secondary institution. Finally, because students' socioeconomic circumstances and high school extracurricular activities also influence college choice, it is conceivable that school-specific peer influences carry over to college. Because college orientation of secondary school attended is a strong predictor of college choice (Niu and Tienda 2008), it is conceivable that high school peer groups also influence postsecondary performance.

Most empirical measures of college social networks are crude (Ryan, 2000) and few studies measure actual (as compared with reported or aspired) patterns of interaction. Nevertheless, there is compelling evidence about the influence of peer groups on academic achievement at the collegiate level. Several studies use the random assignment of roommates to identify peer influences on college outcomes. In a study of Dartmouth students, Sacerdote (2001) finds roommate influences on participation in fraternities and GPA; specifically, he shows that having a roommate in the top ability quartile increases own-GPA by 0.05 points. Stinebrickner and Stinebrickner (2006) and Zimmerman (2003) present similar results from

[3] There is a larger literature on peer influences on college outcomes outside of economics that uses smaller samples and different study designs (e.g. Perl and Trickett 1988).

other selective colleges, but because less than ten percent of all college students attend elite, private institutions (Bowen and Bok 1998), the external validity of these findings is unclear.

Despite different methods and university populations, studies that describe the formation of social networks on college campuses identify several common factors that indicate how peer groups can influence postsecondary scholastic outcomes. Using email exchanges between students at Dartmouth College, Marmaros and Sacerdote (2006) find that race, family background, shared academic interests (e.g. major) and geographic proximity influence peer group membership. Mayer and Puller (2008) use information from the website *Facebook.com* at 10 Texas universities and also find that race, family background, and academic interests influence social group membership. Finally, Foster's (2005) study at the University of Maryland concurs that academic background, race, and geographic background are among the most influential individual level predictors of friendship formation on college campuses.

Both Mayer and Puller (2008) and Marmaros and Sacerdote (2006) claim that residential assignments and other institutional policies are ineffective strategies to influence the composition of peer groups. Therefore, it is worthwhile to consider whether pre-collegiate social groups afford academic benefits to enrolled students, and if so, how institutions might capitalize on them to bolster student success.

Measurement of High School Social Influences

Previous studies suggest that high school peers are likely to influence college success, but the optimal measurement is less clear. In additional to highly limited availability of data linking high school peers to college outcomes, researchers face a tradeoff between (1) endogeneity and (2) spheres of influence. To be concrete, nominated friendships such as those found on the social networking website Facebook.com likely indicate a relevant sphere of influence because linked individuals typically know each other and potentially influence each other's behavior (Mayer and Puller 2008). That individuals purposely join specific networks poses a serious endogeneity challenge for empirically linking nominated peer networks with college success. For example, gregarious people both (1) have many friends and (2) attain high college grades in the absence of a causal link between peer influences and college achievement. Empirical strategies to resolve biases resulting from purposeful sorting are not currently available; moreover, data that identify both nominated peer networks and college achievement are also quite limited (Mayer and Puller 2008).

The other side of the measurement and endogeneity tradeoff involves circumstances where researchers have measures of peer groups with minor endogeneity concerns, but that are potentially less informative. For example, assuming that all students in a geographical unit, such as a county or neighborhood, are connected socially poses minor endogeneity concerns because adolescents do not choose their county of residence. The shortcoming of such global measures is their questionable relevance for college success because the social aggregate includes many individuals who do not interact, much less influence each other. For smaller aggregate units, however, this limitation becomes less problematic.

Accordingly, we construct a measure of high school peers that balances the strengths and weakness of these two extremes, namely the number of high school classmates who enrolled at a postsecondary institution at the same time. Even in large high schools, some if not all members of the same graduation class who matriculate at the same university are likely to know each other. Moreover, given the propensity of students to establish friendships along race and ethnic lines, we also calculate the number of *same race* high school classmates who matriculate as freshmen at the same college. As elaborated below, we control for time-invariant high school characteristics to reduce the likelihood that other factors, such as size, quality, or geographic distance from college bias our estimates of classmate influences on college achievement.

III. Texas Case Study

Texas provides an interesting venue to examine whether the size of high school peer groups is associated with academic performance because of recent changes in admission regimes. In response to the judicial ban on affirmative action resulting from the *Hopwood* decision, the state legislature passed a law in 1997 guaranteeing automatic admission to students who graduate in the top 10% of their high school class. Architects of the law sought to level the playing field by equalizing access to all high schools throughout the state by admitting a fixed share based on a single merit criterion. Beginning in 1998, all applicants who graduated in the top decile of their class were admitted to the public university of their choice, provided they submitted a completed application (including standardized test scores as well as required fees, essays, and recommendation letters).[4] Non-top 10% graduates were subjected to full file review.

Despite the apparent novelty of the Texas admissions experiment, both public flagships—the University of Texas at Austin and Texas A&M University—placed heavy emphasis on grades. Even before the top 10% law went into effect, in-state applicants who graduated in the top decile of their class were virtually ensured (but not guaranteed) admission (Walker and Lavergne, 2001). For perspective, the two public flagships combined enroll nearly one quarter of all students (23 percent) attending four year public institutions in Texas (THECB, 2001). With a student body in excess of 48 thousand, UT-Austin ranks among the largest campuses in the United States, second only to Ohio State in 2006 (The College Board, 2007); undergraduates comprise about three-fourths of the entire student body. More important for understanding the significance of changes in college admission regimes are the trends in high school graduation rates relative to the growth of post secondary opportunities.

Although the top 10% law has been credited with restoring diversity to the Texas public flagships, a systematic analysis of changes in the composition of high school graduates leads to a different interpretation (Tienda, Niu and Alon, 2009). Even before the judicial ban on affirmative action, Texas was experiencing a “college squeeze” driven by the rapid growth of high school graduates compared with a relatively slow expansion of college opportunities. Between 1994 and 2004, the number of high school graduates rose 50 percent and became more diverse, such that less than half of all high school graduates were white by 2004. In contrast to the rapid increase in high school graduates, college enrollment opportunities grew only 20 percent over the same period. Moreover, most of the growth in Texas post-secondary education involved two-year colleges (THECB, 2005). [5] These secular changes in the college-eligible population have implications for modeling strategies, which we address below.

A third aspect of college-going behavior in Texas warrants attention, namely the possibility that the top 10% law altered the redistribution of applicants by broadening access to graduates from high schools that historically sent few students tob UT. Tienda and Niu (2006b) report that 23 percent of freshmen admitted to UT in 2000 hailed from only 28 high schools, out of a possible 1644 statewide. Predictably, the number of high schools that sent

[4] This is not a trivial point. Although test scores of top decile applicants were disregarded for purposes of the admission decision, they were required for an application to be complete. Part of the increase in total applications received at UT is driven by the growth in incomplete applications, such as those prepared and submitted as a requirement for senior English classes.

[5] The distribution of two and four-year college opportunities in Texas differs from most states, where college enrollment in four-year institutions far outstrips that in two-year institutions. This circumstance intensifies the “college squeeze,” making the issue of admissions far more contentious during the current decade, as the baby boom offspring flood college campuses.

students to UT increased. The University of Texas Admissions Office (2005) reports that the number of high schools represented among enrolled freshmen rose from 616 to 815 between 1996 and 2004, thus about half of all high schools are now represented. Nevertheless, a few large, affluent high schools continue to dominate application pools at both public flagships, even as many new sending schools provide a handful of students each (Tienda and Niu, 2006b). The sheer size of the freshman cohorts coupled with recent changes in feeding patterns provide large variation in peer cohort size both within and among high schools over this time period, thus providing a unique opportunity to investigate whether the number of co-matriculating high school classmates enhances collegiate academic performance.

