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Improving the Odds:

An Empirical Look at the Factors That Influence Upward Transfer

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Table of Contents

I. Introduction

Improving the Odds: An Empirical Look at the Factors That Influence Upward Transfer

Community colleges play a vital role in increasing access to higher education. These uniquely American institutions, with their open-admissions, low-tuition models, serve approximately 40 percent of the total annual undergraduate enrollment in this country (Snyder, de Brey, and Dillow 2016). While many students enroll in a community college solely to earn a certificate or associate degree, others, particularly first-time enrollees, do so with the ultimate goal of transferring to a four-year institution and earning a baccalaureate degree.

This brief is the first in a series of three, exploring outcomes for recent high school graduates who begin their postsecondary education in one of our nation's more than 1,100 community colleges. For years, practitioners, researchers, and policymakers have been concerned by the fact that too few students successfully navigate the complex process of transferring from a two- to four-year institution. As such, we explored student- and institutional-level factors that influence the likelihood of upward transfer for students who enroll in community college directly after high school. Drawing from the results of a multilevel regression model and supporting literature, we conclude by recommending five strategies for high school educators, faculty and staff at colleges and universities, and policymakers to consider to increase upward transfer rates.

Background

For many American industries, the beginning of the 20th century marked a period of increased modernization and a growing demand for well-educated and highly skilled workers. As the needs of the labor market were expanding, so too were the number of high school graduates seeking opportunities for improved economic standing and upward mobility. These changes put pressure on states to consider how best to expand access to postsecondary education (Drury 2003).

Established more than 100 years ago, community colleges were created to increase access to higher education by serving students who, for various reasons, were often denied access to or decided not to pursue an education at four-year colleges and universities. The purpose of the early community college was twofold. The first was to help prepare students for upper-level study at four-year colleges and universities (Cohen, Brawer, and Kisker 2013; Drury 2003). To do this, community colleges developed curricula equivalent to the first two years of general instruction

provided by four-year institutions. This allowed students to begin their postsecondary education by earning college-level credit at their local community college before transferring to a four-year institution to complete their bachelor's degree. The second purpose was to prepare students to enter the workforce by providing specialized vocational education and technical training (Cohen, Brawer, and Kisker 2013; Drury 2003).

Today, community colleges continue to strive to meet the unique needs of their communities by providing students with opportunities to earn technical and career-based certificates and associate degrees in both general education and specialized fields, prepare for upward transfer, and to participate in a variety of adult and continuing education programs (Cohen, Brawer, and Kisker 2013). As the demand increases for workers with baccalaureate degrees, understanding how to improve upward transfer rates will continue to be of paramount importance.

Our Study

The aim of ensuring accessible transfer options has led to increased interest in understanding how, when, and why community college students transfer to four-year colleges and universities. For the purposes of this study, we define upward transfer as occurring when a student who enrolled first in a community college[1], left that institution, and subsequently enrolled in a four-year institution. We limited our definition to the movement between students' first and second postsecondary institutions.

To identify key predictors of upward transfer, we empirically tested a series of academic, demographic, social, and institutional-level characteristics to determine what impact they have on community college students' likelihood of transferring to a four-year institution. We were particularly interested in exploring the impact of high school and other pre-college factors on upward transfer rates. Using a nationally representative data source and a multivariate, multilevel model which took into consideration the nesting of students within high schools, we tested the influence of a series of independent variables on upward transfer. Table 1 provides an overview of the independent variables of interest.

Table 1. *Variables Used in the Analysis*

Independent Variables Tested for Influence on Upward Transfer	
College Courses While in High School	
Dual Enrollment	Identifies whether students took any college-level courses in postsecondary institutions before graduating from high school.
AP/IB English Credits	Total AP/IB English credits students earned in high school.
High School Academic Performance	
Reading Test Score	Results of a standardized reading test administered to the students in 10th grade.
Math Improvement Score	The difference between standardized math test scores at 12th grade and at 10th grade.
Social Behavior in High School	
High School Absences	Identifies how many times students were absent from high school: (1) None, (2) 1–2 times, (3) 3–6 times, (4) 7–9 times, or (5) 10 or more times.
High School Behavioral Troubles	Identifies how many times students reported getting into trouble: (1) None, (2) 1–2 times, (3) 3–6 times, (4) 7–9 times, or (5) 10 or more times.
High School Awards	Identifies how many times students received an academic honor, good attendance, or good grades award while in high school.

1 For the purposes of this study, we define community colleges as public or private not-for-profit institutions where an associate degree is the highest degree offered.

