

**MAKING THE TRANSITION TO FOUR-YEAR INSTITUTIONS:
ACADEMIC PREPARATION AND TRANSFER**

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Abstract

In this study, we examine the role of academic preparation in the transition from community colleges to four-year institutions. We address two specific questions: To what extent do academically unprepared students transfer to four-year institutions? And, can positive experiences in community colleges diminish the role of inadequate academic preparation? The results, which are based on analyses of Florida's unit record data of first-time community college students, indicate that a substantial proportion of students who enter community colleges academically unprepared do indeed transfer to four-year institutions. Moreover, successful completion of intermediate outcomes — such as passing college-level math and writing courses, meeting specific credit thresholds, and earning an associate degree — enhances students' probability of transfer. However, the ability of community colleges to mitigate the negative effects of inadequate academic preparation is limited: successful completion of even the most demanding intermediate outcomes does not alleviate the negative consequences of entering higher education unprepared. The policy implications of these findings are discussed.

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Introduction

Community colleges originated as transfer institutions, providing the first two years of college education and preparing students for transition to four-year institutions. Although they have adopted a growing number of missions over the course of the 20th century, community colleges continue to serve as an avenue of access to four-year institutions. The success of community colleges in fulfilling the transfer mission has been amply debated in previous literature (for reviews see Bailey & Morest, 2004; Dougherty, 1991, 2001). One particularly salient issue in this debate is academic preparation. Previous studies indicate that students who enroll in community colleges are not always well prepared academically (National Center for Education Statistics [NCES], 1998, 2003a, 2003b). The question thus becomes not only whether community colleges can facilitate transfer but whether they can serve as a pathway to four-year institutions for academically unprepared students.

Although virtually all studies of transfer control for academic preparation, there is a dearth of research focusing on whether and how academically unprepared students can catch up in higher education. We consider the plight of academically unprepared students by using Florida's unit record data of first-time community college students. We examine the probability that students who enter community college academically unprepared go on to transfer to four-year institutions. Moreover, we explore the extent to which successful completion of intermediate outcomes, such as passing college-level math and writing courses, meeting specific credit thresholds, and earning an associate degree, diminishes the role of initial preparation and increases the probability of transfer.

The results suggest that, indeed, a substantial proportion of students who enter community colleges without adequate academic preparation do transfer to four-year institutions. Moreover, successful completion of intermediate outcomes is related to an increase in the probability of transfer. However, successful completion of intermediate outcomes does not alleviate the negative consequences of entering higher education unprepared. Even when academically unprepared students complete the most demanding intermediate outcome (the Associate of Arts degree), they continue to lag behind their academically prepared peers in transfer to four-year institutions. Thus, while community colleges can serve as a democratizing force, their ability to overcome the poor academic preparation with which some students enter higher education is limited.

These findings not only provide a better understanding of students' educational trajectories but also have important policy implications. The extent to which students in higher education can compensate for inadequate preparation in high school helps to illuminate the likelihood of success of different policy solutions aimed at improving educational attainment. If students can catch up, then investing extra resources in information, counseling, developmental education, and other forms of support in community colleges may be effective. If they cannot catch up, then it is crucial that students be adequately prepared before they enter community colleges. The results of this study shed light on the extent to which policymakers can count on the effectiveness of either of these approaches. This may assist future decision-making aimed at facilitating the transition of students from community colleges to four-year institutions.

Transfer from Community Colleges to Four-Year Institutions

Transfer has always been an important component of community college education. Although most modern community colleges have comprehensive missions, performing numerous functions from terminal vocational education to community service (Cohen & Brawer, 1996), they are still committed to their original mission of preparing students for transfer to four-year institutions. Approximately two thirds of community college students express a desire to transfer to four-year institutions (Lee & Frank, 1990; NCES, 2001, 2003a; Roksa, 2006). The proportion of students who actually do transfer is highly contentious and varies depending on the definition used. Transfer rates can range from a low of 25 percent for all first-time community college students to a high of 52 percent for students who enroll in an academic major and take courses toward a bachelor's degree (NCES, 2001; see also Spicer & Armstrong, 1996).