IV. Data and Estimation Strategy

We use longitudinal administrative data from the University of Texas-Austin collected under the auspices of the Texas Higher Education Opportunity Project.[6] In this paper we analyze first semester college grade point average (GPA) and two-year persistence for freshmen who enroll at UT with high school classmate peer groups of differing sizes.[7] Two types of administrative records are available. The baseline file includes all students who applied in a given year, their admission decision, and conditional on acceptance, their enrollment decision. For matriculants, a term file records various measures of academic progress, notably persistence (measured by whether a student is still enrolled at UT after four semesters), GPA, choice of major, and graduation status for each semester enrolled.

The comprehensive data file analyzed includes every student who applied to the university from the early 1990's through 2003. The administrative data also include a rich set of academic and demographic variables for each college applicant, including SAT/ACT test scores, class rank, sex, ethnicity, maternal education attainment, and high school advanced placement course work. In addition to individual characteristics of all applicants, the administrative data contains high school and geographic identifiers, which permits measurement of the size of students' high school peer groups upon entering college.

Many research universities draw their student body from the entire nation, but public Texas universities enroll over 80 percent of their incoming class from instate high schools. Therefore, we focus on students who graduated from Texas high schools to construct school-specific measures of co-matriculating classmates, including same race classmates. Specifically, for each high school we compute the number of classmates enrolled in the same freshman cohort. Because Texas high schools vary in the size of their senior class, from 10 to over 2,000, this measure exhibits large variability.[8] In particular, the large freshman cohorts (~ 6,000) at the University of Texas-Austin allow substantial variation in high school cohorts over time, and the large proportion of Hispanic students in Texas permits an examination of this under-researched group. Texas high schools are highly segregated along race and ethnic lines (Tienda and Niu, 2006a).

A primary limitation of this measure of peer influences is that we likely misclassify some individuals as "socially connected" when in fact they are not; however, this bias renders our results conservative. A second limitation is the inability of this measure to shed light on the mechanisms operating on academic performance—peer emotional support, information transmission, friendship formation or consolidation based on high school affinity, or some other mechanisms. Illuminating the mechanisms of peer influence likely requires richer data

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[6] THEOP is a longitudinal study of college-going in Texas designed to understand the consequences of changing admissions regimes after 1996. The description of this project is available at www.THEOP.Princeton.edu.

[7] Because of the timing of the Longhorn scholarship programs, which began in 1999, we are unable to adequately examine four and six year graduation rates with our data, which covers 1993–2003.

[8] Several high schools enroll only freshmen and sophomores, or juniors and seniors. At least one high school is exclusive to seniors.

than is currently available, however. Establishing an association between size of high school cohorts and college success is important nonetheless because this is a lever over which postsecondary institutions have some control.

Estimation Strategy

The empirical methodology builds from a generalized educational production function tailored to consider whether high school peers are important inputs into college achievement. A generic education production function typically used in the economics literature specifies an educational outcome as the product of a vector of individual (*X*), family (*F*), school (*S*), and environmental/neighborhood (*E*) level inputs:

$$Y=f(X, F, S, E) \quad (1)$$

We hypothesize that an important and usually unobserved input in the production of college achievement is the size of matriculants' high school peer group. To descriptively examine the data, we take a linear approximation of the education production function and use OLS regression analysis to estimate the association between educational inputs and college achievement. Because we use pooled enrollment data for over 10 years from the University of Texas-Austin, we also use year fixed effects to capture any secular trends in the outcomes over the time period for which we estimate the following specification:

$$y_{ist}=\alpha N_{ist}+X_{ist}\beta+\theta_t+\varepsilon \quad (2)$$

where y_{ist} denotes the outcome (e.g. GPA) for student *i* from high school *s* entering college at time *t*, N_{ist} represents the number of high school classmates who enroll at UT at the same time as the index student, *X* denotes the vector of student characteristics reported in Table 1, and θ indicates year effects that capture e.g. grade inflation and changes in the applicant and admission pool. Because all students attend the same institution, it is not necessary to include a vector of college or neighborhood-level inputs.

Finally, because students who attend high schools with large numbers of economically disadvantaged classmates are less likely to attend college than their peers who graduate from affluent schools, we also estimate the impact of a marginal increase in the number of high school peers for relatively disadvantaged students using an instrumental variable/fixed effects strategy. As an instrument, we use the introduction and expansion of a scholarship program at UT that was targeted to students from poor high schools with low college-going traditions. These scholarship programs not only raised the number of enrollees from several targeted high schools, but also increased the number of classmates who enter college together from these high schools regardless of scholarship receipt (Domina 2007).[9] These changes in the size of peer cohorts allow us to estimate the impact of increasing same school peers on college achievement for freshmen who graduated from high schools with low college-going traditions.

V. Results

Table 1, which provides summary statistics of the full sample, shows that UT freshmen averaged a GPA of 2.93 during their first semester of college coursework (SD = 0.87). Further, nearly 80 percent of first time freshmen were enrolled after 4 semesters (our

[9] Domina (2007) reports that the scholarship program averages 225–250 scholarships per year combined across all schools. The success of the school-targeted programs is evident in the higher enrollment rates of graduates from these Longhorn schools, 22 percent versus 17 percent for otherwise similar schools not targeted for the program.

measure of persistence). Almost two-thirds of UT enrollees during the observation period were white, with blacks and Hispanics representing 4 and 15 percent, respectively. Although Asians represent less than 5 percent of Texas high school graduates, they accounted for 17 percent of first time enrollees.

Given the segregation of Texas high schools along race and ethnic lines, the typical white freshman at UT arrives on campus with approximately 30 high school classmates compared with over 40 for an average Asian student; by contrast, the high school cohort of black and Hispanic UT freshmen consists of less than 20 classmates, on average. For same-race peer cohorts at college entry, there are even larger differences between white and Asian students and black and Hispanic students. White college freshmen enter UT with 23 white high school classmates on average, but black college freshmen typically enter UT with only 1 black high school classmate. Asian UT freshmen average nearly four times as many same-race high school classmates as Hispanic freshmen. If size of high school cohorts improves college performance, blacks and Hispanics are at a decided disadvantage.

Table 2 presents OLS estimates predicting first semester grade point average (GPA) or college persistence as a function of the inputs specified in (2).[10] The adjusted average GPA (col. 1) for males is 0.15 points below that of females, and males are two percentage points less likely to persist in college (col. 4). Asian students outperform the GPA of all other groups, but there are only small GPA differences between whites and blacks and Hispanics. Furthermore, Asian students and black students are, respectively, 3.6 and 2.4 percentage points *more* likely than white students to remain enrolled two years after matriculation, but Hispanic students are 1.4 percentage points less likely to do so. As is well known, SAT scores and high school class rank are positively related to college GPA and persistence; additionally, students with more highly educated mothers typically achieve higher first semester GPAs and persist in college at higher rates than their counterparts with less well educated mothers.

Especially noteworthy are the associations between the number of high school classmates and our measures of academic success. Consistent with our hypothesis, UT freshmen from larger peer cohorts achieved higher GPAs than first-time enrollees with fewer high school peers. Specifically, students with a one standard deviation larger peer cohort (30) earn GPAs that average 0.12 points higher, which is comparable to a difference of 60 SAT points (1/3 a standard deviation in SAT scores). Similar results obtain for persistence in that freshmen who matriculated with 30 more high school classmates are 3 percentage points more likely to remain enrolled four semesters later.