Table 1. *Variables Used in the Analysis, cont'd.*

College Plans and Aspirations	
Enrollment Plans	Indicates whether students reported plans to enroll in college immediately after high school.
Educational Aspirations	Reported during their senior year of high school, students reported aspiring to earn one of four levels of education: (1) High school diploma or less, (2) some college, (3) bachelor's degree, or (4) graduate degree.
College Entrance Exam	Identifies whether students took a college entrance exam prior to enrolling in their first postsecondary institution.
Matriculation	
Entry Time	Captures the length of time between high school departure and postsecondary enrollment: (1) Enrolled within three months or (2) enrolled after three months.
Claimed Major	Identifies whether students declared a major while enrolled at their first postsecondary institution.
Enrollment Intensity	Identifies students' enrollment intensity for the entire period of enrollment at their first postsecondary institution: (1) Exclusively full-time, (2) exclusively part-time, or (3) mixed-time.
Academic Advising	The frequency in which students' met with an academic advisor while enrolled at their first postsecondary institution: (1) Never, (2) sometimes, or (3) often.
Developmental Education	Indicates whether students enrolled in developmental math or English while at their first postsecondary institution.
College GPA	Students' cumulative grade point average at their first postsecondary institution reported on a standardized four-point scale.
Student Life	
Extracurricular Participation	Frequency in which students participated in extracurricular activities while enrolled at their first postsecondary institution: (1) Never, (2) sometimes, or (3) often.
On-Campus Housing	Indicates whether the students live on or off campus while enrolled at their first postsecondary institution.
Financial Aid	
Received a Pell Grant	Indicates whether students received a Pell Grant at any time while enrolled at their first postsecondary institution.
Received a Federal Loan	Indicates whether students received a federal loan at any time while enrolled at their first postsecondary institution.
Demographics	
Gender	Students' self-reported gender: (1) Female or (2) male.
Race	Students' self-reported race: (1) White, (2) Asian, (3) African American, (4) Latino/Hispanic, and (5) others, including Pacific Islanders, American Indian, and those reporting multiple races.
Socioeconomic Status	A standardized measure of students' families' socioeconomic status.
Urbanicity	Describes the location of students' homes while in high school: (1) Urban, (2) suburban, or (3) rural.
High School Resources (Level-Two Covariates)	
Free and Reduced Lunch	The percent of students within a high school receiving free and reduced lunch.
Control	The institutional control of a high school: (1) Public or (2) private.
Availability of AP/IB Courses	Indicates whether a high school offered any AP/IB courses.

Data for this study come from the Education Longitudinal Study (ELS) of 2002, a nationally representative, longitudinal study of students who began 10th grade

in 2002. Data were collected through a series of administrative sources and surveys administered to study participants over a 10-year period. A product of the U.S. Department of Education's National Center for Education Statistics, ELS provides researchers with an extensive body of data on students' high school records, family demographic and background information, postsecondary enrollment and achievement information, and workforce participation. It is worth noting that as robust as the ELS data are, because the sample is derived from high school students who are tracked to postsecondary education and beyond, the data are not necessarily representative of all community college students. As a result, the findings of this study are likely confined to traditionally aged students whose first postsecondary institution was a community college. A complete discussion of the

II. Study Findings

data and methods used in this report is presented in the appendix.

Study Findings

Community colleges have played a vital role in democratizing American higher education by serving some of the most diverse students in the country (Boggs 2010; Cohen, Brawer, and Kisker 2013). The students in our sample, like the community college student body at-large, are diverse in terms of race/ethnicity, socioeconomic background, and academic preparation. Close to 39 percent of students in our sample transferred to a four-year institution by 2013. Table A1 in the appendix provides a full list of descriptive statistics for the variables explored in our study. What follows are the eight major findings distilled from the results of our empirical model. Table A2 in the appendix presents the detailed results of our multilevel regression analysis.

Dual enrollment and AP/IB course-taking have a positive effect on upward transfer rates.

Dual enrollment offers opportunities for students to complete college courses while still enrolled in high school and is viewed as a means to increase college accessibility as well as reduce college costs for students (Kilgore and Taylor 2016). We defined dual enrollment as enrollment in a postsecondary institution prior to leaving high school. On average, students in our analysis who participated in dual-enrollment programs were two-and-a-half times as likely to transfer to a four-year institution as students who did not.

In addition to dual-enrollment opportunities, Advanced Placement and International Baccalaureate (AP/IB) courses provide another avenue for students to earn college credit while in high school. Both AP and IB courses, which are offered in a variety of different subjects, provide college-level curricula and final examinations to high school students. Although students are only awarded college credit for passing AP/IB exams, our analysis revealed that simply completing AP/IB courses has a positive impact on upward transfer. After looking closer at individual course subjects, we found AP/IB English to be the source of the finding's statistical significance. Each additional AP/IB English credit earned resulted in a 63 percent increase in the odds of upward transfer.

Strong academic performance in high school positively impacts the likelihood of upward transfer.

To explore the role of pre-college academic preparation, we tested the impact of standardized 10th grade reading scores and the improvement in standardized math test scores between 10th and 12th grades on upward transfer. Reading test scores were found to have a positive impact on upward transfer, with each one-point increase in the score resulting in a 4 percent increase in the odds of transferring. However, the relationship between math improvement scores and upward transfer were not statistically significant in our model. This may be due to the overwhelming and direct effect of reading test scores or that despite increased math test scores, students' overall performance in math may still not be at a high enough level to improve the odds of upward transfer. To avoid issues of multicollinearity (i.e., a violation of an assumption of regression modeling, where two or more independent variables in a regression model are very highly correlated and can yield inaccurate estimates), we excluded students' high school GPA from the model due to the high correlation between high school GPA and college GPA (which is included in our model). Including both GPA measures in the same model could result in less accurate and less reliable estimates.

Behavioral problems in high school negatively impact the likelihood of upward transfer.

In addition to our analysis of academic preparation, we sought to test whether certain types of social behavior in high school affected students' chances of upward transfer. Students who reported getting into trouble while in high school were significantly less likely to transfer to a four-year institution than their counterparts who reported no disciplinary issues. Compared to students who reported never getting into trouble at school, students who got into trouble one to two times were 40 percent less likely to transfer. Getting into trouble three to six times reduced the odds of upward transfer by an additional 5 percent. We also tested the impact of frequently being absent from school, but found no statistically significant effect.

College aspirations and planning are associated with higher rates of upward transfer.

