High School Peer Networks and College Success: Lessons from Texas

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Abstract

This paper uses administrative data from the University of Texas-Austin to examine whether high school peer networks at college entry influence 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, which we use as a proxy for freshmen's high school peer network. 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 IV/fixed effects strategy that exploits the introduction and expansion of the Longhorn Scholars Program that targeted low income schools with low college traditions we also evaluate whether marginal increases in the size of peer networks influence college grades. Results show that students with larger high school peer network upon entering college outperform their counterparts with smaller networks. Average effects of network size on college achievement are small, but a marginal increase in the size of same-race peer networks raises GPA by 0.1 point. We also find some suggestive evidence that minority students reap larger academic benefits from bigger high school peer networks than their white counterparts.

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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, however. 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, peer networks in particular, 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 is a key determinant of membership in a particular college network, 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 with larger high school peer networks achieve higher first semester GPA and are more likely to remain enrolled beyond the freshman year compared with students who arrive on campus with fewer high school classmates. [1] Because high school 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 strategy that exploits the introduction and expansion of a scholarship program that targets students attending high schools with low college-going traditions (Longhorn Scholars Program), we also examine whether marginal increases in the size of peer networks of relatively disadvantaged students is associated with higher college achievement, and whether such effects are uniform among ethno-racial groups.

Our results indicate that having a larger high school peer network upon entering college is associated with higher academic performance. Specifically, a marginal increase in the size of same-race peer networks is associated with a 0.11 point higher first-year GPA. Furthermore, black and Hispanic students appear to benefit more academically from having large high school peer groups compared with similarly situated white freshmen. The relationship between peer network 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

[1] In this paper, our measure of peer network is the number of entering college freshman who attended the same high school. This is not a traditional definition of peer network, but we use the term for brevity and interchangeably with classmates.

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). Moreover, because most research about social influences on academic outcomes is based on primary, middle and high school contexts, considerably less is known about whether adolescent 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, 2007).

Ream and Rumberger (2008) concur that peer networks are constructed both through participation in organized and informal school activities. Despite their explicit acknowledgement that peer influences on high school completion also reflect the propensity of academically engaged students to befriend similarly disposed classmates, Ream and Rumberger claim that students can participate in both school- and street-oriented peer networks. 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 claims about high school graduation. Sokatch's (2006) study about peer influences of college-going decisions of low-income urban youth is also fraught with serious selection bias. Specifically, Sokatch's claim that college plans of friends are the single best predictor of post-secondary enrollment may be specious. Although he acknowledged the sorting process among similarly disposed peers, he did not implement a statistical strategy to correct for selection bias.

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 and implementing a clever strategy that exploits the institutional sorting of students in the transition from middle to high school, Schiller examines continuities and discontinuities in educational performance following the transition. 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 movement reinforces or weakens students' links with familiar peers. Put differently, are transitions

[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.

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?

The transition to college is both a challenging and stressful phase of the academic lifecycle (Shaver, Furman, and Buhrmester 1985), which, especially during the first semester, is often accompanied by feelings of loneliness (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, Phinney, and Chuateco 2005; Massey 2006; Terenzini et al. 1996; Tinto 1993). 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 are less well understood. A few recent studies have begun to 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. Their study based on a single Midwestern university did not consider whether influential peers attended the same high school, however.

Using data from West Point, Lyle (2007) shows that peers influence selection of college major, although 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 networks 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]

Taken together, recent studies that focus on the formation of college social networks provide evidence that friends, fraternity members, roommates, and teammates influence college achievement. Although several authors have identified geographic proximity as an important correlate of college friendship formation, none has considered whether high-school-specific peer groups influence college achievement. Yet, there are several reasons why secondary school networks would promote college success. First, students' college choice sets are highly constrained by the high school they attend. Niu and Tienda (2008) show that secondary school attended determines how high and how broadly students cast their college sights and ultimately their enrollment decisions. 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.

[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).