Transfer between community colleges and four-year institutions has been a subject of many research studies and policy debates. A number of scholars have noted that most community college students who say that they expect to transfer do not actually make the transition to four-year institutions (e.g., Brint & Karabel, 1989; Cohen, 1994; Grubb, 1991; Lee & Frank, 1990; Surette, 2001). Moreover, previous research suggests that baccalaureate degree attainment is hindered by starting in community college as opposed to starting in four-year institutions, even when comparing students who are similar in many background and academic

characteristics (e.g., Alfonso, 2006; Dougherty, 1992; Monk-Turner, 1995; Whitaker & Pascarella, 1994). Based largely on descriptive statistics, some studies suggest that once community college students transfer to four-year institutions, they complete bachelor's degrees at similar rates as their counterparts in four-year institutions (Adelman, 1999, 2005; Melguizo & Dowd, 2006). Although additional studies of baccalaureate completion are needed, current research indicates that transfer presents a critical juncture in the educational attainment of community college students who aspire to a bachelor's degree.

Explanations for the relatively low transfer rates have developed along two lines, one institutional and the other individual. Building on Clark's seminal critique of community colleges (1960), Brint and Karabel (1989) have highlighted the extent to which transfer is hindered by the location of community colleges in the hierarchy of higher education. Broadening this argument, Dougherty (2001) has demonstrated that not only institutional but also political forces can create structural disjunctions between community colleges and four-year institutions. Many states have attempted to weaken some of the structural barriers to transfer by mandating articulation policies between the two segments of higher education (for a review see Roksa, 2007).

The other line of research regarding transfer has focused on examining the effects of individual characteristics. Numerous studies have explored the extent to which specific student attributes either facilitate or hinder the transition to four-year institutions. Although there is some variation in results depending on the specific models examined, there is substantial consistency across studies in factors that affect transfer (see, e.g., Anderson, Sun, & Alfonso, 2006; Bailey, 2004; Dougherty & Kienzl, 2006; Lee & Frank, 1990; Palmer, 1991; Roksa, 2006, 2007; Surette, 2001). In general, students who come from more privileged family backgrounds, who expect to earn bachelor's degrees, or who are better prepared academically are more likely to make the transition to four-year institutions. In contrast, students who delay enrollment, who interrupt enrollment, who have low GPAs in community college, or who have children have a lower likelihood of transfer.

Virtually all studies of transfer make use of some measure of academic preparation, whether it be simply a 12th grade test score or a more comprehensive measure of high school curriculum. Although there is much variation across students, many community college students are not well prepared academically, and they are less well prepared than their counterparts in four-year institutions (Bailey, 2004; Lee & Frank, 1990; Monk-Turner, 1995; NCES, 1998;

2003a, 2003b). For example, a report from the National Center for Education Statistics [NCES] (2003a) notes that of the 1992 high school graduates who entered community colleges, 44 percent were at or below the lowest level of reading proficiency, and 30 percent were at or below the lowest level in math proficiency.¹ A third of the students did not complete even the basic high school curriculum, and two thirds were deemed either not qualified or minimally qualified to attend a four-year college.

As would be expected, academic preparation is an important predictor of educational success. Community college students who are less well prepared academically are less likely to experience successful outcomes in higher education, including the completion of credentials and/or transfer to a four-year institution (Bailey, 2004; Calcagno, Crosta, Bailey, & Jenkins, 2007; Dougherty & Kienzl, 2006; Lee & Frank, 1990; NCES, 2003a; Palmer, 1991; Roksa, 2006; Surette, 2001). Earning an associate degree, transferring to a four-year institution, and earning a bachelor's degree are all related to academic preparation in predictable ways: students who complete a basic high school curriculum, who have greater math and reading proficiency, and who are overall deemed academically qualified to attend four-year institutions are more likely to succeed in attaining any of those outcomes (NCES, 2003a). While undeniably important, academic preparation has been largely used as a control variable. Thus, while it is clear that academic preparation is associated with transfer, there is little evidence of the extent to which less academically well prepared students can transfer to four-year institutions. Previous research has also not examined whether specific events occurring while students are in community colleges can help compensate for their poor academic preparation at the point of entry into higher education.

¹ Reported percentages refer to students who were at or below Level 1 of reading and math proficiency. Reading proficiency is divided into three levels. Level 1: simple reading comprehension including reproduction of detail and/or the author's main thought. Level 2: Ability to make relatively simple inferences beyond the author's main thought and/or understand and evaluate relatively abstract concepts. Level 3: Ability to make complex inferences or evaluate judgments that require piecing together multiple sources of information from the passage. Math proficiency is divided into five levels, ranging from simple arithmetical operations on whole numbers (Level 1) to proficiency in solving complex, multistep word problems and/or the ability to demonstrate knowledge of the material found in advanced mathematics courses. For more information on these classifications, see NCES (1995).