While academic preparation can be a key indicator of college student success, internal motivation also plays a significant role. We tested the impact of three factors that aimed to capture the role of college planning and motivation to attend college on the likelihood of upward transfer. First, educational aspirations in high school were found to have a highly significant impact on upward transfer rates. Students who aspired to earn graduate and professional degrees were nearly twice as likely to transfer, compared to students who aspired only to complete their high school diploma. Moreover, students who aspired to complete only some college (and no degree) were considerably less likely to transfer to a four-year institution. Surprisingly, students who aspired to earn a bachelor's degree were no more or less likely to transfer, relative to students who aspired only to complete their high school diploma. Plans to enroll in college immediately after high school were also associated with higher odds of upward transfer. Finally, students who took a college entrance exam while in high school were more than three times as likely to transfer to a four-year institution than students who had not.

Enrollment decisions, before and soon after matriculating to a community college, greatly impact upward transfer rates.

Students who enroll in college immediately after leaving high school were found to be more likely to transfer to a four-year institution than students who took longer to matriculate. Specifically, students who waited longer than three months after high school to enroll in community college saw their odds of transferring reduced by 43 percent. Enrollment intensity was also a significant factor. Students who enrolled exclusively part-time were statistically no more or less likely to transfer to a four-year institution than students who enrolled exclusively full-time. However, students who changed their enrollment intensity from full-time to part-time or vice versa over the course of their enrollment, were significantly less likely to transfer than exclusively full-time students. Furthermore, students who declared a major while at community college were more than one-and-a-half times as likely to transfer as students who did not. Community college GPA was also

a highly significant predictor of upward transfer. With each one-point increase in GPA, the odds of transferring increased by 112 percent. Enrolling in remedial or developmental courses, as well as meeting with an academic advisor, were both found to have no statistically significant impact on upward transfer.

Participating in student activities boosts the chances of upward transfer.

Community colleges offer a number of co-curricular and extracurricular activities that further enrich the education their students receive. Participating in extracurricular activities significantly increases students' odds of transferring to a four-year institution. In fact, frequent participation in extracurricular activities more than doubles the odds that a student will transfer, when compared to students who do not participate in campus-based activities or clubs. Nearly one in four community colleges offer their students an on-campus residence option, though less than 1 percent of all community college students nationwide choose to live on campus (American Association of Community Colleges 2016a; 2016b). Our study reveals students who do elect to live on campus are more likely to transfer to a four-year institution.

Receiving federal financial aid significantly impacts the likelihood of upward transfer.

Millions of students each year rely on federal financial aid programs in order to gain access to college. We tested the relationships between receiving Pell Grants and federal student loans at students' first institutions and upward transfer. Receiving a Pell Grant was associated with a close to 30 percent reduction in the odds of transfer, though this finding was only marginally significant. Pell Grant recipients are among those with the greatest financial need and are often first-generation college students and underrepresented minorities. Thus, the negative impact of Pell Grants in our model is likely a function of the background characteristics of these students and not the aid dollars themselves. However, students who received a federal student loan were more than four-and-a-half times as likely to transfer to a four-year institution as students who did not receive a federal loan. Again, this finding is likely more reflective of the characteristics of the students who needed to borrow while at their first institution, than of the loan program itself.

Demographic factors significantly impact the chances of upward transfer.

In exploring the effect of various student-level factors on upward transfer, it is important to consider and control for the potential impact of demographic characteristics. Our results revealed female students to be 32 percent less likely to transfer than their male counterparts. This finding was surprising as, on average, female students enroll and complete postsecondary education at higher rates than male students. One potential explanation may be that female students are more likely to enroll in degree programs that often do not lead to upward transfer. As a result, female students enter community college less likely to be planning to transfer than their male counterparts. While students of all socioeconomic backgrounds were present in our sample, the odds of transferring to a four-year institution for students at the upper end of the continuum were 47 percent higher than those of students at the bottom end. We also found students from suburban areas to be less likely to transfer than students from urban areas, though this may also be a function of socioeconomic status. Finally, we found race to be only a marginally significant factor, with Hispanic students transferring to four-year institutions at slightly higher rates than white students.

III. Recommendations

Recommendations

The results of our analysis identify a number of factors that impact community college students' likelihood of transferring to a four-year institution. Drawing from these results and previous research, we present five key recommendations for policy and practice. We conclude our recommendations with a list of additional resources for those wanting more information on ways to improve transfer and success rates.

1 Ensure that all students have access to rigorous high school curricula.

Our findings show that students who take advantage of dual enrollment and AP/IB courses, as well as those who earn stronger GPAs and score higher on standardized exams in high school, have higher odds of transferring to a four-year institution. Research has long shown the positive connections between strong academic preparation and college enrollment and success. Students who complete a more rigorous high school curriculum generally achieve higher postsecondary GPAs, take fewer remedial or developmental courses, and are more likely to graduate (Bailey 2004; Calcagno et al. 2007; Dougherty and Kienzl 2006; Warburton, Bugarin, and Nuñez 2001). Opportunities to earn college credit while in high school are also vital. Prior studies have found dual enrollment to have a positive impact on persistence, credit accumulation, and GPA for community and four-year college students (An 2013; Community College Research Center 2012). While a number of studies have found taking AP/IB courses to be associated with higher rates of success, other research suggests that the greatest impact appears to be on students who pass AP exams (Dougherty, Mellor, and Jian 2006; Geiser and Santelices 2004; Klopfenstein and Thomas 2009).

Too few students, especially low-income and racial/ethnic minority students, have access to a rigorous high school curriculum and to dual enrollment or AP/IB programs. Though the number of high schools offering dual enrollment and AP/IB programs is increasing, schools that educate more low-income and minority students, and those that serve smaller communities, tend to lack the financial and human capital resources needed to offer these programs (Handwerk et al. 2008; Perna et al. 2015). High schools, colleges and universities,

and policymakers all have a role to play in in ensuring students have access to a rigorous high school education.

