Can Two-Year College Attendance Lead to Enrollment and Degree Completion at More Selective Four-Year Colleges?

Eric R. Eide, Dan D. Goldhaber, and Michael J. Hilmer
September 2003

Contact information:
Michael J. Hilmer
316 Hutcheson
Department of Economics
Virginia Tech
Blacksburg, VA 24061-0401

I. Introduction

Two-year colleges play a major role in post-secondary education in the United States and that role has become more important in recent years. From 1976 to 2000, overall post-secondary enrollment rose from 11.0 million to 15.3 million, approximately a 40% increase, while enrollment in community colleges (two-year colleges) during the same time period rose about 51%, from 3.9 million to 5.9 million (U.S. Department of Education, 2002). Thus, as a percentage of overall post-secondary enrollment, community college enrollment increased from 35 to 39 percent. Also, many students who first enroll in a community college eventually transfer and receive a diploma from a four-year institution. This is an important trend in higher education that has received little attention.

There is some evidence that community colleges are providing a bridge for students who may not be able to afford four years of tuition at four-year colleges but wish to receive a diploma from such institutions (Hilmer, 1999). And, the fact that community colleges are disproportionately attended by minority students suggests that this bridge may be especially important for them. For instance, 48% of all minorities enrolled in post-secondary education in 2000 were attending community colleges.[1]

The role that community colleges play in providing access to college for minorities may be particularly important given recent court and legislative actions limiting the use of race or ethnicity as a consideration in admissions ("affirmative action") to state-sponsored educational

---

[1] Of total black enrollment in 1996, 43% were attending two-year colleges while 58% of Hispanics enrolled in post-secondary education were attending two-year colleges that year (U.S. Department of Education, 2002).

institutions.[2] These actions have the potential to dramatically affect the racial and ethnic composition of students in higher education.

Why does the racial and ethnic make-up of students in higher education institutions attract so much public debate and concern – why does race/ethnicity matter? It is a well-established empirical fact that attending a two- or four- year college has an economic value for individuals, and that those who do not attend college will, on average, have significantly less upward economic mobility.

If minorities have limited access to education beyond high school, growing economic inequality may result. Given the role that educational attainment can play in narrowing the persistent income and wealth gap between minorities and whites, the composition of groups attending higher education institutions is important for a society that values minimal economic inequality along racial/ethnic lines. Despite this, much of the ongoing debate over the role of race and ethnicity in college admissions has ignored the importance of community colleges — which are increasingly important institutions, particularly for minority students.

In this study we examine two issues associated with the relation between two-year and four-year colleges: first, whether two-year transfer students have the same likelihood of enrolling in four-year colleges of varying selectivity levels compared to students who enroll in four-year colleges directly after high school; and second, whether two-year transfer students are as likely to graduate from a particular college quality type as non-transfer four-year students. Each of these questions is addressed separately for white, black, and Hispanic students.

---

[2] Proposition 209 in California, the *Hopwood* decision in Texas, and a recent plan set forth by Governor Bush in Florida, all prohibit the use of race or ethnicity as a consideration in admissions decisions. In contrast, there have recently been two federal court rulings, one in Washington state and one in Michigan, that have declared that diversity is an adequate justification for race-conscious admissions policies.

II. Background

A. The Role of Two-Year Colleges in Higher Education

As stated earlier, community colleges enroll an increasing share of overall enrollment and this trend is likely to continue because they enroll almost half of all first-time freshmen (U.S. Department of Education, 2002). One of the primary benefits of attending a two-year college is the relatively low attendance cost. During the 2001 academic year, the average annual undergraduate tuition, fees, and room and board at two-year colleges was $5,705 compared to $13,677 at four-year colleges. Not surprisingly, Hilmer (1997) finds that low-income students are significantly more likely to attend two-year colleges than their high-income peers. Thus, it is plausible that economically disadvantaged students are more likely to enter higher education in two-year colleges because of their relatively low cost.