The Present Study

We begin this study by estimating the average gap in transfer rates between academically prepared and unprepared students. We then explore whether successful completion of intermediate outcomes can help students compensate for the initial disadvantage associated with inadequate academic preparation. We define intermediate outcomes as passing college-level math and writing courses, meeting specific credit thresholds, and earning an associate degree. We consider these outcomes because previous research demonstrates that completion of these intermediate steps increases the probability of overall educational success. McCormick (1999) proposed that credit accumulation provides a basic measure of progress through postsecondary education and showed that four-year students who completed a certain number of credits in the first year were much more likely to accumulate more credits overall, as well as complete their degrees (see also Adelman, 1999). Earning credits has been perceived as so important to degree attainment that some analysts exclude students who do not earn a certain number of credits from their models. Adelman (2003, 2005, 2006), for example, defines students who have earned less than 10 credits as “incidental” and removes them from his analyses of attainment. These students are considered not adequately committed to earning postsecondary degrees to warrant inclusion in analyses. Indeed, exclusion of students below a certain credit threshold is a common practice in estimating transfer rates, which we discuss in more detail in the section on data and methods.

In addition to credit accumulation, some scholars have noted that passing gatekeeper classes, such as remedial and initial college-level courses, can substantially increase the probability of earning educational credentials (Adelman, 2006; Bailey & Alfonso, 2005). Examining the educational attainment of community college students, Calcagno and his colleagues (2007) showed that passing the first college-level writing and math courses is related to students’ likelihood of completion (including completion of both degrees and certificates). Successfully passing these initial courses thus seems to have consequences for eventual educational attainment.

In the context of transfer from community colleges to four-year institutions, another important intermediate outcome is earning an associate degree. Associate of Arts (AA) degrees are usually the only credentials included in statewide articulation policies and thus serve as an established pathway to four-year institutions (Ignash & Townsend, 2000, 2001). The importance of AA degrees for transfer is particularly pronounced in Florida, where we base our analyses.

While nationally only one third of transfer students have associate degrees,² in Florida over two thirds of students earn AA degrees before transferring to the four-year system (Florida Department of Education, 2003; Florida Postsecondary Education Planning Commission, 1999). Due to state-mandated articulation policies by which community college students who complete AA degrees are guaranteed admission to the four-year system as juniors, students have strong incentives to earn AA degrees before transfer. Thus, in the context of Florida, earning an AA degree is a crucial step in gaining access to four-year institutions.

While previous research has demonstrated that completion of intermediate outcomes influences student success, scholars have yet to examine the relationship between these intermediate outcomes and academic preparation. In particular, previous research has not examined the extent to which successful completion of intermediate outcomes can help compensate for inadequate academic preparation or how they can be particularly beneficial for students who enter community colleges academically unprepared. We examine these possibilities by utilizing data on first-time community college students in Florida. We use event history modeling, which is specifically designed to study the occurrence and timing of events (Allison, 1984; Singer & Willett, 2003), and is thus appropriate to examining the dynamic nature of students' passage through higher education (DesJardins, 2003). Although not common in the literature on community colleges in general or transfer in particular, this methodology allows us to dynamically measure the impacts of intermediate outcomes on transfer, better approximating the reality of complex and varied trajectories that occur in student progression through higher education.

It is important to note that we are not concerned specifically with remedial education in this study. Low academic preparation is often linked to remedial education, and much research has been conducted to examine the effects of remedial education on educational outcomes (for reviews see Goldrick-Rab, 2007; Levin & Calcagno, 2007; Schwartz & Jenkins, 2007). Although researchers sometimes use remedial education as a proxy for low academic preparation, this tends to confuse two different issues: 1) students who are not prepared, and 2) students who are receiving a particular treatment to remedy their lack of preparation. What we explore in this study is the extent to which academically unprepared students can make the transition to four-year institutions, and in particular the extent to which completing certain intermediate outcomes plays a role in this process. Remedial education is one common institutional response to the

² Authors' calculations based on the National Education Longitudinal Study (NELS 1988-2000).

overall lack of academic preparation, and, to the extent that it facilitates students' transitions through the community college curriculum, it may be an effective strategy for improving educational attainment. But examining institutional responses and ways in which they can encourage students to advance along the road to transfer is beyond the scope of this study. It remains an important area for future research, however, which we highlight in the conclusion.

Data

In this study, we use unit record transcript data for 37,623 first-time, degree-seeking Florida community college students who enrolled in a college-credit course at one of Florida's 28 community colleges in the fall of 1998.³ Student enrollment is tracked through the summer of 2003 (for a total of 15 terms, which includes fall, spring, and summer terms). The dataset includes demographic characteristics and college placement test scores, as well as detailed information on enrollment, coursework, and outcomes (e.g., degree completion, transfer, etc.) for each term.