High school administrators and faculty should strive to provide students with challenging and diverse course options that prepare students for success in higher education. While offering opportunities to earn college credit is one approach, integrating instructional strategies that challenge students and promote higher-level thinking in all courses is important. High schools that have the resources to offer dual enrollment and AP/IB courses should consider additional support strategies for students, including exam preparation, to help increase the benefits students receive from these programs. Furthermore, high schools should expand their AP/IB offerings by incentivizing faculty to become certified to teach AP/IB courses.

In collaboration with high schools, colleges and universities have a role to play in helping to ensure that students are college ready. First, as the institutions that educate future teachers, colleges have an important role in preparing pre-service teachers to help students transition to the rigors of college. Colleges and universities also have a responsibility to work with high schools to define what it means to be "college ready." Better aligning our secondary and postsecondary systems will help make sure that more students develop the competencies needed to succeed in higher education. Colleges should work cooperatively with local high schools to help develop affordable dual enrollment opportunities for students. In addition to the benefits students will receive, dual enrollment presents an opportunity for colleges to pursue alternative sources of revenue and more strongly align their curriculum.

Finally, policymakers should consider ways to increase funding to school districts in order to ensure that more students have access to dual enrollment and AP/IB courses. Special focus should be paid to increasing the availability of these courses at high schools that serve large percentages of low-income and racial/ethnic minority students. Increased investments at this level can yield future cost savings through improved college student retention and ultimately, success. Policymakers also play an important role in holding schools accountable for meeting more rigorous educational standards and in helping foster better alignment between secondary and postsecondary education systems.

2 Expand access to and strengthen college and career counseling in high school.

Our findings highlight the important relationship between educational goals, social behavior, and college planning on transfer rates. These findings suggest an important role for high school counselors. In the United States, on average, one school counselor is expected to serve close to 500 students; this is twice the recommended student-to-counselor ratio (American School Counselor Association 2015). Due to the large number of students they serve and the administrative responsibilities they are often assigned, high school counselors rarely have enough time to provide their students with thorough college and career counseling, not to mention individualized assessment and support.

While a number of factors influence whether students ultimately meet their educational goals, prior research has shown that having higher aspirations at the start of college are generally associated with improved student outcomes (McCarron and Inkelas 2006; Pascarella and Terenzini 2005; Perna and Titus 2005). Furthermore, research has shown that students and families who are able to plan ahead for college—those often equipped with more knowledge of and experience with the college admissions process—enroll in higher education at greater rates (Perna and Titus 2005). Beyond college and career counseling, high school counselors can play an important role in helping students develop the psychosocial and behavioral competencies necessary for success in college. Casillas et al. (2012) found social and behavioral factors, such as absenteeism and frequent disciplinary issues, to be significant predictors of high school academic achievement which in turn have a strong impact on future success in college.

Few students are well served by such high student-to-counselor ratios. Policymakers should consider ways to help high schools and school districts increase the number of counselors available to students. In turn, high schools should consider ways to lessen the administrative responsibilities of counselors so that they are able to spend more time attending to the personal, social, and academic development of their students. Effective pre-college counseling should also find ways to include parents, particularly for low-income families. For schools that are unable to devote additional resources to counseling, volunteer and community-based mentoring programs can help fill unmet needs. Drawing from their professional admissions and outreach staff, colleges and universities can help provide students and their families with information about applications, financial aid, potential programs of study, and college life. Finally, colleges and universities should ensure that counselor education programs include college-access training in the curriculum.

3 Ensure that students have access to financial aid and that existing financial aid systems better serve students.

The rising costs of higher education can be a significant barrier to college access and persistence. Institutional, state, and federal financial aid programs, particularly need-based programs, can be effective in increasing access and success for community college students. Our model revealed a positive effect for students who received federal student loans. Previous research corroborates the positive connections between student aid and retention, degree completion, and transfer (Castleman and Long 2013; Chen and DesJardins 2008; Gross 2011; Gross, Torres, and Zerquera 2013; Long 2008; Nora, Barlow, and Crisp 2006). Students benefit from the ability to focus more time and effort on their education, and spend less time on ways in which to pay for tuition, books, and living expenses.

However, research has also shown that despite high levels of need, low-income and community college students are among the least likely to apply for aid (American Council on Education 2004; Juszkiewicz 2016). The reasons are varied, but research suggests these students are unaware or unfamiliar with the financial aid application processes, are discouraged by the complexity of the Free Application for Federal Student Aid (FAFSA), feel as though they may not qualify for aid, or are averse to borrowing (Bettinger et al. 2012; Feeney and Heroff 2013; McKinney and Novak

2012). Given the populations community colleges serve and the likelihood that these students will require financial assistance in order to persist and even transfer, more focus needs to be placed on ensuring students have access to and actually receive the aid they need. When it comes to ensuring students have access to the financial resources required to pursue postsecondary education, policymakers at the federal and state levels both have roles to play.

Federal policymakers should provide adequate funding for the Title IV financial aid programs, especially Pell Grants, which serve the neediest of students. At a minimum, funding increases for Pell Grants should keep up with inflation. Furthermore, restoring year-round Pell Grants—which would allow students the ability to use the funds for summer enrollment—can help students decrease time to completion. Congress should move to establish Pell Grants as an entitlement, which would further secure the program's funding and help students and their families more accurately plan for college. Efforts to reduce the complexity and burden on students and families when applying for federal aid should also continue. Initiatives such as Prior-Prior Year—which allows students and families to complete their FAFSAs earlier in the year using tax information from two years ago—and proposals to simplify the FAFSA itself are steps in the right direction. State policymakers, who bear the primary responsibility for funding higher education institutions, should provide colleges and universities with the funding levels needed to offer high-quality and affordable education for their students. Additionally, states should prioritize need-based grant programs as one of the most effective means to increase college access and degree completion.