While many two-year college students take a class or two for personal interest or career advancement, one of the main functions of a community college is to prepare students for transfer to a four-year institution (Brawer and Cohen 1987). Recent evidence suggests that the percentage of college graduates using two-year college as an entry-point is on the rise. Although Tinto (1987) found that roughly nine percent of a sample of students who graduated college in the mid- 1970's had started at a two-year college, a recent survey of 1992 college graduates found that roughly thirty percent did so (National Center for Education Statistics, 1996). Rouse (1995), Holahan, Green, and Kelley (1983), Nolan and Hall (1978), and Nickens (1970) indicate that two-year transfers receive similar grades and are as likely to graduate from the institution to which they transfer as are continuous attendees. Hilmer (1997) suggests that initial two-year attendance may actually enable students to transfer to a more selective university than the one they would otherwise have attended. Further, that study finds that two-year attendance does not

appear to limit access to elite institutions as two-year transfers graduate from universities that are as highly selective as those attended by direct four-year attendees.[3]

B. The Importance of College Quality in the Labor Market

A major point of our paper is to assess the impact of community college attendance on the selectivity of four-year college attended. We are concerned with the quality of the four-year institutions that transfer students attend because there is growing evidence indicating that the *type* of four-year college attended is an important determinant of labor market success.[4] Researchers have found that attending an elite undergraduate institution both increases the likelihood of attending graduate school (Eide, Brewer, and Ehrenberg, 1998) and has a direct impact on earnings in the labor market. For instance, Brewer, Eide, and Ehrenberg (1999) find attending an elite university (where elite status is based on the *Barrons Profiles of American Colleges* rankings) increases earnings by as much as 39 percent over attending the least competitive schools. They also find that this pay premium has been increasing over time. Given this earnings differential across four-year colleges of differing selectivity, it is vital to understand the ways in which two-year college attendance are related to the selectivity of the four-year college attended, since the

difference in the consequent labor market reward upon completion of the four-year degree can be substantial.

---

[3] A number of studies also document the value of a two-year degree in the labor market. See for example the papers by Kane and Rouse (1995), Leigh and Gill (1997), and Grubb (1997).
[4] The reason *why* students who attend certain colleges – those that are more selective – achieve a higher payoff in the labor market is not well established. Possible explanations include higher skill acquisition through better teaching or peer interaction, and access to well connected alumni networks.

C. The Impact of Race and Ethnicity on College Matriculation

Two-year colleges may play an important role in helping minority students gain admission to colleges of differing selectivity. We specifically address whether two-year college attendance can serve as an alternate route into the most selective schools for students who may be less academically prepared at the time of high school graduation, but who could use a two-year college to strengthen their academic credentials and increase their likelihood of eventually gaining admission to a selective school.

Despite the widespread perception that race and ethnicity play a prominent role in determining who is admitted to which colleges, there is remarkably little evidence on the effectiveness of race-based admissions policies and their importance relative to other admissions criteria. The few studies that explicitly examine the role of race and ethnicity in the selectivity type of four-year college attended find that minority students are more likely than whites to be admitted to elite institutions, but the majority of colleges and universities do not demonstrate a significant minority preference because they admit most students who apply. For instance, Kane (1998) finds that black and Hispanic students receive an 8 to 10 percent preference at the most academically selective fifth of four-year institutions (which is equivalent to having an A- rather than a B, or an SAT score of 1400 rather than 1000) but only a 3 percent preference in schools ranked in the fourth of the five tiers. Bowen and Bok (1998) find that race neutral admissions policies would lead to a drop in black matriculants from 7.1 to somewhere between 2.1 and 3.6 percent (the drop in Black enrollment would increase the white probability of admission, but only by 1.5 percentage points from 25.0 to 26.5 percent).[5] Consistent with Kane's findings, Bowen and Bok predict the most selective schools would experience the largest drop. Brewer,

---

[5] The precise drop in enrollment depends on the assumptions used in determining the likelihood that a candidate that has been offered admission accepts the offer (the yield).

Eide, and Goldhaber (1999) find strong evidence that there are racial and ethnic differences in the *application* behavior of students with both black and Hispanic students more likely than white students to apply to a four-year top institution as their first choice school, all else equal.

III. Data and Estimation

A. Data

In conducting our analysis we use data from the (nationally representative) *High School and Beyond* (HSB), sophomore and senior cohorts. The HSB includes detailed information on students' family background and educational experiences, both during high school and during college. Nearly 15,000 high school sophomores and about 12,000 high school seniors were surveyed in the 1980 base year interview. Follow-up surveys were conducted in 1982, 1984 and 1986, and then in 1992 for the sophomores.