Most empirical measures of college student social networks are crude (Ryan, 2000) and few 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 examine the causal effect of peers 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 other colleges. None of these studies examined whether pre-collegiate networks enhance college outcomes, however. 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 scholastic outcomes. Using email exchanges between students at Dartmouth College as a measure of peer networks, Marmaros and Sacerdote (2006) find that race, family background, shared academic interests (e.g. major) and geographic proximity determine peer group membership. Mayer and Puller (2008) use information from the website *Facebook.com* at 10 Texas universities 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 networks afford academic benefits to enrolled students, and if so, how institutions might capitalize on them to bolster student success. Because college orientation of secondary school attended also is a strong predictor of college choice (Niu and Tienda 2008), it is conceivable that high school peer groups also influence postsecondary performance.

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

[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.

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 to 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 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 network sizes both within and between high schools over this time period, thus providing a unique opportunity to investigate whether high school peer networks enhance collegiate academic performance.

[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.

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

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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.

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 high schools within the state. Therefore, we focus on students who graduated from Texas high schools to construct peer network measures, including race-specific peer groups. Specifically, we define high school peer networks as the number of high school classmates enrolled in the same college 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]

The large freshman cohorts (~ 6,000) at the University of Texas-Austin allow substantial variation in high school peer networks 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), therefore peer networks are likely to differ appreciably in their ethno-racial composition (Kao and Joyner, 2006; Joyner and Kao, 2000; Hallinan and Williams, 1990). Table 1 provides summary statistics of the full sample; summary statistics for specific years are available on request.

Estimation Strategy

The empirical methodology builds from a generalized educational production function tailored to consider whether high school peer networks are important inputs into college achievement. A generic education production function typically used in the

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

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:

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

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:

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

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 peer networks 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 size of peer networks at college entry for students from these high schools regardless of scholarship receipt (Domina 2007).[9] These changes in peer network size across cohorts from the same high school allow us to estimate the impact of increasing peer network size on college achievement for relatively disadvantaged freshmen that attended high schools with low college-going traditions.

V. Results

Summary statistics reported in Table 1 indicate 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 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.

(Table 1 about Here)

Given the segregation of Texas high schools along race and ethnic lines, a white freshman at UT averages a peer network in excess of 30 high school classmates compared with over 40 for an average Asian student; by contrast, black and Hispanic UT

[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.

freshmen average high school peer networks of less than 20 classmates. For same-race peer networks 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 enter UT with only 1 black high school classmate on average. Asian students typically enter college with nearly four times as many same-race high school classmates as Hispanic students. If size of high school peer network 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.

(Table 2 about Here)

[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.

Especially noteworthy are the associations between high school peer networks and our measures of academic success. Consistent with our hypothesis, freshmen who arrived at UT with a larger number of high school classmates (the measure of peer network) achieved higher GPAs than first-time enrollees with smaller peer networks. Specifically, students with a one standard deviation larger peer network (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.

Columns 2-3 and 5-6 in Table 2 consider whether the relationship between peer network size and college outcomes is nonlinear. The quadratic terms for peer network size reveal that the relationship exhibits an inverse-U shape; the size of the squared term coefficient suggests that the maximum GPA achievement benefit corresponds to a peer network of size 114. Finally, columns 3 and 6 portray the relationship between peer network and GPA across quartiles of the peer group size. The positive achievement benefits persist. Moving from the 1st to the 4th quartile of peer network size is associated with an increase in 1st semester GPA of 0.4 points and an increase in persistence of 10 percentage points.

High School Fixed Effects Results

The associations between peer networks 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 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 representing peer networks 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).

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

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.

(Table 3 about Here)

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 (2008) 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).

Lending additional support to our hypothesis that peer network size is likely correlated with unmeasured high school quality, the specification with high school fixed effects shrinks the point estimate for size of peer network. 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, with a maximum benefit associated with a high school peer group of approximately 100. Column 3 suggests that moving from the 1st to the 4th quartile of peer network 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. Cols 4-6 indicate that modeling high school fixed effects also weakens the association between network size and college persistence. Moving from the 1st to the 4th quartile of peer network 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 network size on college first semester grades (Columns 1-3) and two-year persistence (columns 4-6). Specifically, the association between peer network 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 benefits of high school peer networks on continued enrollment obtain only for Hispanics once high school fixed effects are modeled. The point estimate suggests that increasing the size of the peer network for Hispanic students by 10 would raise persistence rates by 1 percentage point.