One limitation with column 1 results is a “scaling” issue that arises because of the assumed linear association. The empirical results represent the estimated achievement gains from increasing the size of the high school cohort by one student. More concretely, scholastic benefits associated with additional high school classmates could depend on the current cohort size such that the potential benefits of additional high school peers will diminish. That many UT enrollees hail from a few high schools with large college sending traditions could attenuate the estimated average effect. To consider whether the relationship between peer cohort size and college outcomes is nonlinear, we estimate additional specifications with quadratic terms, which are reported in Columns 2–3 and 5–6 in Table 2. The quadratic terms for peer cohort size indicate an inverse-U shape association; the size of the squared term coefficient suggests that the maximum GPA achievement benefit corresponds to a peer cohort of size 114. Finally, columns 3 and 6 portray the relationship between high school

[10] All specifications control year fixed effects, but these are omitted from the tables in the interest of parsimony. Complete results are available from the authors.

classmates and GPA across quartiles of the cohort size. The positive achievement benefits persist. Moving from the 1st to the 4th quartile of peer cohort size is associated with an increase in 1st semester GPA of 0.4 points and an increase in persistence of 10 percentage points. [11]

High School Fixed Effects—The associations between peer cohort size and college academic outcomes, while suggestive, should not be interpreted as causal for several reasons. A higher-quality Texas high school (which is an unobserved individual-level educational input) typically sends more students to a selective public flagship institution like the University of Texas-Austin compared with a low-quality high school of comparable size (Tienda and Niu 2006b). Because high-quality high schools are populated by affluent students who are more likely to attend college than lower economic status students, even controlling for individual academic achievement and family economic status may not eliminate the influence of high school quality that is correlated with the number of high school classmates who attend UT. One reason is that the most competitive high schools have sophisticated college counseling offices and extensive ties with post-secondary institutions (Frost, 2005). Therefore, the coefficient for size of high school cohort could be a proxy for unmeasured variation in high school quality that is associated with first semester college performance and college persistence.

To examine this possibility, we add high school fixed effects to equation (2).

$$y_{ist}=\alpha N_{ist}+X_{ist}\beta+\delta_s+\theta_t+\varepsilon \quad (3)$$

Estimates based on equation (3), which are reported in Table 3, reveal that race coefficients change considerably in the fixed effects specification (compare with estimates reported in Table 2). Controlling for time-invariant high school characteristics, black and Hispanic students achieve *higher* grade point averages than comparable white students, and the white-Asian difference is eliminated. The fixed effects specification not only eliminates the Hispanic-white difference in college persistence found in Table 2, but also increases the black advantage in college persistence from approximately two-and-a half to nearly 4 percentage points.

Consistent with Niu and Tienda’s (2008) claim that high school quality constrains college options more than student academic achievement, our results suggest that differences in high school characteristics are a primary arena for the production of black-white and Hispanic-white college performance gaps. Following this work, Fletcher and Tienda (forthcoming) show that adding high school fixed effects eliminates or reverses the coefficient on race in predicting college GPA across at least 4 institutions of higher education in Texas of varying selectivity (University of Texas-Austin, Texas A &M, Texas Tech, University of Texas-San Antonio).

Supporting our intuition that peer cohort size is likely correlated with unmeasured high school quality, the specification with high school fixed effects shrinks the point estimate for the number of high school peers who matriculate together. The inverse-U association reported in column 2 of Table 3 reveals that the influence of high school classmates on first semester college grades is attenuated when a fixed effects specification is used; a maximum benefit obtains from high school peer groups of approximately 100, which only the largest

[11] In unreported results, we also stratified our specifications by the typical sending patterns of the high school—into quartiles based on average peer network size over the time period of our data. The stratified specifications did not reveal a “tipping point” where further increases in peer network size are no longer beneficial.

schools can satisfy. Column 3 suggests that moving from the 1st to the 4th quartile of peer cohort size increases GPA by 0.08 points, which is 1/5th the size of the point estimate in the absence of high school fixed effects. Modeling high school fixed effects also weakens the association between peer cohort size and college persistence. Moving from the 1st to the 4th quartile of peer cohort size raises persistence by 2.2 percentage points, which is approximately 1/5th the size of the point estimate reported in Table 2.

Table 4 reports group-specific estimates of the influence of peer cohort size on college first semester grades (Columns 1–3) and two-year persistence (columns 4–6). Specifically, the association between peer cohort size and GPA is 0.001 for white students, but for Hispanic and black students, the point estimates are not statistically significant. Analyses of persistence (columns 4–6) indicate that only Hispanics benefit from enrolling with larger numbers of high school classmates once school fixed effects are modeled. The point estimate implies that adding 10 same high school peers would raise persistence rates for Hispanic students by 1 percentage point.

Finally, restricting comparisons to students who attended the same high school also attenuates the association between college GPA and other covariates associated with scholastic achievement. For example, the association between maternal education and college GPA is attenuated once school-specific variation is modeled; so too is the influence of SAT on college grades. That the association between class rank and first semester GPA appears to be strengthened in the fixed effects specification is consistent with a voluminous literature demonstrating that high school grades, which are less tightly coupled with high school quality, predict college success more reliably than SAT scores (Alon and Tienda 2007; Bowen and Bok 1998).

Results for Same-Race Classmates—Texas high schools are highly segregated (Tienda and Niu, 2006a) and because adolescent friendships often form along race and ethnic lines, even in integrated schools, it is conceivable that the association between the size of high school cohorts and college achievement depends on the number of same-race high school classmates. To evaluate this possibility, in Table 5 we estimate the influence of same-race classmates on first semester GPA and 2-year persistence using specifications that include year fixed effects (column 1) as well as both year and school fixed effects (column 2). Results for the pooled sample indicate that a 10-person increase in the size of the same-race cohort is associated with a 0.05 point boost in first semester college GPA and 1 percentage point increase in persistence. Neither association attains statistical significance in the high school fixed effects specification (column 2), however. The pooled models may obscure group-specific benefits of entering college with familiar high school classmates, which may be particularly important for first generation college-goers.

To consider whether the academic benefits of matriculating with high school peers differ by race, columns 3–5 report separate estimates for white, black and Hispanic students. The largest association between same-race peer cohort size and both college achievement outcomes corresponds to black students; however, the point estimates for same-race peers are statistically significant only for white students. Racial differences in the association between number of high school classmates and college achievement provide only suggestive evidence that minority students (black students in particular) reap larger benefits than white students who begin enroll at UT along with other white high school peers..[12]

[12] Even in high schools with large numbers of black and or Hispanic students, the number of minority students who enroll at UT is typically small both because most feature low college-going traditions and because financial barriers remain a formidable obstacle to college enrollment (Tienda and Niu, 2006a). Within-school stratification may also lead to low rates of minority enrollment.

Results for Disadvantaged Students

Overall, the results presented in Tables 2–5 indicate that for typical UT freshmen, the influence of high school classmates on first semester GPA and college persistence is modest, although there is some indication that the number and ethno-racial composition of high school classmates who begin college together differs by race and Hispanic origin. Given the unequal shares of black, white and Hispanic students in the freshman class, a logical question, therefore, is whether a marginal increase in the size of high school cohorts raises achievement more than the average effect. In light of unequal academic benefits among minority and non-minority freshmen of enrolling with same race high school classmates, it is conceivable that under-represented minority students benefit more than either white or Asian students from a marginal increase in peer cohort size.

To address this question, we use an instrumental variables/fixed effects estimation strategy. The instrument used is the implementation of the Longhorn Scholars program by the University of Texas at Austin in response to the change in admission regime following the judicial ban on affirmative action (1996) and the enactment HB 588 a state law that guaranteed admission to students who graduated in the top decile of their high school class. Passed in 1997 and in force by 1998, HB 588, popularly known as the top 10% law, was designed to restore diversity to the public flagships by guaranteeing access to a fixed percentage of the graduating class. Because UT administrators appreciated that an admission guarantee can not ensure enrollment, particularly among economically disadvantaged students, they designed the Longhorn Scholars program, which targeted high schools with large numbers of disadvantaged students and low college-going traditions. The program sought to recruit to UT underrepresented students who were eligible for automatic admission. Although Longhorn high schools tend to have large minority enrollments, economic status of the student population and low college going traditions were the key criteria used to designate schools for the program (Domina, 2007; Tienda and Niu, 2006b).