A crucial component of the analyses is how we rank four-year institutions according to college quality. We use two measures for college quality. The first is a broad three-fold classification of college type, based on selectivity measures derived from Barron's *Profiles of American Colleges* (1984 edition). Barron's ratings are based on selectivity of admissions decisions, such as students' class rank, high school grade point average, average SAT scores, and the percentage of applicants admitted. We divide institutions into three groups based on a rating of most competitive, highly competitive, or very competitive ("top"), competitive ("middle"), and less competitive or non-competitive ("bottom"). The second approach to measuring college quality is to use the median SAT score of the entering freshmen at the student's four-year college. This alternative linear measure offers a more intuitive and concrete interpretation of the

effect of transferring from a two-year college relative to starting at a four-year college than do the categorical rankings. The two college quality measures are for the first four-year college attended after high school.

These two measures for college quality are used as dependent variables in the models that study the effect of transferring from a two-year college on the selectivity of four-year college attended. In the models that estimate the effect of transferring from a two-year college on the probability of graduating from a four-year college of a given quality type, the dependent variable is a binary variable that equals one if the student graduated from that quality type, and equals zero if the student did not graduate.[6]

The main independent variable of interest is a binary variable that equals one if the student transferred from a two-year college to a four-year college, and equals zero if the student enrolled directly in a four-year college. Hence, in the regression models the coefficient for the two-year college transfer variable will give the effect on the dependent variable (e.g. selectivity of college attended) relative to a student who started postsecondary studies at a four-year college. We also include controls for gender, parents education, family income, high school grades, standardized math and vocabulary test scores (taken from the 1980 base year survey), whether the high school was religious, urban, or rural, whether the student was in the senior cohort, and state dummies for California, Florida, Illinois, New York, and Texas (states which have high numbers of 2-year college students and high minority populations), and dummy variables representing missing values (in which case the variables were set to zero). Complete variable definitions are provided in the Appendix.

---

[6] We do not impose the restriction that the four-year college graduated from be the same college as the first four-year college in which the student enrolled.

The samples consist of students who attended a four-year college and have non-missing data for the outcome variable under study (either the qualitative college quality measure, the linear measure, or the binary variable for graduate or not).[7] Each model is estimated separately for white, black, and Hispanic students, which results in sample sizes of approximately 4904, 1311, and 1327, respectively.

Table 1 contains representative summary statistics for the variables used in the analysis. These figures are presented separately for two-year college transfers and for those who started college at four-year colleges. Within each of these categories the variable means are presented separately by bottom, middle, and top college quality. An interesting finding from Table 1 is that the median SAT score of entering freshmen at the student's four-year college (Col_SAT) are quite comparable within college quality types between the two-year transfers and four-year starters. For example, the average for Colsat among two-year transfers at middle quality colleges is about 909, while for middle quality colleges for those who started at four-year colleges it is about 910. There are some stark differences, however. Among two-year transfers at top quality colleges the percent of students who are Hispanic is 32 percent and the percent of black students is 6 percent, while the comparable figures among those who started at four-year colleges is 16 percent for Hispanic students and 13 percent for black students. Another finding of note from Table 1 is that the average high school grade point average for two-year transfer students at *top quality* colleges is the same as the average high school grade point average for four-year college starters at *bottom quality* colleges, which suggests some differential in academic aptitude between students who first attended a two-year college and those who directly entered a four-year college.

---

[7] There is a small number of students in the HSB who start attending a four-year college before transferring down to a two-year college. These few students were dropped from the sample.

The estimation objectives of this paper are two-fold. First, we set out to explore the role that attendance at a two-year college plays in the quality of four-year college in which a student subsequently enrolls. To do this we first estimate multinomial logit models for college quality based on the three broad rankings of top, middle, or bottom quality. The marginal effects estimates from this estimation procedure suggest whether two-year transfer students, particularly minorities, have the same likelihood of enrolling in a given selectivity type of four-year college compared to similar students who enrolled in four-year colleges directly after high school.

We then take a second approach to this question by using the linear college quality measure based on the median SAT score of incoming freshmen at the student's institution to estimate OLS and quantile regression estimates of the effect of attending a two-year college on the quality of four-year college attended. The estimates from the OLS models will suggest whether, on average, attendance at a two-year college leads to an increase or decrease in college quality relative to enrolling in a four-year college directly after high school, all else equal. The advantage of this linear model is that the estimates will be in terms of SAT points, which has an intuitive interpretation. While useful, the OLS estimates only show how, "on average," transferring from a two-year college is correlated with four-year college quality. It may be the case, however, that the relationship between transferring from a two-year college and quality of four-year college attended is more complex, and may differ across the *distribution* of college quality. By using quantile regression we can estimate the association between transferring from a two-year college and four-year college quality at any point in the conditional istribution of college quality (e.g. the 10th percentile, the median, the 90th percentile, etc.). The quantile

regression estimates present a much broader relationship between transferring from a two-year college and the quality of four-year college attended.