(Table 4 about Here)

Finally, the influence on college GPA of several other individual level characteristics is also diminished once high school fixed effects are modeled. 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. By contrast, the association between class rank and first semester GPA appears to be strengthened once high school fixed effects are modeled. This is consistent with a voluminous literature demonstrating that high school grades, which are less tightly coupled with high school quality, are a more reliable predictor of college success than SAT scores (Alon and Tienda 2007; Bowen and Bok 1998).

Results for Same-Race Peer Networks

Texas high schools are highly segregated (Tienda and Niu, 2006a) and because peer networks often form along race and ethnic lines, even in integrated schools, it is possible that the association between pre-collegiate peer networks 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). For the pooled sample, a 10-person increase in the size of the same-race peer network at college is associated with a 0.05 point boost in first semester GPA and 1 percentage point increase in persistence. Neither association attains statistical significance in the high school fixed effects specification (column 2), however.

(Table 5 about Here)

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 benefits of peer networks differ by race, columns 3-5 report separate estimates for white, black and Hispanic students. The largest association between same-race peer network size and both college achievement outcomes corresponds to black students; the point estimates for same-race peer network size are statistically significant only for white students. Racial differences in the influence of network size on college achievement provide only suggestive evidence that minority students (black students in particular) reap larger benefits than do white students from entering college with an established high school peer network.[11]

Peer Networks of Disadvantaged Students

Overall, the results presented in Tables 2-5 indicate that for typical UT freshmen, the influence of pre-collegiate peer networks 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 peer networks raises achievement more than the average effect. In light of

[11] 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.

unequal academic benefits of peer network among minority and non-minority freshmen, it is conceivable that under-represented minority students benefit more than either white or Asian students from a marginal increase in peer network 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 peer networks, particularly for economically disadvantaged students, who are the intended beneficiaries of these means-tested scholarships (Domina 2007). Because we expect the effect of peer network size on college achievement to be heterogeneous, we interpret the IV estimator as a local average treatment effect (LATE) for students who achieve larger peer networks as a result of the Longhorn Scholarship Program (Imbens and Angrist 1994).[12] Therefore, we estimate the following main and first-stage equations

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

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

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 student characteristics). Rather, graduating from a Longhorn high school should increase the size of students' peer network in college, 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: (1) whether an individual graduated from a high school with a Longhorn Scholars Program, (2) whether an individual graduated in the top decile of his/her class, (3) whether the individual is an ethnic minority, and (4) whether the individual comes from a low-income

[12] 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

household (which we proxy with maternal education). That is, we assume that receipt of a Longhorn Scholarship is determined by observed individual and school factors, $L_{ist} = g(X, S)$, and 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. Empirical specifications control for the mean SAT score of the peer network in order to control for time-varying quality of high school peers that could possible confound the estimates of high school peer network size.

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 peer network by attending a high school with a Longhorn Scholars Program on individual-level college achievement. 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 peer network size on college achievement to be biased upward.[13]

IV/FE Estimates for Multi-Race Peer Networks

Table 6 reports the instrumental variables estimates of high school peer networks on college GPA and college persistence.[14] For the full sample, results indicate that a

[13] 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.

[14] 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

marginal increase in peer network size increases college GPA by 0.069 points and college persistence by 0.017 points. Group-specific estimates reveal that failure to differentiate peer networks by race yields low correlations between peer group 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 peer networks for these groups. For the Hispanic students, however, the instrument is strong.

(Table 6 about Here)

Results shown in column 4 indicate that marginal increases in peer network 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. The point estimates imply that increasing the peer network size by one student of any race 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 students' peer network raise college persistence by nearly 2 percentage points. The results stratified by race do not reach statistical significance, but the coefficients are positive and of similar magnitude for all groups.