Due to our focus on transfer, we restricted the sample to students who completed at least 12 non-remedial credits. It is recommended that a certain threshold of credits be employed in the assessment of transfer (e.g., Clagett & Huntington, 1992; Spicer & Armstrong, 1996). Establishing a credit threshold eliminates incidental students who enroll for a limited number of courses only and who do not intend to transfer or earn a degree. These students are not likely candidates for transfer, so including them would substantially bias transfer estimates. While Adelman (2003, 2005) used 10 credits as the threshold for inclusion in his sample, studies specifically focusing on transfer, such as the Transfer Assembly Project, have restricted the estimation of transfer to students who have earned 12 or more credits (Cohen, 1994, 1996). Using this latter restriction reduces our sample to 24,572 students. We then excluded those cases with missing information for independent variables (3,388 cases were deleted due to missing test score data and another 284 due to missing high school diploma information), which produced the final sample of 20,900 students with complete records.

³ The sample does not include students who were formerly in dual high school-college enrollment programs.

It is important to note that the sample is not restricted to students who expected to earn a bachelor's degree. The administrative data employed in this study do not provide information on long-term educational expectations. Moreover, educational expectations tend to shift over time and are not entirely reliable (see Bailey, Leinbach, & Jenkins, 2006). For example, almost 20 percent of traditional-age students in the National Education Longitudinal Study sample who transferred to four-year institutions did not have an expectation of earning a bachelor's degree.⁴ Restricting the sample to students who expected to earn a bachelor's degree would have missed such students. Moreover, the current restrictions employed in this study (degree seeking, earned 12 or more credits) create a sample that represents a reasonable risk set for students who may wish to transfer. Indeed, an NCES report (2001) comparing transfer rates across different groups of students notes that transfer rates for students expecting to earn a bachelor's degree were remarkably similar to those for students enrolled in degree-granting programs who completed 12 or more credits.

Variables

The dependent variable examined in this study is transfer to a four-year institution in the Florida higher education system. As noted above, the sample includes first-time, degree-seeking⁵ students who have completed at least 12 credits in community colleges. When estimating transfer rates, previous research also frequently restricts the amount of time students have to transfer. For example, the Transfer Assembly Project considers whether students transferred within four years of enrollment in community college. Although it is likely that some students will transfer after this time period, the likelihood of transfer decreases precipitously over time. NCES (1997) reports that among transfers, students spent on average 20 months in a community college. And in a sample of traditional-age community college students, the average time to transfer was slightly over 3 years, with 80 percent of students transferring within 4 years of entering community college.⁶ The data in our study includes information on 15 terms (or 5 years), which should thus capture the majority of students who transfer from community colleges to four-year institutions.

⁴ Authors' calculations based on the National Education Longitudinal Study (NELS 1988-2000).

⁵ A student is considered degree-seeking if the college deems her to be studying in any of the following programs: Associate in Arts Degree, Associate in Science Degree, Vocational Certificate, General Freshman, Linkage (programs in more than one school), Associate in Science Certificate, Associate in Applied Science Degree, Applied Technology Diploma, or Advanced Technical Certificate.

⁶ Authors' calculations based on the National Education Longitudinal Study (NELS 1988-2000).

Our analyses include two sets of key independent variables: academic preparation and intermediate outcomes. The first key variable is a dummy variable indicating whether a student is academically prepared for college-level work. We define academic preparedness using Florida State Board of Education guidelines. According to these guidelines, students who score below a certain cutoff point are deemed to be not academically prepared for college-level work. The thresholds of preparedness depend on the tests students submit for consideration: the SAT threshold is 420 for verbal and 440 for math;⁷ the College Placement Test (CPT) threshold is 83 for verbal and 72 for math. Our category of “academically unprepared” students includes those who have fallen below the threshold on both reading and math. This category includes almost one third (28 percent) of our sample. Academically unprepared students scored on average 346 in math and 371 in reading/writing, which is significantly below the average for the whole sample, $p < 0.01$ (422 for math and 465 for verbal).⁸

The second set of key independent variables refers to intermediate outcomes that were identified in previous research as important stepping stones in progression toward degree completion: 1) whether students passed their first college-level math and writing courses; 2) whether students met specific credit thresholds — 24, 36, or 48 credits; and 3) whether students completed an Associate of Arts degree. Students who complete these intermediate outcomes would be expected to have a higher likelihood of transfer. All of these measures are entered as time-varying indicators, which take on different values over the course of the 15 terms of enrollment. These variables “turn on” when a student reaches a given step and stay on in all periods thereafter.