In our graduation models we study whether there is a difference between two-year transfer students and students who started at four-year colleges in the likelihood of completion of the four-year degree, *conditional* upon enrolling in a particular selectivity type of four-year college. The dependent variable is the binary indicator for graduation, and the models are estimated separately by race/ethnicity and college quality type (top, middle, bottom) using logit models. An implication associated with the findings from this model is whether two-year college transfer students are more or less likely to complete the degree than similar students of the same race/ethnicity who initially enrolled in a four-year college of the same selectivity type.

IV. Results

We begin the discussion of results by presenting our college selectivity findings on whether there is a difference between two-year transfer students and students who began at four-year colleges in the selectivity types of colleges in which the students enroll.[8] Table 2 presents marginal effects from the multinomial logit estimation of these models. The two-year college transfer variable is interpreted relative to those of the same race/ethnicity group who started at a four-year college.

We present estimation results separately for white, Hispanic, and black students. There appears to be little difference in attendance patterns for white students who attend community

---

[8] We note that enrollment is a function of both the application decisions made by the student and the admissions decisions made by the institutions. For simplicity we chose to focus just on the enrollment outcome.

colleges and those who enroll directly in four-year institutions.[9] The findings for Hispanic

students provide an interesting contrast to the findings for white students. Hispanic students who

transfer from a two-year college are just as likely as those who directly enrolled in a four-year

college to enroll in a top quality college. Indeed, the estimated marginal effect for top quality

four-year colleges is 0.0068, or approximately zero both in magnitude and in statistical

significance. This implies that while there is no advantage for Hispanic students to attending a

two-year college prior to enrolling in a four-year college, there is no disadvantage either. By

contrast, we find that Hispanic two-year transfer students are significantly more likely than four-

year college starters to enroll in a middle quality college and less likely to enroll in a bottom

quality college. One hypothesis for these results is that community colleges are being utilized by

Hispanic students to gain the skills and credentials necessary to gain admission to more selective

four-year colleges. As a result, relative to otherwise identical Hispanic students, they substitute

middle quality colleges for bottom quality colleges.

In some respects the findings for black two-year college transfers relative to black four-

year college starters are consistent with the findings for Hispanic students. For instance, we find

black two-year college transfer students are significantly more likely to enroll in middle quality

colleges (by about 9 percentage points). But, for black students the trade-off appears to be

mainly from top quality four-year schools, as those who transfer from a two-year college are

about 7 percentage points less likely to enroll in a top quality college (though this finding is not

statistically significant at the 95 percent confidence level). In summary, the results in Table 2

suggest that students who transfer from a two-year college to a four-year college are no more

---

9 The results for whites suggest that students who transfer from a two-year college are about 5 percentage points less

likely than four-year college starters to enroll in top quality four-year colleges.

likely, and probably less likely than similar students of the same race/ethnicity to enroll in a top quality college. There do appear, however, to be benefits from transferring from a two-year college in terms of enrolling in a middle ranked college.

In Table 3 we present results for our enrollment models using our linear measure of college quality, the median SAT score of entering freshmen at the student's four-year college as a dependent variable. This alternative college quality measure has an intuitive interpretation since the estimated coefficient for the two-year transfer dummy is in terms of SAT points. In column 1 we present the OLS results, and columns 2-6 contain quantile regression results.

The coefficients estimates are very small in magnitude, and only the result for whites is statistically significant. The negative coefficient of about 11 for whites suggests that white two-year transfer students attend four-year colleges that have median SAT scores that are about 11 points lower on average than the four-year colleges attended by white four-year starters. While this result is statistically significant it is so small in magnitude that it likely makes very little difference from a practical standpoint. The OLS results for Hispanic and black students suggest no difference in quality, on average, between two-year transfers and four-year starters of the respective racial/ethnic groups.

The quantile regression estimates shed a bit more light on the impact of transferring from a two-year college because these estimates allow the relationship to differ at different points in the conditional distribution of the linear college quality measure.[10] These estimates have the same interpretation as the more familiar OLS estimates, except that the quantile regression estimates are interpreted relative to a particular point in the conditional distribution of the college quality measure.

---

[10] These quantile regression estimates therefore paint a broader picture than the OLS estimates which only present estimates for the mean or average of the conditional college quality distribution.