IV/FE Estimates for Same-Race Peer Networks

Table 7 summarizes the results for our IV estimates for same-race peer networks. For the full sample (columns 1 and 5), the point estimates imply that a one-student

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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.

increase in the size of an enrollee's same-race peer network is associated with a 0.11 increase in first semester GPA (column 1) and a 3 percentage point increase in persistence (column 5). These results indicate that small increases in the size of same-race peer networks produced by the Longhorn Scholarship Program at the University of Texas-Austin substantially increased first-semester GPA for disadvantaged students in targeted high schools.

(Table 7 about Here)

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 individual to the freshman network. 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. On balance, because these estimates correspond to the marginal student affected by the Longhorn Scholar Program, they suggest that increases in the size of peer networks for students from disadvantaged high schools could be more beneficial to college success than are increases in the sizes of peer networks for the average student. Moreover, the academic benefits from having larger same-race high school peer networks that are reaped by economically disadvantaged students do not appear to differ by minority group status. Rather, increases in the size of one's peers network matters more 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 high school peer networks, defined as 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 peer networks 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 network 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. Specifically, among students from economically disadvantaged high schools, a marginal increase in the size of same-race peer networks is associated with a 0.1 grade-point higher GPA, on average. Further, we find suggestive evidence that minority students who enter college with sizable high school peer networks reap larger academic benefits than their white counterparts. These findings suggest that both size and composition of peer networks 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 size of pre-collegiate peer networks at college entry 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 students (Domina, 2007). That high achieving students sort by ethnicity (Bank, et al., 1990; Schiller, 1999) increases the likelihood that they will affiliate in college—at least during the early and most challenging transition year. These pre-existing networks 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 reliance on an approximation of the sizes of students' peer networks rather than using data on actual peer networks leads to downwardly biased estimates (Weinberg 2007). Thus, the causal effects of peer network size on college achievement could be larger than our empirical estimates imply. The use of additional data sources and alternative measures of peer networks are important future steps in estimating the effects of peer networks on educational outcomes. Although our data preclude specifying the specific mechanisms through which high school peer networks 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 network size serves as a form of cognitive support or actually provides practical support. Whether these results would be similar in other states or in non-US settings is unknown and warrants further replication.

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Table 1 - Summary Statistics: All Enrollees 1993-2003

Variable	Obs	Mean	Std. Dev	Min	Max
Male	66654	0.49	0.50	0	1
White	66654	0.63	0.48	0	1
Black	66654	0.04	0.19	0	1
Hispanic	66654	0.15	0.36	0	1
Asian	66654	0.17	0.38	0	1
Other Race	66654	0.00	0.06	0	1
SAT/ACT Score	66654	1200	144	560	1600
First Semester GPA	66654	2.93	0.87	0	4
2 Yr Persistence	66654	0.79	0.41	0	1
Number of HS Classmates	66654	32.39	33.27	0	210
Number of HS Classmates (White)	42002	33.47	33.66	0	210
Number of HS Classmates (Asian)	11501	43.71	36.34	0	210
Number of HS Classmates (Hispanic)	10262	18.84	22.78	0	210
Number of HS Classmates (Black)	2622	18.77	24.08	0	210
Number of Same-Race Classmates	66654	18.13	21.99	0	132
Number of Same-Race Classmates (White)	42002	23.34	24.35	0	132
Number of Same-Race Classmates (Asian)	11501	15.50	16.69	0	79
Number of Same-Race Classmates (Hispanic)	10262	4.50	4.13	0	22
Number of Same-Race Classmates (Black)	2622	1.46	1.93	0	12
Long Horn School	66654	0.02	0.13	0	1
Maternal Education	66654	3.51	1.02	0	5
Missing Maternal Education	66654	0.24	0.42	0	1
High School Class Rank (%)	66654	85.80	13.42	0	99.9
Top 10% of HS Class	66654	0.54	0.50	0	1

Source: University of Texas at Austin (UT) Administrative Data

Table 2 - Determinants of First-Semester College GPA and 2-year and Persistence: Baseline OLS Estimates[a]