The Longhorn Scholars program has potential to increase the size of freshman cohorts from specific high schools, particularly for economically disadvantaged students, who are the intended beneficiaries of these means-tested scholarships (Domina 2007). Because we expect the association between size of high school cohort and college achievement to be heterogeneous, we interpret the IV estimator as a local average treatment effect (LATE) for students whose peer cohorts are larger as a result of the Longhorn Scholarship Program (Imbens and Angrist 1994).[13] Therefore, we estimate the following main and first-stage equations

$$y_{ist}=\alpha N_{ist}+X_{ist}\beta+\rho L_{ist}+\delta_s+\theta_t+\varepsilon \quad (4)$$

$$N_{ist}=X_{ist}\eta+\phi L_{ist}+\sigma LHS_{st}+\delta_s+\theta_t+\upsilon \quad (5)$$

where L indicates whether a student received a Longhorn Scholarship and LHS denotes whether an enrollee's high school had a Longhorn Scholars Program when the student applied to UT-Austin. LHS is a time-varying school-level variable that is assumed not to directly influence college performance (controlling for school fixed effects and observable

[13] In order for the LATE interpretation to be valid, a monotonicity condition must be satisfied, namely that students attending high schools targeted for the Longhorn program will attend UT with a larger peer network than would be the case had the school not received the program. This assumption cannot be empirically verified because schools already received the "treatment," but there is evidence that students from Longhorn schools increased their propensity to take college entrance exams (Domina, 2007). The assumption would be incorrect if, for example, the introduction of the Longhorn program leads classmates to attend Harvard instead of UT because it provides information and optimism about enrolling in highly selective colleges

student characteristics). Rather, graduating from a Longhorn high school should increase the size of freshmen's peer cohort and, consequently, boost college performance.

The administrative data does not directly record which individuals received Longhorn Scholarships, but does indicate which high schools implemented Longhorn Scholars Programs over time. Therefore, it is possible to approximate this instrument using information about the principal factors determining receipt of the scholarship, namely whether students: (1) graduated from a high school with a Longhorn Scholars Program; (2) graduated in the top decile of their class; (3) are black or Hispanic; and (4) are from a low-income household (which we proxy with maternal education). Assuming that receipt of a Longhorn Scholarship is determined by observed individual and school factors, $L_{ist} = g(X, S)$, we use a flexible functional form that includes interaction terms between indicators of top 10% class rank, race, and maternal education to control for receipt of the Longhorn scholarship in the empirical specifications. To control for time-varying quality of their classmates that might confound the estimates of peer cohort size, models also include the mean SAT score of the matriculating cohort.

Assumptions regarding the determinants of Longhorn scholarship receipt are important to our empirical approach because we seek to distinguish the effects of receiving a Longhorn scholarship on college achievement from the effects of having a larger high school cohort by virtue of attending a high school with a Longhorn Scholars Program. Importantly, to the extent that we fail to fully capture the direct benefits (e.g. tutoring services, monies from the scholarship) of receipt of a Longhorn scholarship, we expect our estimate of the effect of high school classmates on college achievement to be biased upward.[14]

IV/FE Estimates—Table 6 reports the instrumental variables estimates of high school classmates on college GPA and college persistence.[15] For the full sample, results indicate that a marginal increase in the number of high school classmates increases college GPA by 0.069 points and college persistence by 0.017 points. Group-specific estimates reveal that failure to differentiate high school peers by race yields low correlations between peer cohort size and the Longhorn Scholars Program indicator in the first stage for blacks and whites (columns 2, 3, 6, 7). This signals a weak instrument problem for black and white students, which makes it difficult to determine the effects of marginal increases in high school classmates for these groups. For the Hispanic students, however, the instrument is strong.

Results shown in column 4 indicate that marginal increases in peer cohort size for relatively disadvantaged Hispanic students (who were targeted by the Longhorn Scholars Program) boosts freshman GPA, but the point estimate is not statistically significant. Substantively this implies that enrolling with one more classmate (of any race) at UT raises Hispanic freshmen's first semester college GPA by 0.067 points. This coefficient is not statistically significant, yet its magnitude is similar to the GPA boost Sacerdote (2001) calculated for students who were assigned a high ability roommate. Columns 5–8 show that marginal increases in freshmen's high school classmates raise college persistence by nearly 2

[14] Selection of high schools for the Longhorn Scholars Program could not consider ethnic and racial composition, which was judicially prohibited by the *Hopwood* decision. In order to select schools, UT administrators considered the percentage of low-income families in a district (based on census data) and the schools' history of sending students to the University of Texas at Austin. Although we cannot claim that the assignments were randomly made within eligible schools, we are confident in assuming that these high schools were not chosen based on the benefits to the students of enrolling in UT with larger peer networks. In fact, because of their typically low sending rates, the opposite would be true.

[15] In Table 6, we present results where the samples include students who enrolled at UT between 1995 and 2003. Since the first Longhorn Scholars Program was not implemented until 1999, we have also estimated results for the years 1997–2003 for greater comparability of student populations within the treated schools. These results are qualitatively similar and available from the authors. Results from the first stage regressions are available upon request.

percentage points. The results stratified by race do not reach statistical significance, but the coefficients are positive and of similar magnitude for all groups.

Given the propensity of students to sort along race and ethnic lines in their social relationships, Table 7 summarizes the IV estimates for same-race high school classmates who enter college together. For the full sample (columns 1 and 5), the results imply that students who enroll with one additional same-race classmate is associated with a 0.11 point higher first semester GPA (column 1) and a three percentage point higher persistence rate (column 5). These results suggest that small increases in the size of same-race classmates produced by the Longhorn Scholarship Program at the University of Texas-Austin substantially increased first-semester GPA for disadvantaged students in targeted high schools.

Group-specific estimates produce relatively similar but lower magnitude coefficients for first semester GPA. The black and white samples have small F-statistics, but for each group the point estimates suggest sizable GPA benefits from adding one same-race student to the freshman cohort. For college persistence, the group-specific point estimates reported in columns 5–8 are relatively comparable, although the race-specific estimates are not statistically significant. Because these estimates correspond to the marginal student affected by the Longhorn Scholar Program, they suggest that graduates from disadvantaged high schools potentially benefit more than the average student from increases in their high school cohort. Moreover, the academic benefits from having larger same-race peer cohorts reaped by economically disadvantaged students do not appear to differ by minority group status. Rather, increases in the number of high school classmates appears to be more beneficial for students from high schools with low college-going traditions regardless of race.

VI. Conclusions and Future Directions

Using administrative data from the University of Texas-Austin, we examine whether the number and ethnic makeup of same high school classmates who enter college together influence first-semester GPA and two-year persistence rates. Empirical specifications include high school fixed effects, which take advantage of variation in college-sending patterns of cohorts from the high same school over time, as a strategy to control for high school factors that directly affect college GPA. To estimate the effects of “marginal” increases in the size of high school cohorts on college achievement, we exploit the introduction of the Longhorn Scholars program, which was designed to raise college attendance from economically disadvantaged high schools with low college going traditions.