Observation across columns 2-6 shows that an interesting and consistent pattern emerges. For each race/ethnicity group the coefficient estimates are positive at the 10th percentile but become negative at higher points in the conditional distribution of college quality. A positive coefficients suggest that two-year college transfers attend four-year colleges that are more selective than similar four-year college starters at the same point in the conditional distribution of college quality. A similar but opposite interpretation holds for negative coefficients.

The two significant results for white students at the median and the 75th percentile basically reinforce the OLS results. White two-year transfer students attend somewhat less selective (10-15 SAT points) four-year colleges than four-year college starters. The quantile regression estimates for Hispanic and black students are more informative since the significant results occur in the tails of the college quality distribution. The fairly large positive result for Hispanic students suggests that a student at the 10th percentile of the college quality distribution who was a four-year starter would have improved the quality of four-year college attended by about 34 SAT points by first attending a two-year college. In contrast, the significant result for black students suggests that a two-year transfer student at the 90th percentile of the college quality distribution could have improved the quality of four-year college attended by 46 SAT points by starting out at a four-year college and by-passing the two-year college. Taken together these quantile regressions suggest that enrolling in a two year college has a larger positive impact on the quality of four-year school students attend at the bottom of the college quality distribution than at the top. These findings are broadly consistent with the findings from Table 2 since both find that two-year transfer students are less likely to enroll in top quality colleges, and less likely to enroll in bottom quality colleges.

In Table 4 we address the question of whether two-year transfer students are more or less likely than comparable four-year starters to complete a four-year degree, *conditional* on enrolling in a particular quality type (bottom, middle, top). These models are estimated separately by race/ethnicity for each college quality type. Moreover, we add the additional restriction that students in these samples must have attended at least two years of college, at either the two-year or four-year level, or any combination of the two. Without this restriction we may be comparing two-year college transfer students who have attended college for one or two years before enrolling at a four-year college, and hence have shown some aptitude for postsecondary study, with four-year students who may have dropped out after the first year. Such a comparison would potentially bias our results in favor of two-year college transfers.[11]

The estimated marginal effects from our logit models for bottom and middle quality four-year colleges show that there is little difference between two-year transfer students and students who started at four-year colleges in the likelihood of graduating from a bottom or middle quality college, conditional on attending at least two years of college. Most of the estimated coefficients are positive (with the exception of Hispanic students at middle quality colleges), but they are not statistically significant. By contrast, there are rather large and significant results for students in the top quality category. Both white and Hispanic transfer students are significantly less likely to graduate from top quality four-year colleges than their counterparts who entered a four-year school directly. White transfer students are about 8 percent less likely to graduate, while Hispanic transfer students are 14 percentage points less likely to graduate.

The above findings are particularly interesting in light of the results from Table 2. Taken together these results imply that while Hispanic two-year transfer students are just as likely to

---

[11] We also estimated the graduation models without the restriction of at least two years of college attendance, and the results were broadly consistent.

enroll in a top quality college as Hispanic four-year college starters, they are much less likely to *graduate* from a top quality college, conditional on completing at least two years of college.[12] White two-year transfer students are less likely than white four-year college starters to enroll in a top quality college and also less likely to graduate once they have enrolled and completed at least two years. Black two-year transfer students are somewhat less likely than black four-year college starters to enroll in a top quality college, but once black two-year transfer students do enroll they are just as likely to graduate.[13]

V. Conclusion

There have been considerable shifts over time in the importance of community colleges as a source of post-secondary education. Despite the fact that community colleges enroll nearly half of all first time freshman, their role has been largely ignored, for instance in the debate over affirmative action. This then is an important gap in the literature. Our paper is among the first to examine how the initial enrollment in a community college affects not only the quality of school to which (some) students transfer, but ultimately the probability of graduating. We have found that two-year colleges may indeed provide important access points to more selective colleges for Black and Hispanic students. Specifically, we find that both Black and Hispanic two-year transfers are nearly nine percentage points more likely to enroll in middle quality four-year colleges than their similar counterparts who enroll directly in four-year colleges. We further find

---

[12] This result for Hispanic students in top quality colleges also holds when the restriction for at least two years of college attendance is removed.

[13] In future work we will address the potential issue of the endogeneity of the two-year transfer variable. For example, thus far our statistical approach treats two-year transfers and four-year starters as if they are the same, both with respect to observables and unobservables. If however, initial four-year college students are different in unobservable ways relative to those who first enroll in a community college, these results may overstate the negative impact — that is, the enrollment in a lower quality four-year school— of first enrolling in a community college.

that when those students enroll in middle quality four-year colleges they are not significantly more or less likely to graduate than four-year starters.