Outcome	GPA			2 Year Persistence		
	(1)	(2)	(3)	(4)	(5)	(6)
Male	-0.152***	-0.146***	-0.149***	-0.022***	-0.020***	-0.021***
	(0.007)	(0.007)	(0.007)	(0.003)	(0.003)	(0.003)
Black	-0.038**	-0.027	-0.026	0.024***	0.026***	0.027***
	(0.017)	(0.017)	(0.017)	(0.007)	(0.007)	(0.007)
Hispanic	-0.023**	-0.015	-0.014	-0.014***	-0.012***	-0.012***
	(0.010)	(0.010)	(0.010)	(0.004)	(0.004)	(0.004)
Asian	0.035***	0.019**	0.027***	0.036***	0.032***	0.033***
	(0.009)	(0.009)	(0.009)	(0.003)	(0.003)	(0.003)
Other Race	-0.151***	-0.144***	-0.147***	-0.041*	-0.039*	-0.040*
	(0.051)	(0.051)	(0.051)	(0.023)	(0.023)	(0.023)
Maternal Education	0.033***	0.030***	0.031***	0.010***	0.009***	0.009***
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
Missing Maternal Education	-0.203***	-0.199***	-0.200***	-0.155***	-0.154***	-0.154***
	(0.012)	(0.012)	(0.012)	(0.005)	(0.005)	(0.005)
High School Class Rank	0.018***	0.019***	0.018***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
SAT/ACT Test Score	0.002***	0.001***	0.001***	0.006***	0.004***	0.005***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Top 10	0.186***	0.200***	0.200***	0.018***	0.022***	0.022***
	(0.011)	(0.010)	(0.010)	(0.004)	(0.004)	(0.004)
Number of HS Classmates	0.004***	0.009***		0.001***	0.002***	
	(0.000)	(0.000)		(0.000)	(0.000)	
Number of HS Classmates (squared) X 100		-0.004***			-0.001***	
		(0.000)			(0.000)	
2nd Quartile HS Classmates			0.098***			0.034***
			(0.011)			(0.004)
3rd Quartile HS Classmates			0.256***			0.069***
			(0.011)			(0.004)
4th Quartile HS Classmates			0.411***			0.101***
			(0.014)			(0.005)
Constant	-0.723***	-0.754***	-0.739***	0.598***	0.589***	0.589***
	(0.049)	(0.049)	(0.049)	(0.020)	(0.020)	(0.020)
Observations	66654	66654	66654	66654	66654	66654
R-squared	0.29	0.30	0.29	0.37	0.37	0.37

Note: Standard errors clustered at the high school level. ***1%, **5%, *10%
Source: UT administrative data
[a]Includes year fixed effects

Table 3 - OLS Estimates of HS Peer Group on First Semester College GPA and 2-Year Persistence: High School Fixed Effects

	First Semester GPA			2 Yr Persistence		
Fixed Effects?	Year/School	Year/School	Year/School	Year/School	Year/School	Year/School
	(1)	(2)	(3)	(4)	(5)	(6)
Male	-0.107***	-0.107***	-0.107***	-0.012***	-0.012***	-0.012***
	(0.007)	(0.007)	(0.007)	(0.003)	(0.003)	(0.003)
Black	0.051***	0.052***	0.052***	0.039***	0.039***	0.039***
	(0.019)	(0.019)	(0.019)	(0.008)	(0.008)	(0.008)
Hispanic	0.023**	0.023**	0.023**	0.001	0.001	0.001
	(0.011)	(0.011)	(0.011)	(0.005)	(0.005)	(0.005)
Asian	0.000	0.000	0.000	0.025***	0.025***	0.025***
	(0.012)	(0.012)	(0.012)	(0.004)	(0.004)	(0.004)
Other Race	-0.103**	-0.102**	-0.102**	-0.031	-0.030	-0.030
	(0.047)	(0.047)	(0.047)	(0.023)	(0.023)	(0.023)
Maternal Education	0.016***	0.016***	0.017***	0.005***	0.005***	0.005***
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
Missing Maternal Education	-0.184***	-0.184***	-0.184***	-0.150***	-0.150***	-0.150***
	(0.012)	(0.012)	(0.012)	(0.006)	(0.006)	(0.006)
SAT/ACT Test Score	0.024***	0.024***	0.024***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
High School Class Rank	0.001***	0.001***	0.001***	-0.005***	-0.005***	-0.005***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Top 10 %	0.233***	0.233***	0.233***	0.029***	0.029***	0.029***
	(0.011)	(0.011)	(0.011)	(0.005)	(0.005)	(0.005)
Number of HS Classmates	0.001***	0.003***		0.0003**	0.001***	
	(0.000)	(0.001)		(0.000)	(0.000)	
Number of HS Classmates (squared) X 100		-0.001***			-0.000***	
		(0.000)			(0.000)	
2nd Quartile HS Classmates			0.023			0.002
			(0.015)			(0.007)
3rd Quartile HS Classmates			0.062***			0.008
			(0.020)			(0.008)
4th Quartile HS Classmates			0.084***			0.022**
			(0.026)			(0.010)
Constant	-0.514***	-0.546***	-0.526***	0.651***	0.641***	0.652***
	(0.061)	(0.059)	(0.057)	(0.026)	(0.025)	(0.025)
Observations	66654	66654	66654	66654	66654	66654
Number of High Schools	1179	1179	1179	1179	1179	1179
R-Squared	0.30	0.30	0.30	0.37	0.37	0.37