Empirical results indicate that students with larger high school peer groups upon entering college outperform their counterparts with fewer co-enrolled classmates, and they are also more likely to remain enrolled after four semesters. Although the associations between the high school cohort size and college achievement are small, it appears that benefits accrue both to minority and nonminority students, including those who graduated from high schools with large numbers of economically disadvantaged classmates. For the latter, a marginal increase in the number of same-race classmates is associated with a 0.1 grade point higher GPA, on average. Results provide suggestive evidence that minority students who enter college with sizable cohorts reap larger academic benefits than their white counterparts. These findings suggest that both size and composition of peer cohorts is relevant for understanding their influence on college achievement, but much more research is needed, for example, to identify cross-race and gender-specific differences, such as those reported by Hallinan and Williams (1990). Future research along these lines would also benefit from a longitudinal analysis that could verify whether the associations were sustained over time.

Our results indicate that scholarships and other interventions that increase the number of high school classmates who enter college together can potentially raise the chances that disadvantaged students will succeed academically. Because colleges and universities exercise some control over the number of students they enroll from specific high schools, it is worth replicating our analyses at other institutions before drawing implications for recruitment policies. The Longhorn Scholarship program illustrates how financial aid offers can be targeted to high schools as a strategy for recruiting the most promising graduates (Domina, 2007). That high achieving students sort by ethnicity increases the likelihood that they will affiliate in college—at least during the early and most challenging transition year (Bank, et al., 1990; Schiller, 1999). These pre-existing social groups could assist in the transition from high school to college and be a source of social support to first-time college freshman.

Finally, we should note that our measure of high school peers leads to downwardly biased estimates because we can not ascertain whether and to what extent high school classmates interact upon beginning postsecondary study (Weinberg 2007). Thus, the causal effects of peer group size on college achievement could be larger than our empirical estimates imply. The use of additional data sources and alternative measures of social influences are important future steps in estimating the effects of peers on educational outcomes. Although our data preclude specifying the specific mechanisms through which high school peer groups produce salutary effects on academic achievement, future analyses with suitable data might productively explore whether college students who attended the same high school are likely to sort into similar courses and majors and whether peer cohort size represents cognitive, symbolic or practical support.

Acknowledgments

This project was supported with a grant from the University of Kentucky Center for Poverty Research through the U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, grant number 5 UO1 PE000002-05. Data collection was supported by the Ford, Mellon, Hewlett, and Spencer Foundations. The authors thank Dylan Conger, Mark Long, Bruce Sacerdote and participants at 2007 APPAM meetings for very helpful comments. Dawn Koffman was instrumental in creating the database we use for our analysis.

References

Alon, Sigal; Tienda, Marta. Diversity, Opportunity and the Shifting Meritocracy in Higher Education. American Sociological Review. 2007; 72:487–511.

Alvarado, Steven E.; Turley, Ruth Lopez. Working Paper. Texas Higher Education Opportunity Project; 2008. College Bound Friends: A Study of Racial and Ethnic Differences. (http://theop.princeton.edu/conference/seminar08/Alvarado_CollegeBoundFriends_v01.pdf)

Ammermueller, Andreas; Pischke, Jörn-Steffen. Working Paper. Cambridge, Mass: National Bureau of Economic Research; 2006. Peer Effects in European Primary Schools: Evidence from PIRLS. (http://www.nber.org/papers/W12180.pdf)

Bank, Barbara J.; Slavings, Ricky L.; Biddle, Bruce J. Effects of Peer, faculty and Parental Influences on Students' Persistence. Sociology of Education. 1990; 63:208–225.

Bowen, William G.; Bok, Derek. The Shape of the River: Long-Term Consequences of Considering Race in College and University Admissions. Princeton, NJ: Princeton University Press; 1998.

Cameron, Stephen V.; Heckman, James J. Life Cycle Schooling and Dynamic Selection Bias: Models and Evidence for Five Cohorts of American Males. Journal of Political Economy. 1998; 106:262–333.

Cameron, Stephen V.; Heckman, James J. The Dynamics of Educational Attainment for Black, Hispanic and White Males. Journal of Political Economy. 2001; 109:455–99.

The College Board. College Search. 2007. retrieved 9/16/07. http://www.collegeboard.com/student/index.html?student

Cooley, Jane. Working Paper. Madison, WI: University of Wisconsin; 2007. Desegregation and the Achievement Gap: Do Diverse Peers Help?. (http://www.ssc.wisc.edu/~jcooley/cooleyMar07.pdf)

Coleman, James S. The Adolescent Society. New York: Free Press of Glencoe; 1961.

Cutrona, Carolyn E. Transition to College: Loneliness and the Process of Social Adjustment. In: Peplau, LA.; Perlman, D., editors. Loneliness: A Source Book of Current Theory, Research, and Therapy. New York: Wiley-Interscience; 1982.

Dennis, Jessica M.; Phinney, Jean S.; Chuateco, Lizette I. The Role of Motivation, Parental Support, and Peer Support in the Academic Success of Ethnic Minority First-Generation College Students. Journal of College Student Development. 2005; 46:223–36.

Ding, Weili; Lehrer, Steven F. Do Peers Affect Student Achievement in China’s Secondary Schools? Review of Economics & Statistics. 2007; 89:300–12.

Domina, Thurston. Higher Education Policy as Secondary School Reform: Texas Public High Schools After “Hopwood”. Educational Evaluation and Policy Analysis. 2007; 29:200–17.

Fletcher, Jason M.; Tienda, Marta. ANNALS of the American Academy of Political and Social Science. Race and Ethnic Differences in College Achievement: Does High School Attended Matter?. (forthcoming)

Fletcher, Jason. Working Paper. Texas Higher Education Opportunity Project; 2006. Social Interactions in College Choice: The Interplay of Information, Preferences, Social Norms, and Individual Characteristics in Predicting College Choice. (http://theop.princeton.edu/reports/wp/Fletcher%20THEOP.pdf)

Foster, Gigi. Making Friends: A Nonexperimental Analysis of Social Pair Formation. Human Relations. 2005; 58:1443–65.

Frost, Michelle B. Texas Students’ College Expectations: Does High School Racial Composition Matter? Sociology of Education. 2008; 80:43–65.

Frost, Michelle B. Texas Students’ Knowledge of University Admissions Policies and Standards: Do High School Counselors Matter?. Unpublished. 2005. Retrieved February 28, 2008 (http://theop.princeton.edu/reports/wp/students_knowledge.pdf)

Fuller, Winship C.; Manski, Charles F.; Wise, David A. New Evidence on the Economic Determinants of Postsecondary Schooling Choices. The Journal of Human Resources. 1982; 17:477–98.

Hallinan, Maureen; Williams, Richard A. Students’ Characteristics and the Peer-Influence Process. Sociology of Education. 1990; 63:122–132.

Hanushek, Eric A.; Kain, John F.; Markman, Jacob M.; Rivkin, Steven G. Does Peer Ability Affect Student Achievement. Journal of Applied Econometrics. 2003; 18:527–44.

Hoxby, Caroline M. Working Paper. Cambridge, Mass: National Bureau of Economic Research; 2000. Peer Effects in the Classroom: Learning from Gender and Race Variation. (http://papers.nber.org/papers/7867)

Imbens, Guido A.; Angrist, Joshua D. Identification and Estimation of Local Average Treatment Effects. Econometrica. 1994; 62:467–75.

Joyner, Kara; Kao, Grace. School Racial Composition and Adolescent Racial Homophily. Social Science Quarterly. 2000; 81:810–825.

Kao, Grace; Joyner, Kara. Do Asian and Hispanic Adolescents Practice Panethnicity in Friendship Choices? Social Science Quarterly. 2006; 87:972–992.