Finally, in future work we will estimate all models both with and without Historically Black Colleges and Universities (HBCU). Recent work by Chaplin and Hannaway (1999) suggests that black students on average apply to less selective colleges, however, those with high SAT scores tend to apply to more selective school then whites with similar SAT scores. Further, blacks tend to apply to a wider range of colleges in terms of college selectivity with many black students with high SAT scores applying to HBCUs that have relatively low average SATs. Thus, black students tend to both under- and over-shoot in terms of their application behavior with much of the undershooting a result of applications to HBCUs.

REFERENCES CITED

Barron's College Division. *Barron's Profiles of American Colleges*. Woodbury, CT: Barron's Educational Series.

Bowen, William G. and Derek Bok (1998), *The Shape of the River Long-term Consequences of Considering Race in College and University Admissions*. Princeton: Princeton University Press.

Brawer, F B. and Cohen, Arthur M. (1987), *The Collegiate Function of Community Colleges*. San Francisco: Jossey-Boss Inc.

Brewer, Dominic J., Eide, Eric R., and Ehrenberg, Ronald G. (1999). "Does It Pay to Attend an Elite Private College? Cross-Cohort Evidence on the Effects of College Type on Earnings." *Journal of Human Resources* 34, 104-23.

Brewer, Dominic J., Eric R. Eide, and Dan D. Goldhaber, (1999). The Effect of Race and Ethnicity in Higher Education Since 1972. Forthcoming Working Paper, Public Policy Institute of California.

Chaplin, Duncan, and Jane Hannaway (1999), "Applying to College: Are African-Americans Undershooting?" Paper presented at the Annual meetings of the Association of Public Policy and Management, November 1999.

Council of Economic Advisors (1998), *Changing America: Indicators of Social and Economic Wellbeing by Race and Hispanic Origin*, Presidents Initiative on Race, September.

Eide, Eric, Dominic J., Brewer, and Ronald G. Ehrenberg (1998), "Does it Pay to Attend an Elite Private College? Evidence on the Effects of Undergraduate College Quality on Graduate School Attendance." *Economics of Education Review*.

Ganderton, Philip T., and Santos, Richard (1995). "Hispanic College Attendance and Completion: Evidence From the High School and Beyond Surveys." *Economics of Education Review* 14(1): 35-46.

Grubb, W. Norton (1997) "The Returns to Education in the Sub-Baccalaureate Labor Market, 1984-1990." *Economics of Education Review* 16(3): 231-45.

Hilmer, Michael J. (1997). "Does Community College Attendance Provide a Strategic Path to a Higher Quality Education?" *Economics of Education Review* 16(1): 59-68.

Hilmer, Michael J. (1999), "Human Capital Attainment, University Quality, and Entry-Level Wages for College Transfer Students" Unpublished paper presented at the Cornell Higher Education Research Conference.

Holahan, Carole K., Green, Janet L., and Kelley, H. Paul. (1983), "A 6-year Longitudinal

Analysis of Transfer Student Performance and Retention." *Journal of College Student Personnel*: 305-310.

Kane, Thomas J. (1998), "Racial and Ethnic Preferences in College Admissions", in Christopher Jencks and Meredith Phillips (eds.), *The Black-White Test Score Gap*, Washington, DC: Brookings Institution Press.

Kane, Thomas J. and Cecilia Rouse (1995), "Labor Market Returns to Two- and Four-year Colleges", *American Economic Review*, 85(3): 600-614.

Leigh, Duane E. and Gill, Andrew M. (1997). "Labor Market Returns to Community Colleges: Evidence for Returning Adults." *Journal of Human Resources* 32: 334-53.

National Center for Education Statistics (NCES) (1999), *Digest of Educational Statistics, 1998*. Washington, DC: U.S. Department of Education, NCES 99-036.

Nickens, John M. (1970). "The Relationship of Selected Variables to Performance of Junior College Transfer Students at Florida State University." *Journal of Experimental Education* 38: 61-65.

Nolan, Edwin J. and Hall, Donald L. (1978). "Academic Performance of the Community College Transfer Student: A Five-Year Follow-Up Study." *Journal of College Student Personnel*: 543-548.

Rouse, Cecilia E. (1995). "Democratization or Diversion? The Effect of Junior Colleges on Educational Attainment." *Journal of Business & Economic Statistics* 13: 217-224.