Note: Standard errors clustered at the high school level. ***1%, **5%, *10%
Source: UT administrative data

Table 4 - Group Estimates of HS Peer Group on First Semester College GPA and 2-year Persistence: High School Fixed Effects

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

Note: Standard errors clustered at the high school level. ***1%, **5%, *10%
Source: UT administrative data

Table 5 - OLS Estimates of Same-Race HS Peer Group on College Achievement: High School Fixed Effects

Sample	Pooled	Pooled	White	Black	Hispanic
Fixed Effects?	Year	Year/School	Year/School	Year/School	Year/School
	(1)	(2)	(3)	(4)	(5)
First Semester GPA					
Number of Same Race HS Classmates	0.005***	0.000	0.001**	0.012	0.000
	(0.000)	(0.000)	(0.001)	(0.012)	(0.003)
Observations	66654	66654	42002	2622	10262
Number of Schools		1179	1096	477	755
R-Squared	0.28	0.30	0.32	0.26	0.22
2 Year Persistence					
Number of Same Race HS Classmates	0.001***	0.0002	0.0004**	0.002	0.001
	(0.000)	(0.000)	(0.000)	(0.005)	(0.002)
Observations	66654	66654	42002	2622	10262
Number of Schools		1179	1096	477	755
R-Squared	0.37	0.37	0.35	0.41	0.33

Note: Standard errors clustered at the high school level. ***1%, **5%, *10%, Same background controls as Table 3 are used
Source: UT administrative data

Table 6 - 2SLS Estimates of HS Peer Group on College Achievement: 1995-2003

Outcome	First Semester GPA				2 Year Persistence			
Sample	Pooled	White	Black	Hispanic	Pooled	White	Black	Hispanic
Method	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
Fixed Effects?	Y & S	Y & S	Y & S	Y & S	Y & S	Y & S	Y & S	Y & S
Column	1	2	3	4	5	6	7	8
Number of HS Classmates	0.069**	0.087	0.034	0.067	0.017*	0.025	0.022	0.012
	(0.035)	(0.064)	(0.111)	(0.049)	(0.009)	(0.019)	(0.037)	(0.012)
Male	-0.104***	-0.116***	-0.137*	-0.092***	-0.011***	-0.009*	-0.013	-0.012
	(0.009)	(0.014)	(0.074)	(0.026)	(0.003)	(0.005)	(0.030)	(0.009)
Black	0.226***				0.064***			
	(0.043)				(0.016)			
Hispanic	0.075**				-0.003			
	(0.032)				(0.010)			
Asian	0.012				0.034***			
	(0.021)				(0.006)			
Other Race	-0.066				-0.023			
	(0.066)				(0.027)			
Maternal Education	0.026***	0.045***	-0.009	0.004	0.011***	0.016***	-0.006	0.006
	(0.007)	(0.012)	(0.098)	(0.015)	(0.003)	(0.005)	(0.035)	(0.006)
Missing Maternal Education	-0.166***	-0.204***	-0.261*	-0.180***	-0.135***	-0.145***	-0.225***	-0.180***
	(0.024)	(0.032)	(0.137)	(0.057)	(0.009)	(0.012)	(0.048)	(0.023)
High School Class Rank	0.028***	0.029***	0.020***	0.028***	0.005***	0.005***	0.006**	0.005***
	(0.002)	(0.003)	(0.008)	(0.002)	(0.000)	(0.001)	(0.003)	(0.001)
SAT/ACT Score	0.001***	0.001***	0.001***	0.001***	-0.007***	-0.008***	-0.027***	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)	(0.009)	(0.004)
Top 10%	0.271***	0.308***	0.045	0.218***	0.042***	0.059***	-0.064	0.039
	(0.035)	(0.053)	(0.490)	(0.066)	(0.012)	(0.021)	(0.179)	(0.026)
Classmate SAT/ACT Score	0.001**	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)	(0.000)
Top 10 X Black	-0.203***				-0.028			
	(0.048)				(0.018)			
Top 10 X Hispanic	-0.070**				0.016			
	(0.035)				(0.011)			
Top 10 X Maternal Education	-0.015*	-0.035**	0.046	-0.008	-0.007**	-0.012**	0.012	-0.003
	(0.009)	(0.017)	(0.104)	(0.018)	(0.003)	(0.006)	(0.039)	(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%, *10%