Colleges and universities should conduct reviews of their financial aid and counseling systems in order to make sure they are best serving an increasingly diverse student body. Financial aid counseling should be made available to students in the evenings and on weekends, educational materials and services should be provided in multiple languages, and community and admissions outreach programs should include information on financial aid. Special financial aid materials and counseling should also be made available to students who are planning to transfer, including information on institutional aid available at four-year institutions. Beyond counseling, colleges should consider ways to integrate financial aid applications into the admissions process to increase aid application rates. Finally, institutional grant aid, including micro and emergency grants, can be an effective tool in preventing dropout and should be a focus for community colleges. For many students, a $100 car repair bill or an unexpected medical bill can be the difference between continuing their education and dropping out.

4 Reexamine academic advising programs to ensure that they are serving the needs of community college students.

The decisions students make when first enrolling in college often have a lasting impact on their later academic success. Our findings show students who enroll full-time, declare a program of study, who earn stronger grades, and who are actively involved on campus transfer to a four-year institution at higher rates. Previous research supports these findings (Crosta 2013; Jenkins and Cho 2012; Juszkiewicz 2016; Pascarella and Terenzini 2005; Rosenbaum, Deil-Amen, and Person 2006). However, academic advising, which can play an important role in helping students achieve many of these goals, was found to be an insignificant predictor of upward transfer in our analysis.

Education researchers have long explored the connections between academic advising and student success. Some have suggested academic advising plays a significant role in redirecting students out of general education programs and transfer pathways and into certificate and workforce education programs (Clark 1960; Rosenbaum 2001). Further research has found that institutional structures and policies at the community college level often passively discourage students who aspire to earn bachelor's degrees (Deil-Amen and Rosenbaum 2002; Rosenbaum, Deil-Amen, and Person 2006). Still others have found limited support for the so called "cooling-out" effect, and suggest strategic academic advising and interventions boost transfer and completion rates (Bahr 2008). These findings suggest the need to reexamine community college advising and consider new approaches in order to better serve students with baccalaureate aspirations.

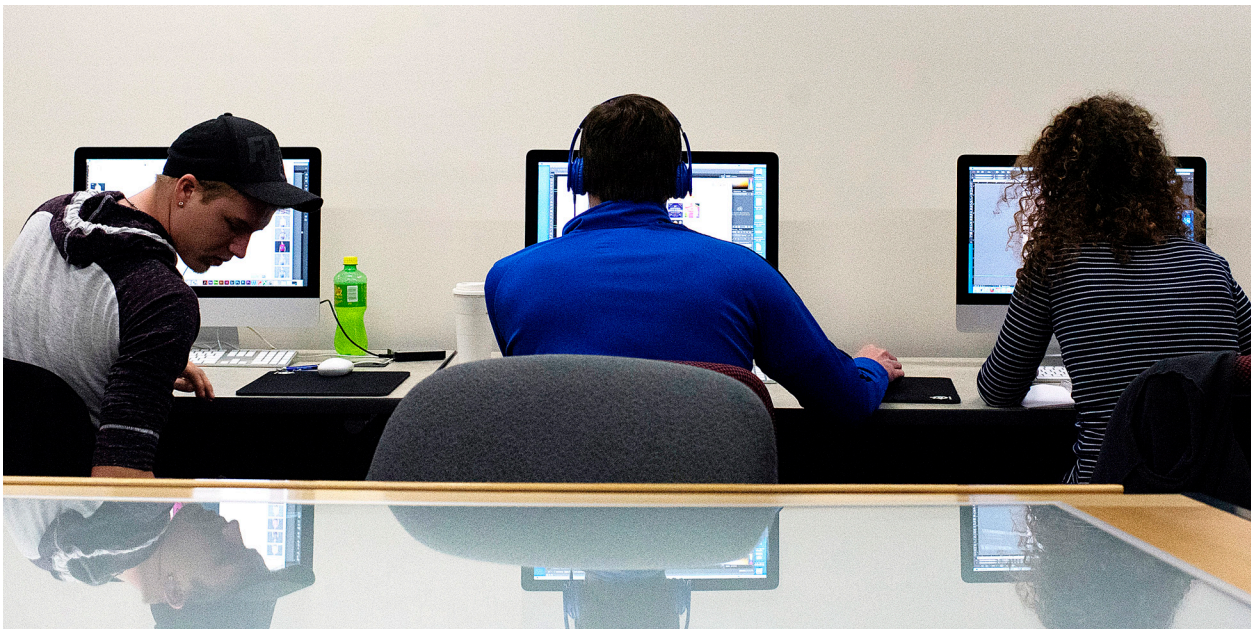
Community colleges should critically review their academic advising programs in order to make sure that they are truly student-centered. Quality academic advising is more than just helping students understand the mechanics of enrollment and transfer. As a developmental process, effective advising helps students identify and explore how their interests and skills align with specific academic programs and potential occupations as well as how to navigate the complex college environment. For example, community colleges can require students to attend advising sessions prior to enrolling in courses each term. Online advising resources or e-advising can help streamline advising costs, expand the capacity of academic advisers, and better reach students whose schedules make attending in-person advising sessions

difficult. Furthermore, more community colleges should consider adopting the guided pathways model. Guided pathways present "courses in the context of highly structured, educationally coherent program maps that align with students' goals for careers and further education" (Bailey, Jaggars, and Jenkins 2015, p.1). Guided pathways can help students more quickly select a program of study and more clearly understand the steps required in meeting their educational goals. Four-year institutions should also review their admissions and academic advising programs to ensure that they are equipped to meet the needs of transfer students. Finally, both the preparation and continued professional development of college advisers should be informed by research from the fields of human and college student development.