Tinto, Vincent (1987), *Leaving College: Rethinking the Causes and Cures of Student Attrition*. Chicago, IL: University of Chicago Press.

U.S. Department of Education (1999), *Digest of Education Statistics*, National Center for Education Statistics.

Appendix: Variable Definitions

Name	Definition
Col_SAT	Median SAT of entering Freshmen at four-year college in which student enrolls
Grad Coll	Dummy variable equal to 1 if student graduated, 0 otherwise
Grad Coll 2+	Dummy variable equal to 1 if student graduated, 0 otherwise, conditional on at least 2 years of college attendance (either 2-year or 4-year)
Male	Dummy variable equal to 1 if student is male, 0 otherwise
White	Dummy variable equal to 1 if student is white, 0 otherwise
Hispanic	Dummy variable equal to 1 if student is Hispanic, 0 otherwise
Black	Dummy variable equal to 1 if student Black, 0 otherwise
Other	Dummy variable equal to 1 if student is Other Race, 0 otherwise
Mother Grad	Dummy variable equal to 1 if student's mother graduated from college, 0 otherwise
Father Grad	Dummy variable equal to 1 if student's father graduated from college, 0 otherwise
Inc <15	Family Income Less Than $14,999
Inc 15-20	Family Income $15,000 to $19,999
Inc 20-25	Family Income $20,000 to $24,999
Inc 25-30	Family Income $25,000 to $29,999
Inc 30-40	Family Income $30,000 to $39,999
Inc 40-50	Family Income $40,000 to $49,999
Inc >50	Family Income Greater Than $50,000
Math Test	Student's standardized score on math test
Voc. Test	Student's standardized score on vocabulary test
HS Grades	Student's self-reported high school grades converted to a four-point scale
Relig. HS	Dummy variable equal to 1 if student attended a religious high school, 0 otherwise
Rural HS	Dummy variable equal to 1 if student attended a rural high school, 0 otherwise
Urban HS	Dummy variable equal to 1 if student attended an urban high school, 0 otherwise
Senior	Dummy variable equal to 1 if student was a member of the senior cohort, 0 otherwise

Table 1
Summary Statistics

	2-Year College Transfers			Started at 4-Year College		
	Bottom Quality	Middle Quality	Top Quality	Bottom Quality	Middle Quality	Top Quality
Col_SAT	867.89	908.76	1,025.88	827.35	910.41	1,067.39
	(82.37)	(67.59)	(73.60)	(94.88)	(78.12)	(102.99)
Grad Coll	.4255	.5175	.5329	.3738	.5311	.6636
Grad Coll 2+	.4895	.5728	.5892	.4509	.6001	.7100
Male	.4772	.4923	.4756	.4226	.4430	.4911
White	.5927	.6559	.5435	.5013	.6656	.6346
Hispanic	.1611	.1776	.3185	.1789	.1384	.1584
Black	.1763	.1007	.0573	.2897	.1576	.1290
Other	.0699	.0657	.0807	.0300	.0383	.0780
Mother Grad	.2019	.2098	.2217	.1827	.2124	.2572
Father Grad	.2516	.2191	.2933	.2084	.2254	.2865
Inc <15	.2093	.1503	.1620	.2423	.1624	.1308
Inc 15-20	.1395	.1396	.1432	.1318	.1193	.1009
Inc 20-25	.1429	.1672	.1103	.1510	.1342	.1164
Inc 25-30	.1595	.1442	.1338	.1406	.1738	.1323
Inc 30-40	.1761	.2025	.1667	.1679	.1832	.1792
Inc 40-50	.1096	.1273	.1737	.1156	.1459	.1926
Inc >50	.0631	.0690	.1103	.0508	.0812	.1478
Math Test	.3455	.3739	.3676	.3238	.3502	.3805
	(.2658)	(.2563)	(.2687)	(.2790)	(.2783)	(.2870)
Voc. Test	.3502	.3895	.3782	.3426	.3608	.3982
	(.2510)	(.2492)	(.2601)	(.2772)	(.2680)	(.2770)
HS Grades	2.8528	2.8433	2.9364	2.9360	3.0481	3.2931
	(.6666)	(.6543)	(.6268)	(.6600)	(.6203)	(.5905)
Relig. HS	.2097	.2434	.2760	.2196	.2765	.2986
Rural HS	.2644	.2140	.1571	.2850	.2822	.1561
Urban HS	.2614	.1846	.1953	.2630	.2183	.2252
Senior	.4347	.3748	.4098	.5020	.4679	.4458
Observations	329	715	471	1,498	2,817	2,140

Notes: Standard deviations in parentheses. Missing values for parental education, family income, high school grades, and test scores not included in the calculation of those means.