Kao, Grace; Joyner, Kara. Do Race and Ethnicity Matter Among Friends? Activities Among Interracial, Interethnic and Intraethnic Adolescent Friends. The Sociological Quarterly. 2004; 45:557–573.

Lavy, Victor; Schlosser, Analia. Working Paper. Cambridge, Mass: National Bureau of Economic Research; 2007. Mechanisms and Impacts of Gender Peer Effects at School. (http://papers.nber.org/papers/13292)

Light, Audrey; Strayer, Wayne. Determinants of College Completion: School Quality Or Student Ability? The Journal of Human Resources. 2000; 35:299–332.

Lyle, David S. Estimating and Interpreting Peer and Role Model Effects from Randomly Assigned Social Groups at West Point. Review of Economics and Statistics. 2007; 89:289–99.

Marmaros, David; Sacerdote, Bruce. How do Friendships Form? Quarterly Journal of Economics. 2006; 121:79–119.

Massey, Doug S. Social Background and Academic Performance Differentials: White and Minority Students at Selective Colleges. American Law and Economic Review. 2006; 8:390–409.

Mayer, Adalbert; Puller, Steven L. The Old Boy (and Girl) Network: Social Network Formation on University Campuses. Journal of Public Economics. 2008; 92:329–47.

McDonough, Patricia M. Choosing Colleges: How Social Class and Schools Structure Opportunity. Albany, NY: State University of New York Press; 1997.

McEwan, Patrick. Peer Effects on Student Achievement: Evidence from Chile. Economics of Education Review. 2003; 22:131–41.

Niu, Sunny X.; Tienda, Marta. Choosing Colleges: Identifying and Modeling Choice Sets. Social Science Research. 2008; 37:416–433.

Perl, Harold I.; Trickett, Edison J. Social Network Formation of College Freshmen: Personal and Environmental Determinants. American Journal of Community Psychology. 1988; 16:207–24.

Ream, Robert K.; Rumberger, Russell W. Student Engagement, Peer Social Capital and School Dropout among Mexican American and non-Latino White Students. Sociology of Education. 2008; 81:109–139.

Richardson, Richard C., Jr; Skinner, Elizabeth F. Helping First-Generation Minority Students Achieve Degrees. New Directions for Community Colleges. 1992; 80:29–43.

Ryan, Allison M. Peer Groups as a Context for the Socialization of Adolescents' Motivation, Engagement, and Achievement in School. Educational Psychologist. 2000; 35:101–111.

Sacerdote, Bruce. Peer Effects with Random Assignment: Results for Dartmouth Roommates. Quarterly Journal of Economics. 2001; 116:681–704.

Schiller, Kathryn S. Effects of Feeder Patterns on Students' Transition to High School. Sociology of Education. 1999; 72:216–233.

Sewell, William H.; Haller, Archibald O.; Portes, Alejandro. The Educational and Early Occupational Attainment Process. American Sociological Review. 1969; 34:303–316.

Sewell, William H.; Hauser, Robert M. The Wisconsin Longitudinal Study of Social and Psychological Factors in Aspirations and Achievements. Research in Sociology of Education and Socialization. 1980; 1:59–99.

Shaver, Phillip R.; Furman, W.; Buhrmester, D. Transition to College: Network Changes, Social Skills, and Loneliness. In: Duck, S.; Perlman, D., editors. Understanding Personal Relationships: An Interdisciplinary Approach. Beverly Hills, CA: Sage; 1985. p. 193-219.

Sokatch, Andrew. Peer Influences on the College-Going Decisions of Low Socioeconomic Status UrbanYouth. Education and Urban Society. 2006; 39:128–146.

Stinebrickner, Ralph; Stinebrickner, Todd R. What Can be Learned about Peer Effects Using College Roommates? Evidence from New Survey Data and Students from Disadvantaged Backgrounds. Journal of Public Economics. 2006; 90:1435–1454.

Summers, Anita; Wolfe, Barbara. Do Schools make a Difference? American Economic Review. 1977; 67:639–52.

Terenzini, Patrick T.; Springer, Leonard; Yaeger, Patricia M.; Pascarella, Ernest T.; Nora, Amaury. First-Generation College Students: Characteristics, Experiences, and Cognitive Development. Research in Higher Education. 1996; 73:1–22.

Higher Education Coordinating Board [THECB]. Enrollment Forecasts 2000–2015: Texas institutions of higher education. Study Paper #27. 2001. Retrieved December 18, 2002, from http://www.thecb.state.tx.us/reports/pdf/0380.pdf

Texas Higher Education Coordinating Board. Participation and Success Forecast, 2005–2015. Texas Institutions of Higher Education; Austin, TX: 2005 Feb 25. (updated)

Tienda, Marta; Alon, Sigal; Niu, Sunny X. Sociétés Contemporaines. 2009. Affirmative Action and the Texas Top 10% Admission Law: Balancing Equity and Access to Higher Education. forthcoming

Tienda, Marta; Niu, Sunny X. Capitalizing on Segregation, Pretending Neutrality: College Admissions and the Texas Top 10% Law. American Law and Economics Review. 2006a; 8:312–46.

Tienda, Marta; Niu, Sunny X. Flagships, Feeders, and the Texas Top 10% Law: A Test of the "Brain Drain" Hypothesis. Journal of Higher Education. 2006b; 77:712–39.

Tinto, Vincent. Leaving College: Rethinking the Causes and Cures of Student Attrition. Chicago: University of Chicago Press; 1993.

Walker, Bruce; Lavergne, Gary. Affirmative Action and Percent Plans: What we learned in Texas. The College Board Review. 2001; 193:18–23.

Weinberg, Bruce A. Working Paper. Cambridge, Mass: National Bureau of Economic Research; 2007. Social Interactions with Endogenous Associations. (http://papers.nber.org/papers/13038)

Zimmerman, David J. Peer Effects in Academic Outcomes: Evidence from a Natural Experiment. Review of Economics & Statistics. 2003; 85:9–23.

Table 1

Summary Statistics: All Enrollees 1993–2003

Variable	Observations	Mean	*SD*	Minimum	Maximum
Male	66,654	0.49	0.50	0	1
White	66,654	0.63	0.48	0	1
Black	66,654	0.04	0.19	0	1
Hispanic	66,654	0.15	0.36	0	1
Asian	66,654	0.17	0.38	0	1
Other race	66,654	0.00	0.06	0	1
SAT/ACT score	66,654	1200	144	560	1600
First-semester GPA	66,654	2.93	0.87	0	4
Two-year persistence	66,654	0.79	0.41	0	1
Number of high school classmates	66,654	32.39	33.27	0	210
Number of high school classmates (white)	42,002	33.47	33.66	0	210
Number of high school classmates (Asian)	11,501	43.71	36.34	0	210
Number of high school classmates (Hispanic)	10,262	18.84	22.78	0	210
Number of high school classmates (black)	2,622	18.77	24.08	0	210
Number of same-race classmates	66,654	18.13	21.99	0	132
Number of same-race classmates (white)	42,002	23.34	24.35	0	132
Number of same-race classmates (Asian)	11,501	15.50	16.69	0	79
Number of same-race classmates (Hispanic)	10,262	4.50	4.13	0	22
Number of same-race classmates (black)	2,622	1.46	1.93	0	12
Longhorn school	66,654	0.02	0.13	0	1
Maternal education	66,654	3.51	1.02	0	5
Missing maternal education	66,654	0.24	0.42	0	1
High school class rank (percentage)	66,654	85.80	13.42	0	99.9
Top 10 percent of high school class	66,654	0.54	0.50	0	1

Source: University of Texas at Austin administrative data.