5 Reduce barriers to transfer by developing comprehensive transfer and articulation policies.

During the 2013–14 academic year, 46 percent of all bachelor's degrees awarded went to students who were previously enrolled in a community college (National Student Clearinghouse 2015). Transfer and articulation policies aim to help students and institutions evaluate and apply credit earned at one college or university to another. If effective, these policies simplify the transfer process and boost credential completion by helping students minimize the loss of credit when moving across institutions. In reviewing transfer and articulation policies in all 50 states, the Education Commission of the States (ECS) identified four key statewide approaches to supporting transfer: (1) a transferable core of lower-division courses, (2) a common course numbering system, (3) guaranteed transfer of an associate degree, and (4) reverse transfer (Anderson 2016).

A transferable core of lower-division courses refers to a set of general education courses that are recognized and agreed upon by all public postsecondary institutions within a state. While individual courses may be named and numbered differently at each institution, all public colleges and universities agree to accept a core set of general education courses offered by one another. Taking it a step further, statewide common course numbering systems require institutions to use the same numbering system for all lower-division, general education courses. This helps students more easily see which courses will be accepted by their transfer institution and reduces the effort institutions must make to evaluate incoming



credit. Next, the guaranteed transfer of an associate degree allows students to transfer into a four-year institution with junior-level standing and with the guarantee that no additional general education courses will be required. All three of these policies attempt to limit degree program credit loss—when receiving institutions accept courses as elective credit rather than as credit that meets degree program requirements (Hodara et al. 2016). Finally, reverse transfer policies allow institutions to retroactively grant associate degrees to students who did not earn an associate degree prior to transferring to a four-year institution, but have completed enough credit to qualify for the degree.

State policymakers and higher education systems should continue to work together in order to create and promote clear transfer policies. Community colleges should actively work to promote a better understanding of transfer and articulation policies to both current and prospective students. Four-year colleges and universities should work to establish a transfer-oriented culture that recognizes the unique value transfer students bring to the campus community, as well as support in aiding students making the transition. Finally, and in partnership with four-year institutions, community colleges should explore additional programs—in both academic and student support—that help students prepare for transfer. This may include offering seminars prior to transfer on how to best acclimate to a four-year institution, providing early access to an academic adviser or transfer coordinator from the receiving institution, and building interactive websites and social media tools that provide easy to understand information about transfer and admissions policies.

Conclusion

According to Georgetown's Center on Education and the Workforce, by 2020 65 percent of all jobs in the U.S. economy will require some level of postsecondary education. Breaking this figure down by educational attainment reveals 35 percent of all job openings will require at least a bachelor's degree (Carnevale, Smith, and Strohl 2013). Each year, community colleges play a vital role in helping millions of students make progress towards a bachelor's degree. As the demographics of the nation continue to change, education systems must be prepared to adapt to the needs of an increasingly diverse student body. Our research has identified key factors that influence community college students' likelihood of transferring to a four-year institution. Our analysis, in conjunction with the findings from previous research, suggest a need to reexamine high school curricula, college and career counseling, academic advising, financial aid, and transfer and articulation policies in order to increase rates of upward transfer for those seeking baccalaureate and higher degrees. Educators and policymakers at all levels have roles to play in order to ensure that students have the greatest chances of achieving their educational goals.

IV. Additional Resources

Additional Resources

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A Level
Pure Mathematics

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VI. Appendix: Methods

Appendix: Methods

Data for this study came from the Education Longitudinal Study of 2002 (ELS), a nationally representative study of 10th grade students in 2002. The sample was generated by randomly selecting 10th grade students from more than 700 randomly selected high schools across the United States, generating an initial sample of approximately 16,200[1] students. In addition to the original baseline data collected in 2002, data were collected in 2004, 2006, 2012, and postsecondary transcript data were collected in 2014. While it is important to note that this data is not a representative sample of community college students, ELS provides the most recent and complete data for researchers interested in exploring the connections between high school and other pre-college factors and postsecondary persistence and degree completion.

Our sample was created by first identifying and removing the 4,570 students without a postsecondary transcript record. We then restricted the sample to students whose first postsecondary institution was classified as a public or private not-for-profit two-year institution. In our study, an institution was classified as being two-year if the highest degree awarded offered by that institution was an associate degree. We defined a student's first institution in such a way to exclude dual enrollment institutions or institutions students were enrolled in while still in high school. This yielded a sample of 4,190 students. Drawing from previous literature, we constructed a list of variables with which to test their influence on upward transfer. Students with missing data on any of the selected covariates were then dropped from our final model[2]. This yielded a final sample of 1,880 students (n = 1,880).

Our outcome variable, upward transfer, was constructed by examining postsecondary transcript records to identify all institutions the students attended. Because of the potential moderating effects and limitations of the data collected through ELS, we limited our exploration of upward transfer to students' first two institutions. Again, all members of our sample upon leaving high school enrolled first in a two-year college. Upward transfer was coded as having occurred if a student left that institution and subsequently enrolled in a four-year institution. Four-year institutions were defined as those that offered a bachelor's degree or

1 Per National Center for Education Statistics guidelines, unweighted sample sizes and frequencies are rounded to the nearest 10.

2 Dropping cases with missing data may unintentionally bias the results of any model. Future studies should consider imputation methods to include cases with missing data.

higher. Based on the research literature, a series of demographic, behavioral, academic, and institutional independent variables were selected. Table A1 provides the descriptive statistics for the dependent variable and all independent variables included in the analysis.