Source: UT administrative data

Table 7 - 2SLS Estimates of Number of Same-Race HS Peer Group on College Achievement: 1995-2003

Outcome	First Semester GPA				2 Year Persistence			
Sample	Pooled	White	Black	Hispanic	All	White	Black	Hispanic
Method	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
Fixed Effects?	Y & S	Y & S	Y & S	Y & S	Y & S	Y & S	Y & S	Y & S
Column	1	2	3	4	5	6	7	8
Number of Same Race	0.113*	0.079	0.048	0.086	0.028*	0.022	0.031	0.015
	(0.063)	(0.051)	(0.160)	(0.057)	(0.016)	(0.015)	(0.051)	(0.015)
Male	-0.124***	-0.126***	-0.118**	-0.101***	-0.016***	-0.012**	-0.001	-0.013
	(0.017)	(0.012)	(0.048)	(0.021)	(0.005)	(0.005)	(0.019)	(0.008)
Black	2.619**				0.653*			
	(1.311)				(0.338)			
Hispanic	2.172*				0.514*			
	(1.157)				(0.298)			
Asian	1.449*				0.388*			
	(0.783)				(0.202)			
Other Race	2.355*				0.574*			
	(1.320)				(0.340)			
Maternal Education	0.039***	0.041***	0.018	0.016	0.014***	0.015***	0.011	0.008
	(0.012)	(0.011)	(0.029)	(0.015)	(0.003)	(0.004)	(0.013)	(0.007)
Missing Maternal Education	-0.201***	-0.203***	-0.250**	-0.150***	-0.144***	-0.145***	-0.217***	-0.175***
	(0.049)	(0.027)	(0.126)	(0.049)	(0.014)	(0.011)	(0.042)	(0.023)
High School Class Rank	0.027***	0.028***	0.017***	0.026***	0.005***	0.005***	0.005***	0.005***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Top 10%	0.246***	0.283***	0.178	0.248***	0.036*	0.051***	0.021	0.045*
	(0.068)	(0.049)	(0.158)	(0.062)	(0.019)	(0.019)	(0.065)	(0.026)
SAT/ACT Score	0.001***	0.001***	0.001***	0.001***	0.001	-0.007***	-0.028***	0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.002)	(0.007)	(0.004)
Classmate SAT/ACT Score	0.001*	0.001	-0.000	0.001**	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Top 10 X Black	-1.172**				-0.267*			
	(0.540)				(0.140)			
Top 10 X Hispanic	-0.805*				-0.165			
	(0.423)				(0.109)			
Top 10 X Maternal Education	0.019	-0.026**	0.020	-0.016	0.001	-0.009*	-0.005	-0.004
	(0.023)	(0.012)	(0.040)	(0.017)	(0.006)	(0.005)	(0.016)	(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%, *10%

Source: UT administrative data