Finally, all models in our study include a set of time-invariant control variables. These variables control for student demographic characteristics (age, gender, and race), background (whether students are U.S. citizens and whether they received federal aid), and educational attributes (whether students completed a high school diploma, whether they enrolled full time, and whether they took SAT/ACT entrance exams). While our dataset does not include a measure of educational expectations, we control for whether students took SAT or ACT entrance exams. In the Florida community college system, students are permitted to either report their SAT/ACT scores or take the Florida-administered CPT. However, only SAT/ACT scores are accepted in the State University System (SUS). Thus, we include dummy variables denoting students who

⁷ Starting with the fall 2000 semester, the verbal SAT threshold changed to 440.

⁸ Scores for placement tests were all converted to an SAT scale (200–800) using the test makers’ formulas.

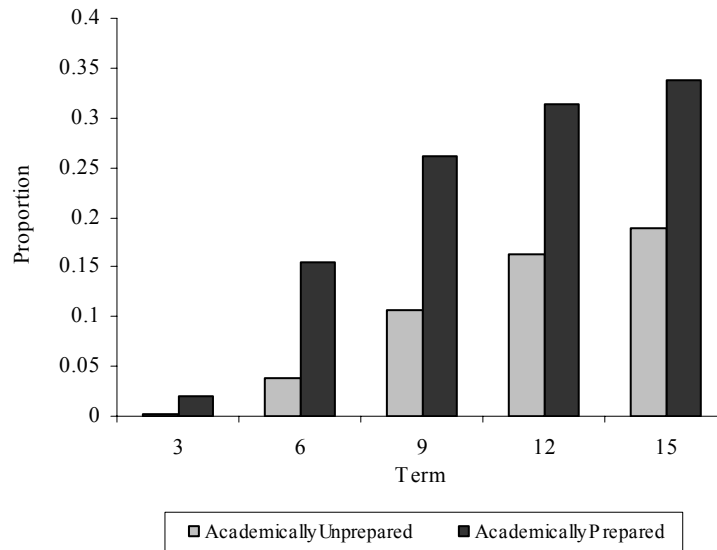
used their SAT/ACT math and verbal scores. These measures may serve as proxies of students' expectations and motivations to transfer to four-year institutions.

Descriptive Results

Transfer to Four-Year Institutions

Figure 1 reports the cumulative proportions of community college students who transferred to public four-year institutions in Florida within different time frames. Focusing on the last set of bars first, this figure presents what might be considered a notable success of academically unprepared students: almost 20 percent of students who entered community college with poor academic preparation (i.e., they were deemed not prepared for college-level work at the point of entry into community college) transferred to a four-year institution within 15 terms (5 years).⁹ However, academically unprepared students lagged behind their more academically prepared counterparts, 34 percent of whom transferred within 5 years.

Figure 1:
Proportion of Students Transferring to Four-Year Institutions



Note: All differences between academically prepared and unprepared students are significant at $p < 0.05$.

While there is a significant gap in transfer rates between students who entered community college with and without adequate academic preparation, it is possible that this

⁹ While the average transfer rates reported in this study may appear low, they are within the range of national averages (NCES, 2001; Cohen, 1994, 1996).

pattern reflects the relatively short time period examined in this study. It could be that students who enter community college with poor academic preparation take a longer time to transfer. By considering transfer within a span of 15 terms, we may be underestimating the ability of academically unprepared students to catch up with their more prepared counterparts in the transition to four-year institutions.

To consider this possibility, we examine the trend in transfer over the 15 terms of available data. Figure 1 shows that the difference in the proportion of students transferring in the first period — within 3 terms — is negligible since a very small proportion of students transfer in such a short amount of time. What is notable about the other time periods is that the gap in the proportion of students who transferred within 6, 9, 12, or 15 terms remains relatively stable: academically unprepared students transferred 12–16 percentage points less than their academically prepared counterparts.¹⁰ Thus, while considering longer time periods may increase the total proportion of students who transfer to four-year institutions, the gap in transfer between academically prepared and unprepared students is not notably altered with the passing of time. Moreover, in our sample, the proportion of students transferring increases rapidly at the beginning, and then begins to level off. The majority of students transferred in their second or third year of community college enrollment. The growth in the proportion of students transferring slows down after the 9th term and is quite small after the 12th term. These findings imply that lengthening the observation period is not likely to either substantially increase the proportion of academically unprepared students who transferred or lead to a convergence in transfer rates of the two groups of students.