Table 2

Determinants of First-Semester College GPA and Two-year Persistence: Baseline OLS Estimates[a]

	GPA			Two-year Persistence		
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Male	−0.152*** (0.007)	−0.146*** (0.007)	−0.149*** (0.007)	−0.022*** (0.003)	−0.020*** (0.003)	−0.021*** (0.003)
Black	−0.038** (0.017)	−0.027 (0.017)	−0.026 (0.017)	0.024*** (0.007)	0.026*** (0.007)	0.027*** (0.007)
Hispanic	−0.023** (0.010)	−0.015 (0.010)	−0.014 (0.010)	−0.014*** (0.004)	−0.012*** (0.004)	−0.012*** (0.004)
Asian	0.035*** (0.009)	0.019** (0.009)	0.027*** (0.009)	0.036*** (0.003)	0.032*** (0.003)	0.033*** (0.003)
Other race	−0.151*** (0.051)	−0.144*** (0.051)	−0.147*** (0.051)	−0.041* (0.023)	−0.039* (0.023)	−0.040* (0.023)
Maternal education	0.033*** (0.003)	0.030*** (0.003)	0.031*** (0.003)	0.010*** (0.001)	0.009*** (0.001)	0.009*** (0.001)
Missing maternal education	−0.203*** (0.012)	−0.199*** (0.012)	−0.200*** (0.012)	−0.155*** (0.005)	−0.154*** (0.005)	−0.154*** (0.005)
High school class rank	0.018*** (0.001)	0.019*** (0.001)	0.018*** (0.001)	0.003*** (0.000)	0.003*** (0.000)	0.003*** (0.000)
SAT/ACT score	0.002*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.006*** (0.001)	0.004*** (0.001)	0.005*** (0.001)
Top 10	0.186*** (0.011)	0.200*** (0.010)	0.200*** (0.010)	0.018*** (0.004)	0.022*** (0.004)	0.022*** (0.004)
Number of high school classmates	0.004*** (0.000)	0.009*** (0.000)		0.001*** (0.000)	0.002*** (0.000)	
Number of high school classmates (squared) X 100		−0.004*** (0.000)			−0.001*** (0.000)	
Second quartile high school classmates			0.098*** (0.011)			0.034*** (0.004)
Third quartile high school classmates			0.256*** (0.011)			0.069*** (0.004)
Fourth quartile high school classmates			0.411*** (0.014)			0.101*** (0.005)
Constant	−0.723*** (0.049)	−0.754*** (0.049)	−0.739*** (0.049)	0.598*** (0.020)	0.589*** (0.020)	0.589*** (0.020)
Observations	66654	66654	66654	66654	66654	66654
R^2	0.29	0.30	0.29	0.37	0.37	0.37

Note: Standard errors clustered at the high school level.

***1%,

**5%, and

*10%.

Source: University of Texas at Austin administrative data.

[a]Includes year fixed effects.

Table 3

OLS Estimates of High School Peer Group on First-Semester College GPA and Two-year Persistence: High School Fixed Effects

Fixed Effects?	First -Semester GPA			Two-year Persistence		
	Year/School (1)	Year/School (2)	Year/School (3)	Year/School (4)	Year/School (5)	Year/School (6)
Male	−0.107*** (0.007)	−0.107*** (0.007)	−0.107*** (0.007)	−0.012*** (0.003)	−0.012*** (0.003)	−0.012*** (0.003)
Black	0.051*** (0.019)	0.052*** (0.019)	0.052*** (0.019)	0.039*** (0.008)	0.039*** (0.008)	0.039*** (0.008)
Hispanic	0.023** (0.011)	0.023** (0.011)	0.023** (0.011)	0.001 (0.005)	0.001 (0.005)	0.001 (0.005)
Asian	0.000 (0.012)	0.000 (0.012)	0.000 (0.012)	0.025*** (0.004)	0.025*** (0.004)	0.025*** (0.004)
Other race	−0.103** (0.047)	−0.102** (0.047)	−0.102** (0.047)	−0.031 (0.023)	−0.030 (0.023)	−0.030 (0.023)
Maternal education	0.016*** (0.003)	0.016*** (0.003)	0.017*** (0.003)	0.005*** (0.001)	0.005*** (0.001)	0.005*** (0.001)
Missing maternal education	−0.184*** (0.012)	−0.184*** (0.012)	−0.184*** (0.012)	−0.150*** (0.006)	−0.150*** (0.006)	−0.150*** (0.006)
SAT/ACT score	0.024*** (0.000)	0.024*** (0.000)	0.024*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)
High school class rank	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	−0.005*** (0.001)	−0.005*** (0.001)	−0.005*** (0.001)
Top 10 percent	0.233*** (0.011)	0.233*** (0.011)	0.233*** (0.011)	0.029*** (0.005)	0.029*** (0.005)	0.029*** (0.005)
Number of high school classmates	0.001*** (0.000)	0.003*** (0.001)		0.0003** (0.000)	0.001*** (0.000)	
Number of high school classmates (squared) X 100		−0.001*** (0.000)			−0.000*** (0.000)	
Second quartile high school classmates			0.023 (0.015)			0.002 (0.007)
Third quartile high school classmates			0.062*** (0.020)			0.008 (0.008)
Fourth quartile high school classmates			0.084*** (0.026)			0.022** (0.010)
Constant	−0.514*** (0.061)	−0.546*** (0.059)	−0.526*** (0.057)	0.651*** (0.026)	0.641*** (0.025)	0.652*** (0.025)
Observations	66654	66654	66654	66654	66654	66654
Number of high schools	1179	1179	1179	1179	1179	1179
R^2	0.30	0.30	0.30	0.37	0.37	0.37

Note: Standard errors clustered at the high school level.

*** 1%,

** 5%, and

* 10%.

Source: University of Texas at Austin administrative data.

Table 4

Group Estimates of High School Peer Group on First-Semester College GPA and Two-year Persistence: High School Fixed Effects

	First-Semester GPA			Two-year Persistence		
Fixed Effects?	**White Year/School (1)**	**Black Year/School (2)**	**Hispanic Year/School (3)**	**White Year/School (4)**	**Black Year/School (5)**	**Hispanic Year/School (6)**
Male	−0.128*** (0.008)	−0.065* (0.039)	−0.103*** (0.017)	−0.011*** (0.004)	−0.008 (0.016)	−0.016** (0.007)
Maternal education	0.032*** (0.004)	0.024 (0.020)	0.001 (0.007)	0.011*** (0.002)	−0.000 (0.007)	0.001 (0.003)
Missing maternal education	−0.193*** (0.015)	−0.307*** (0.068)	−0.214*** (0.034)	−0.158*** (0.008)	−0.195*** (0.023)	−0.169*** (0.016)
SAT/ACT score	0.024*** (0.001)	0.017*** (0.002)	0.024*** (0.001)	0.004*** (0.000)	0.004*** (0.001)	0.004*** (0.001)
High school class rank	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	−0.007*** (0.002)	−0.025*** (0.006)	0.008** (0.003)
Top 10 percent	0.230*** (0.012)	0.258*** (0.053)	0.217*** (0.028)	0.032*** (0.006)	0.047** (0.022)	0.035*** (0.013)
Number of high school classmates	0.001** (0.001)	0.003 (0.002)	0.002 (0.001)	0.0002 (0.000)	−0.0002 (0.001)	0.0008* (0.000)
Constant	−0.601*** (0.073)	0.046 (0.203)	−0.551*** (0.122)	0.678*** (0.032)	0.872*** (0.084)	0.433*** (0.055)
Observations	42002	2622	10262	42002	2622	10262
Number of high schools	1096	477	755	1096	477	755
R^2	0.32	0.26	0.22	0.35	0.41	0.33

Note: Standard errors clustered at the high school level.

*** 1%,

** 5%, and

* 10%.