Because the dependent variable was categorical, we relied upon logistic regression techniques to estimate the log-odds of upward transfer. In order to build a comprehensive model, we included both individual and institutional-level covariates. However, students, our unit of analysis, are nested within high schools. Because of the nested structure of the sample, the independence of observations assumption underlying basic regression-based modeling is violated. In other words, students in one high school are more likely to be similar to one another, than to students in another high school. To overcome this issue and to ensure more accurate parameter estimates, we employed a multilevel model (MLM). Using a two-level random-intercept MLM we were able to simultaneously estimate individual and high school institutional effects on upward transfer.

We began our analysis, by estimating a model with no predictor variables, also known as the null model. Equation 1 presents the null model,

$$Y_{ij} = \beta_0 + r_{ij}$$

where Y_{ij} is the dependent variable (log odds of upward transfer), β_0 is the intercept or average log odds of upward transfer for students from high school *j*, and r_{ij} is the deviation from the mean for students *ij*. The result of the null model was used to estimate the proportion of variance that was accounted for between and within individual groups of students nested in high schools. Our analysis revealed that the proportion of the variance explained at the high school level was approximately 7 percent. We then proceeded to estimate a two-level MLM to account for the nested structure of the data.

Next, we estimated the level-1 or individual-level model. The level-1 model included the academic, demographic, and social/behavioral independent variables of interest (see Table A1 for the descriptive statistics). The full level-1 model can be expressed as,

$$\begin{aligned} Y_{ij} = {} & \beta_0 + \beta_1 (\textit{Dual Enrollment}) + \beta_2 (\textit{AP/IB English Credits}) \\ & + \beta_3 (\textit{Reading Test Score}) + \beta_4 (\textit{Math Improvement Score}) \\ & + \beta_5 (\textit{High School Absences}) + \beta_6 (\textit{High School Behavioral Troubles}) \\ & + \beta_7 (\textit{High School Awards}) + \beta_8 (\textit{Enrollment Plans}) \\ & + \beta_9 (\textit{Educational Aspirations}) + \beta_{10} (\textit{College Entrance Exam}) \end{aligned}$$

$$+ \beta_{11} (\text{Entry Time}) + \beta_{12} (\text{Claimed Major}) + \beta_{13} (\text{Enrollment Intensity})$$
$$+ \beta_{14} (\text{Academic Advising}) + \beta_{15} (\text{Developmental Courses})$$
$$+ \beta_{16} (\text{College GPA}) + \beta_{17} (\text{Extracurricular Participation})$$
$$+ \beta_{18} (\text{On Campus Housing}) + \beta_{19} (\text{Pell Grant})$$
$$+ \beta_{20} (\text{Federal Student Loan}) + \beta_{21} (\text{Gender}) + \beta_{22} (\text{Race})$$
$$+ \beta_{23} (\text{Socioeconomic Status}) + \beta_{24} (\text{Urbanicity}) + r_{ij}$$

where the Y_{ij} (the log odds of upward transfer) is calculated as the deviation from β_0 (the average log odds of upward transfer) based on the effect of the independent variables $(\beta_1 - \beta_{24})$, and an error term (r_{ij}).

We assumed that differences in high school resources impact the quality and rigor of education students receive prior to college. Therefore, we added three high school, institutional-level variables to the level-2 or random effects portion of the model. Again, the level-2 equation is estimated simultaneously in order to allow the intercept (average log odds of upward transfer) to vary, therefore partitioning the variance between the institution/high school and the student. This reduces the chances of committing a Type I error.

The level-2 model can be expressed as,

$$\beta_0 = \gamma_{00} + \gamma_{01} (\text{\% Free Lunch}) + \gamma_{02} (\text{HS Control}) + \gamma_{03} (\text{Availability of AP/IB Courses}) + u_{0j}$$

where the average log odds of upward transfer (β_0) is calculated from high school institutional-level deviations $(\gamma_{01}, \gamma_{02}, \gamma_{03})$ from the average log odds of upward transfer (γ_{00}), and error (u_{0j}). The level-1, or fixed effects, served as the findings of our study and were presented as odds-ratios to ease interpretation. Odds-ratios represent the odds that the outcome will occur given a particular condition, compared to the odds of the outcome occurring in the absence of that condition. Therefore, the findings of our model and presented in this brief should be interpreted as how the odds of upward transfer change given a one unit change in an independent variable, holding all other independent variables in the model constant. Table A2 presents the level-1 or fixed effects estimates discussed in the findings section of this brief.

Finally, it is important to note that the results of our model suggest correlation between factors and upward transfer and do not necessarily imply causation. Additional experimental and quasi-experimental studies will be needed in order to more accurately isolate the causal effects particular factors have on upward transfer.

Table A1. *Descriptive Statistics*

Descriptive Statistics, n = 1,880	Percentage/Mean	(S.D.)
Upward Transfer		
Transferred	39.2%	
Did Not Transfer	60.8%	
Dual Enrollment		
Yes	19.3%	
No	80.7%	
AP/IB English Credits	**0.1**	**(0.4)**
Reading Test Score	**50.2**	**(8.7)**
Math Improvement Score	**-1.1**	**(4.6)**
High School Absences		
Never	17.4%	
1–2 Times	37.9%	
3–6 Times	32.7%	
7–9 Times	7.0%	
10 or More Times	5.0%	
High School Behavioral Troubles		
Never	59.7%	
1–2 Times	29.8%	
3–6 Times	7.1%	
7–9 Times	1.7%	
10 or More Times	1.7%	
High School Awards		
0 Awards	42.3%	
1 Award	26.4%	
2 Awards	22.8%	
3 Awards	8.6%	
Enrollment Plans		
Yes	86.9%	
No	13.1%	
Educational Aspirations		
High School Diploma or Less	9.2%	
Some College	23.1%	
Bachelor's Degree	39.1%	
Graduate Degree	28.7%	
College Entrance Exam		
Yes	75.0%	
No	25.0%	
Entry Time		
Within Three Months	77.9%	
Longer than Three Months	22.1%	