Student Characteristics and Intermediate Outcomes

While academically unprepared students lagged behind their more academically prepared peers in transfer to four-year institutions, one may hypothesize that at least two sets of factors may help to explain this difference: 1) student characteristics and 2) completion of intermediate outcomes. Table 1 presents descriptive statistics for a range of student characteristics in the first term of community college enrollment.¹¹ The pattern of results indicates that the academically unprepared students tended to be more disadvantaged: they were more likely to be members of

¹⁰ All differences between academically prepared and academically unprepared students are statistically significant at $p < 0.01$.

¹¹ In Table 1, all variables are time-invariant; they are restricted to the first term of community college attendance. However, full-time enrollment is allowed to vary over time in the models.

racial minority groups and to have been from less advantaged family backgrounds (they were more likely to have received federal aid). And at the same time, they were less likely to be enrolled full time as well as less likely to have taken SAT/ACT exams. The difference in whether students took SAT/ACT exams is particularly notable, but it is not surprising since the first group of students are those who were not well prepared for college.

**Table 1:
Characteristics of Students in the First Term**

Characteristic	Academically Unprepared	Academically Prepared	Difference
Female	0.637	0.528	0.109**
Age	19.956	19.773	0.183
<i>Race/Ethnicity</i>			
Black	0.260	0.103	0.157**
Hispanic	0.256	0.178	0.078**
White	0.444	0.681	-0.237**
Other	0.040	0.038	0.002
U.S. citizen	0.823	0.887	-0.064**
<i>High School Credential</i>			
HS Diploma	0.839	0.846	-0.006
GED	0.086	0.069	0.018**
Other HS credential	0.002	0.007	-0.005**
<i>SAT/ACT Test Takers</i>			
Mathematics	0.065	0.408	-0.343**
Reading	0.060	0.411	-0.351**
Received federal aid in term 1	0.367	0.268	0.099**
Full-time term 1	0.609	0.737	-0.128**
Number of Observations	5,857	15,043	

**p < 0.01, two-tailed test, unequal variances.

In light of these differences in individual characteristics, most studies examining the likelihood of transfer control for a range of similar attributes. However, previous research has shown that even net of these controls academically unprepared students tend to have less desirable educational outcomes. For example, even after controlling for a host of individual characteristics, academic preparation (as measured by 12th grade test scores) is significantly associated with the probability of transfer (Dougherty & Kienzl, 2006; Roksa, 2006). One of the explanations may be that academically prepared and unprepared students differ not only in what they bring to college, but also in how they advance through college. Thus, in addition to

considering a common set of student characteristics, we also examine a range of intermediate outcomes capturing varying dimensions of student progress through community college.

Table 2 presents descriptive statistics for different intermediate outcomes, all of which are time-varying, reflecting the proportion of students who completed specific transitions sometime during the observation period. Although the gaps vary across these measures, the pattern is consistent: academically unprepared students were less likely to successfully complete any of the intermediate outcomes. With respect to the first college-level courses, the gap is more pronounced for math than for writing. This is notable considering that previous research suggests that math plays a crucial role in persistence and success in postsecondary education (Adelman, 1999, 2003, 2006). The gap between academically prepared and unprepared students is greatest for the most demanding transition — completion of an Associate of Arts degree. While 38 percent of academically prepared students completed an AA degree, only 21 percent of academically unprepared students completed the same intermediate outcome. Since earning an Associate of Arts degree is the main pathway to transfer in Florida, this gap in AA degree completion may be particularly consequential for understanding differences in transfer between academically prepared and unprepared students.

**Table 2:
Descriptive Statistics for Intermediate Outcomes**

Transfer and Intermediate Outcomes	Proportions by group		
	Academically Unprepared	Academically Prepared	Difference
Pass First College-Level Course			
Mathematics	0.345	0.455	-0.110**
Writing	0.848	0.872	-0.025**
Meet Credit Thresholds			
Earned 24 credits	0.731	0.811	-0.080**
Earned 36 credits	0.573	0.684	-0.111**
Earned 48 credits	0.460	0.586	-0.126**
Complete Associate of Arts Degree			
Number of Observations	5,857	15,043	-0.170**

**p < 0.01, two-tailed test, unequal variances.

Considering these descriptive results, which reveal statistically significant differences between academically prepared and unprepared students in both individual characteristics and in completion of intermediate outcomes, it may not be surprising that academically unprepared students have lower transfer rates. Since most previous research on transfer includes controls for individual characteristics, we focus in particular on intermediate outcomes, asking whether the gap in transfer rates between students who are academically prepared and those who are not decreases or disappears after accounting for the completion of intermediate outcomes. This is a crucial question because it illuminates the extent to which students can catch up in community colleges and suggests avenues for intervention. If the gap between academically prepared and unprepared students (measured as the regression coefficient on academically unprepared students) disappears after controlling for intermediate outcomes, then there is a possibility that students can “make up” for poor academic preparation. In this case, educational leaders and policymakers could develop ways to provide students with information, support, and other resources that might allow students to successfully complete these intermediate steps and thus enhance their educational attainment. In contrast, if the gap in transfer remains after controlling for intermediate outcomes, that would indicate that even students who successfully navigate

community college curricula are not able to “make up” for the low academic preparation with which they entered higher education. In this case, assistance at the community college level may have only marginal effects, implying that interventions need to focus on academic preparation before college entry. We turn to event history modeling to consider these different possibilities.