Table 2
Multinomial Logit Estimates of the Effect of 2-year College Transfer on 4-Year College Enrollment,
by College Quality Type

	Whites			Hispanics			Blacks		
	Bottom Quality	Middle Quality	Top Quality	Bottom Quality	Middle Quality	Top Quality	Bottom Quality	Middle Quality	Top Quality
2-Year Transfer	.0156 (.0146)	.0308 (.0197)	**-.0463** **(.0194)**	**-.0922** **(.0338)**	**.0854** **(.0387)**	.0068 (.0387)	-.0242 (.0454)	**.0889** **(.0452)**	<u>-.0647</u> <u>(.0389)</u>
Log Likelihood	-4,753.34			-1,211.24			-1,255.97		
Observations	4,904			1,327			1,311		

Notes: Coefficient estimates are marginal effects. Standard errors in parentheses. Coefficients in bold are significant at the 5% level; underlined coefficients are significant at the 10% level. The dependent variable is based on Barron's quality rankings. Coefficient for 2-year college transfer is relative to those who started at a 4-year college. Estimation also includes sex, parental education, family income, high school grades, test scores, whether the student's high school was religious, urban, or rural, whether the student was in the senior cohort, state dummies for California, Florida, Illinios, New York, and Texas, and dummy variables representing missing values (in which case the variables were set to zero).

Table 3
OLS and Quantile Regression Estimates of the Effect of 2-Year College Transfer on 4-Year College Enrollment,
With Linear College Quality Measure

	OLS	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
Whites (n=4,658)						
2-Year Transfer	**-10.71**	5.47	-3.92	**-10.19**	<u>-14.53</u>	-16.12
	(3.88)	(4.66)	(3.09)	**(4.80)**	<u>(7.57)</u>	(9.85)
R-Square	0.23					
Hispanics (n=1,080)						
2-Year Transfer	2.21	**33.75**	8.64	-0.84	-11.31	-16.79
	(7.69)	**(12.39)**	(8.42)	(9.73)	(7.89)	(16.03)
R-Square	0.33					
Blacks (n=1,067)						
2-Year Transfer	-0.54	21.62	16.02	6.46	-21.55	**-46.39**
	(12.91)	(30.15)	(20.29)	(14.99)	(15.10)	**(17.63)**
R-Square	0.25					

Notes: Bootstrapped standard errors in parentheses. Coefficients in bold are significant at the 5% level; underlined coefficients are significant at the 10% level. The dependent variable is the median SAT score of entering freshmen at the student's 4-year college. Coefficient for 2-year college transfer is relative to those who started at a 4-year college. Estimation also includes sex, parental education, family income, high school grades, test scores, whether the student's high school was religious, urban, or rural, whether the student was in the senior cohort, state dummies for California, Florida, Illinois, New York, and Texas, and dummy variables representing missing values (in which case the variables were set to zero).

Table 4
Logit Estimates of the Effect of 2-Year College Transfer on 4-Year College Graduation, by College Quality Type and Conditional on at Least 2 Years of College Attendance

	Bottom Quality			Middle Quality			Top Quality		
	Whites	Hispanics	Blacks	Whites	Hispanics	Blacks	Whites	Hispanics	Blacks
2-Year Transfer	.0331	.0725	.0200	.0030	-.0267	.0393	**-.0750**	**-.1393**	-.0276
	(.0477)	(.1106)	(.0799)	(.0279)	(.0680)	(.0805)	**(.0307)**	**(.0690)**	(.1399)
Log Likelihood	-523.31	-129.58	-242.04	-1,282.52	-250.51	-252.09	-795.55	-252.82	-154.43
Observations	814	236	402	2,111	420	426	1,518	446	256

Notes: Coefficient estimates are marginal effects. Standard errors in parentheses. Coefficients in bold are significant at the 5% level; underlined coefficients are significant at the 10% level. The dependent variable equals 1 if the student graduated and 0 if did not graduate. Coefficient for 2-year college transfer is relative to those who started at a 4-year college. Estimation also includes sex, parental education, family income, high school grades, test scores, whether the student's high school was religious, urban, or rural, whether the student was in the senior cohort, state dummies for California, Florida, Illinios, New York, and Texas, and dummy variables representing missing values (in which case the variables were set to zero).