Table A1. *Descriptive Statistics, cont'd.*

Descriptive Statistics, n = 1,880	Percentage/Mean	(S.D.)
Claimed Major		
Yes	51.8%	
No	48.2%	
Enrollment Intensity		
Full-Time	78.3%	
Mixed-Time	9.3%	
Part-Time	12.5%	
Academic Advising		
Never	24.0%	
Sometimes	55.7%	
Often	20.3%	
Developmental Education		
Yes	52.8%	
No	47.2%	
College GPA	**2.4**	**(1.0)**
Extracurricular Participation		
Never	64.8%	
Sometimes	22.8%	
Often	12.5%	
On-Campus Housing		
On-Campus Housing	11.7%	
Off-Campus/At-Home	88.3%	
Pell Grant		
Yes	41.7%	
No	58.3%	
Federal Student Loan		
Yes	36.6%	
No	63.4%	
Gender		
Male	46.2%	
Female	53.8%	
Race		
White	61.2%	
Asian	10.1%	
Black	9.2%	
Hispanic	15.2%	
Other	4.4%	
Socioeconomic Status	**0.0**	**(0.7)**
Urbanicity		
Urban	26.5%	
Suburban	51.9%	
Rural	21.6%	

Table A2. *Results from the Fixed Effects Portion of the Model*

Descriptive Statistics, n = 1,880	Odds Ratio	S.E.	P-value	Coefficient	S.E.
Dual Enrollment	**2.48*** **	**0.59**	**0.00**	**0.91*** **	**0.22**
AP/IB English Credits	**1.63***	**0.41**	**0.05**	**0.49***	**0.25**
Reading Test Score	**1.04*** **	**0.01**	**0.00**	**0.04*** **	**0.01**
Math Improvement Score	**1.01**	**0.02**	**0.47**	**0.01**	**0.02**
High School Absences					
1–2 Times	0.86	0.20	0.51	-0.15	0.23
3–6 Times	0.83	0.19	0.42	-0.19	0.23
7–9 Times	0.90	0.32	0.76	-0.11	0.35
10 or More Times	1.15	0.47	0.73	0.14	0.41
High School Behavioral Troubles					
1–2 Times	0.60**	0.11	0.00	-0.51**	0.18
3–6 Times	0.55*	0.17	0.05	-0.60*	0.31
7–9 Times	1.89	1.03	0.24	0.64	0.55
10 or More Times	0.49	0.30	0.25	-0.71	0.61
High School Awards					
1 Award	0.85	0.16	0.40	-0.16	0.19
2 Awards	0.66*	0.14	0.05	-0.42*	0.22
3 Awards	0.99	0.31	0.98	-0.01	0.32
Enrollment Plans	**1.74***	**0.48**	**0.05**	**0.56***	**0.28**
Educational Aspirations					
Some College	0.39**	0.13	0.01	-0.95**	0.34
Bachelor's Degree	1.35	0.42	0.33	0.30	0.31
Graduate Degree	1.94*	0.62	0.04	0.66*	0.32
College Entrance Exams	**3.07*** **	**0.69**	**0.00**	**1.12*** **	**0.23**
Entry Time	**0.57** **	**0.12**	**0.01**	**-0.57** **	**0.21**
Claimed Major	**1.53** **	**0.25**	**0.01**	**0.43** **	**0.16**
Enrollment Intensity					
Mixed-Time	0.37***	0.11	0.00	-1.00***	0.29
Part-Time	0.66	0.18	0.12	-0.42	0.27
Academic Advising					
Sometimes	0.86	0.17	0.45	-0.15	0.20
Often	1.26	0.31	0.34	0.23	0.25
Developmental Education	**0.94**	**0.16**	**0.71**	**-0.06**	**0.17**
College GPA	**2.12*** **	**0.21**	**0.00**	**0.75*** **	**0.10**
Extracurricular Participation					
Sometimes	1.39+	0.26	0.08	0.33+	0.19
Often	2.07**	0.52	0.00	0.73**	0.25
On-Campus Housing	**1.59+**	**0.45**	**0.10**	**0.46+**	**0.28**
Pell Grant	**0.72+**	**0.13**	**0.06**	**-0.33+**	**0.18**

Table A2. *Results from the Fixed Effects Portion of the Model, cont'd.*

Descriptive Statistics, n = 1,880	Odds Ratio	S.E.	P-value	Coefficient	S.E.
Federal Student Loan	**4.56*** **	**0.79**	**0.00**	**1.52*** **	**0.17**
Gender	**0.68***	**0.11**	**0.02**	**-0.38***	**0.16**
Race					
Asian	1.56	0.48	0.15	0.45	0.31
Black	1.37	0.45	0.33	0.32	0.33
Hispanic	1.65+	0.46	0.07	0.50+	0.28
Other	0.90	0.34	0.78	-0.11	0.38
Socioeconomic Status	**1.47** **	**0.20**	**0.00**	**0.38** **	**0.14**
Urbanicity					
Suburban	0.54*	0.16	0.04	-0.62*	0.29
Rural	0.56	0.22	0.14	-0.57	0.38
Constant	**0.00*** **	**0.00**	**0.00**	**-5.73*** **	**0.78**

+p < .10 *p < .05 **p < .01 ***p < .001

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