Event History Analyses

To estimate the likelihood of transfer for our sample of community college students, we rely on event history models, and in particular, we estimate single risk discrete-time hazard models (Allison, 1984; DesJardins, 2003; Singer & Willett, 2003). In order to estimate these models, the data is organized in a person-period format, with a maximum of 15 observations for each student, one for each term in which the student was observed after initial enrollment. Time-invariant variables remain constant for each person in each period, while time-varying variables can take on different values in different time periods.

The event we are modeling is transfer from a community college to a four-year institution in the Florida public higher education system.¹² Each student in the sample is considered “at risk” of transfer when first enrolled. Once a student experiences an event, her observations in later time periods are discarded, effectively preventing her from reentering the risk set. We utilize data for 15 terms (5 years), thus observing outcomes only for these 15 terms, and the 15 terms are referred to as the “event time” or “event period.” The beginning of the event is the first term of enrollment in a Florida community college (fall 1998), and the end is summer 2003. Students who did not transfer by the 15th term had unknown outcomes at the end of the event period and thereafter.

¹² Of the students who completed at least 12 credits, 8.1 percent transferred to institutions outside of the Florida SUS (i.e., to private institutions in Florida or institutions out-of-state). These students are not captured in our analyses.

Formally, we are modeling the risk of transfer in each term, called the hazard. This is the conditional probability that an individual will obtain an outcome in time period j , given that she did not do so in an earlier time period and given that she was in the risk set. To be in the risk set in a given term, the student must be enrolled. The general population discrete-time hazard can be conceptualized as:

$$h(t_j) = \Pr[T_k = j \mid T_k \geq j, G, \mathbf{X}, \mathbf{Z}] \quad (1)$$

where $T_k = j$ indicates student k 's outcome in term j , and the condition $T_k \geq j$ ensures that an outcome for student k has not occurred before time period j and that the student is enrolled in (observed in) time period j . The hazard in this case is the conditional probability that student k completes in term j , given that she did not complete before j and was in the risk set. The model also includes an indicator variable, G , for being an academically unprepared student, a vector \mathbf{X} of student characteristics, and a vector \mathbf{Z} of intermediate outcomes. The occurrence of these intermediate events raises or lowers the hazard of the final outcome; hence we could enter them in the model as time-varying explanatory variables (Allison, 1984). Algebraically, we can write this relationship as:

$$\text{logit } h(t_j) = \mathbf{D}'_j \alpha_j + G\delta + \mathbf{X}'\beta + \mathbf{Z}'\gamma \quad (2).$$

In equation (2), we took the logit of the hazard¹³ and defined a linear relationship between the conditioning data and logit hazard, where \mathbf{D}_j is a vector of dummy variables indexing each term of enrollment, and where α , δ , β , and γ are parameters to be estimated. Taking an inverse transformation of both sides, we derive:

$$h(t_j) = \frac{1}{1 + e^{-[\mathbf{D}'_j \alpha_j + G\delta + \mathbf{X}'\beta + \mathbf{Z}'\gamma]}} \quad (3)$$

which now describes a nonlinear relationship between the predictors and the hazard, and which is analogous to the standard logistic regression routine (Singer & Willett, 2003). Once the data were put in a person-period dataset, we could estimate parameters that maximized the likelihood of observing the sample data, assuming a logistic distribution.

¹³ The logit approach in an event history framework is the discrete-time version of the continuous-time Cox model. It assumes proportional odds rather than proportional hazards. A complementary log-log link could have also been used, but it did not seem necessary to assume proportional hazards given that the data process is occurring in continuous time that is interval-censored (Singer & Willett, 2003).

Since event history analysis has a large temporal component, it is important to discuss our treatment of time in the equations presented above. Our discrete-time models assume a fully-flexible spline for the specification of time that is entered as a series of t dummy variables indicating each term of enrollment as $\mathbf{D}'_j \alpha_j$. That is, no explicit functional restrictions are placed on how time affects the probability of transfer. This allows the baseline hazard to take on any shape and thus captures the effect of enrollment patterns through time, or the profile of hazard over time.