Source: University of Texas at Austin administrative data.

Table 5

OLS Estimates of Same-Race High School Peer Group on College Achievement: High School Fixed Effects

Fixed Effects?	Pooled Sample Year (1)	Pooled Sample Year/ School (2)	White Sample Year/School (3)	Black Sample Year/ School (4)	Hispanic Sample Year/ School (5)
First-Semester GPA					
Number of same-race high school classmates	0.005*** (0.000)	0.000 (0.000)	0.001** (0.001)	0.012 (0.012)	0.000 (0.003)
Observations	66654	66654	42002	2622	10262
Number of schools		1179	1096	477	755
R^2	0.28	0.30	0.32	0.26	0.22
Two-year Persistence					
Number of same-race high school classmates	0.001*** (0.000)	0.0002 (0.000)	0.0004** (0.000)	0.002 (0.005)	0.001 (0.002)
Observations	66654	66654	42002	2622	10262
Number of schools		1179	1096	477	755
R^2	0.37	0.37	0.35	0.41	0.33

Note: Standard errors clustered at the high school level.

*** 1%,

** 5%, and

* 10%. The same background controls as in Table 3 were used.

Source: University of Texas at Austin administrative data.

Table 6

2SLS Estimates of High School Peer Group on College Achievement: 1995–2003

	First-Semester GPA				Two-year Persistence			
Fixed Effects?	**Pooled Sample Year/School (1)**	**White Sample Year/School (2)**	**Black Sample Year/School (3)**	**Hispanic Sample Year/School (4)**	**Pooled Sample Year/School (5)**	**White Sample Year/School (6)**	**Black Sample Year/School (7)**	**Hispanic Sample Year/School (8)**
Number of high school classmates	0.069** (0.035)	0.087 (0.064)	0.034 (0.111)	0.067 (0.049)	0.017* (0.009)	0.025 (0.019)	0.022 (0.037)	0.012 (0.012)
Male	−0.104*** (0.009)	−0.116*** (0.014)	−0.137* (0.074)	−0.092*** (0.026)	−0.011*** (0.003)	−0.009* (0.005)	−0.013 (0.030)	−0.012 (0.009)
Black	0.226*** (0.043)				0.064*** (0.016)			
Hispanic	0.075** (0.032)				−0.003 (0.010)			
Asian	0.012 (0.021)				0.034*** (0.006)			
Other race	−0.066 (0.066)				−0.023 (0.027)			
Maternal education	0.026*** (0.007)	0.045*** (0.012)	−0.009 (0.098)	0.004 (0.015)	0.011*** (0.003)	0.016*** (0.005)	−0.006 (0.035)	0.006 (0.006)
Missing maternal education	−0.166*** (0.024)	−0.204*** (0.032)	−0.261* (0.137)	−0.180*** (0.057)	−0.135*** (0.009)	−0.145*** (0.012)	−0.225*** (0.048)	−0.180*** (0.023)
High school class rank	0.028*** (0.002)	0.029*** (0.003)	0.020*** (0.008)	0.028*** (0.002)	0.005*** (0.000)	0.005*** (0.001)	0.006** (0.003)	0.005*** (0.001)
SAT/ACT score	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	−0.007*** (0.002)	−0.008*** (0.002)	−0.027*** (0.009)	−0.001 (0.004)
Top 10 percent	0.271*** (0.035)	0.308*** (0.053)	0.045 (0.490)	0.218*** (0.066)	0.042*** (0.012)	0.059*** (0.021)	−0.064 (0.179)	0.039 (0.026)
Classmates' SAT/ACT score	0.001** (0.000)	0.001 (0.000)	−0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	−0.000 (0.000)	0.000 (0.000)
Top 10 X Black	−0.203*** (0.048)				−0.028 (0.018)			
Top 10 X Hispanic	−0.070** (0.035)				0.016 (0.011)			
Top 10 X maternal education	−0.015* (0.009)	−0.035** (0.017)	0.046 (0.104)	−0.008 (0.018)	−0.007** (0.003)	−0.012** (0.006)	0.012 (0.039)	−0.003 (0.007)
Observations	50264	31219	1723	7433	50264	31219	1723	7433
Number of schools	851	699	272	471	851	699	272	471
F-statistic	7.597	3.208	2.124	9.415	7.597	3.208	2.124	9.415

Note: Standard errors clustered at the high school level.

*** 1%,

** 5%, and

* 10%.

Source: University of Texas at Austin administrative data.

Table 7

2SLS Estimates of the Number of Same-Race High School Classmates on College Achievement: 1995–2003

	First-Semester GPA				Two-year Persistence			
Fixed Effects?	**Pooled Sample Year/School (1)**	**White Sample Year/School (2)**	**Black Sample Year/School (3)**	**Hispanic Sample Year/School (4)**	**All Year/School (5)**	**White Sample Year/School (6)**	**Black Sample Year/School (7)**	**Hispanic Sample Year/School (8)**
Number of same-race classmates	0.113* (0.063)	0.079 (0.051)	0.048 (0.160)	0.086 (0.057)	0.028* (0.016)	0.022 (0.015)	0.031 (0.051)	0.015 (0.015)
Male	−0.124*** (0.017)	−0.126*** (0.012)	−0.118** (0.048)	−0.101*** (0.021)	−0.016*** (0.005)	−0.012** (0.005)	−0.001 (0.019)	−0.013 (0.008)
Black	2.619** (1.311)				0.653* (0.338)			
Hispanic	2.172* (1.157)				0.514* (0.298)			
Asian	1.449* (0.783)				0.388* (0.202)			
Other race	2.355* (1.320)				0.574* (0.340)			
Maternal education	0.039*** (0.012)	0.041*** (0.011)	0.018 (0.029)	0.016 (0.015)	0.014*** (0.003)	0.015*** (0.004)	0.011 (0.013)	0.008 (0.007)
Missing maternal education	−0.201*** (0.049)	−0.203*** (0.027)	−0.250** (0.126)	−0.150*** (0.049)	−0.144*** (0.014)	−0.145*** (0.011)	−0.217*** (0.042)	−0.175*** (0.023)
High school class rank	0.027*** (0.002)	0.028*** (0.002)	0.017*** (0.002)	0.026*** (0.001)	0.005*** (0.000)	0.005*** (0.001)	0.005*** (0.001)	0.005*** (0.001)
Top 10 percent	0.246*** (0.068)	0.283*** (0.049)	0.178 (0.158)	0.248*** (0.062)	0.036* (0.019)	0.051*** (0.019)	0.021 (0.065)	0.045* (0.026)
SAT/ACT score	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001 (0.005)	−0.007*** (0.002)	−0.028*** (0.007)	0.002 (0.004)
Classmates' SAT/ACT score	0.001* (0.000)	0.001 (0.000)	−0.000 (0.001)	0.001** (0.000)	0.000 (0.000)	0.000 (0.000)	−0.000 (0.000)	0.000 (0.000)
Top 10 X black	−1.172** (0.540)				−0.267* (0.140)			
Top 10 X Hispanic	−0.805* (0.423)				−0.165 (0.109)			
Top 10 X maternal education	0.019 (0.023)	−0.026** (0.012)	0.020 (0.040)	−0.016 (0.017)	0.001 (0.006)	−0.009* (0.005)	−0.005 (0.016)	−0.004 (0.007)
Observations	50264	31219	1723	7433	50264	31219	1723	7433
Number of schools	851	699	272	471	851	699	272	471
F-statistic	4.992	4.895	8.179	12.88	4.992	4.895	8.179	12.88

Note: Standard errors clustered at the high school level.

*** 1%,

** 5%, and

* 10%.

Source: University of Texas at Austin administrative data.