The non-experimental nature of this study's design has methodological strengths and weaknesses. Although the event history model allows us to examine the dynamic nature of students' passage through higher education, it is important to note that the estimates obtained from non-experimental data are limited in terms of making causal inferences. Our models include controls for student characteristics and demographic background, and we use a fully-flexible spline for the specification of time,¹⁴ but we are limited by the variables contained in the dataset. Given that we do not have a randomized design, we are unable to control for all important preexisting characteristics in the models, and our findings may therefore be affected by unmeasured factors that are not accounted for in our models.

Most notably, previous non-experimental studies on transfer have shown that students from more privileged backgrounds are more likely to make the transition to four-year institutions (e.g., Dougherty & Kienzl, 2006; Lee & Frank, 1990; Roksa, 2006). However, we do not have comprehensive measures of students' family background (such as parental education, occupation, income, or composite socioeconomic status [SES]). In the absence of direct measures of family background, we include a variable indicating whether students received federal aid. This measure, which is comprised mostly of Pell Grant recipients (and thus encompasses low- and middle-income students) is used as a proxy of students' relative income level.¹⁵ Future research should seek additional control variables, as well as use experimental and quasi-experimental designs, to establish a causal relationship between academic preparation, intermediate outcomes, and transfer rates.

¹⁴ Empirical evidence suggests that the misspecification problems due to unobserved heterogeneity that is uncorrelated with observed covariates are reduced when researchers use a fully-flexible spline for the specification of time (Dolton & van der Klaauw, 1995).

¹⁵ Having a more comprehensive measure of family background would likely attenuate the effect of academic preparation on transfer. However, previous research provides ample evidence that academic preparation has a significant impact on educational transitions, even net of controls for family background. Thus, while the magnitude of the coefficients may change, we expect that the overall patterns of the results would persist even if we could control more adequately for students' family background.

Multivariate Results

Does Successful Completion of Intermediate Outcomes Decrease the Gap in Transfer?

We estimate several hazard models in order to examine the relationship between academic preparation and transfer. Table 3 represents the first set of baseline models, including odds ratios and standard errors derived from a maximum likelihood estimation of logistic regression parameters. The first model presents a simple baseline hazard model with the time-invariant dummy indicating whether a student was academically prepared at the point of entry into community college. The results indicate that academically unprepared students were approximately 80 percent less likely to transfer to four-year institutions in any given term than their academically prepared counterparts (or, stated differently, the results indicate that a lack of academic preparation is associated with an 80 percent decrease in the odds of transfer to four-year institutions in any given term).

Table 3:
Estimated Odds Ratios for Hazard Models, with Transfer as the Outcome

Variables	Odds (SE) Model 1	Odds (SE) Model 2
Academically Unprepared	0.211 (0.007)**	0.480 (0.019)**
Age		0.855 (0.004)**
Female		1.003 (0.029)
Black		0.666 (0.034)**
Hispanic		0.671 (0.027)**
Other Race		0.799 (0.059)**
U.S. Citizen		0.623 (0.027)**
High School Diploma		0.790 (0.031)**
Received Federal Aid in Term 1		0.897 (0.031)**
Full-time in Term <i>j</i>		1.651 (0.059)**
SAT/ACT test taker (math)		1.146 (0.063)*
SAT/ACT test taker (reading)		1.348 (0.075)**
Number of Observations	144,208	144,208
Number of Groups	20,900	20,900
Deviance (−2*Log Likelihood)	42,377.618	36,364.35

*p < 0.05; **p < 0.01. Note: The model includes 15 time dummies.

The second model includes a list of control variables from Table 1. As might be expected, the disadvantage of entering higher education with poor academic preparation is now smaller, although still notable: students who were not academically prepared were 52 percent less likely to transfer in any given term, even net of the controls. The results for control variables on the probability of transfer mirror previous research: older students, students from racial minority groups and less privileged family backgrounds, as well as students who were not U.S. citizens were less likely to make the transition to four-year institutions. Conversely, students who were enrolled full time and who took SAT/ACT exams were more likely to make this transition. The only characteristic that is not statistically significant is gender. This supports other findings based on nationally representative data indicating gender equality in transfer for recent cohorts (e.g., Dougherty & Kienzl, 2006; Roksa, 2006).

The next set of models in Table 4 examines whether completing different intermediate outcomes mediates the relationship between academic preparation and the probability of transfer. The results indicate that students who passed a college-level math course were more than twice as likely to transfer as those who did not complete this intermediate outcome. However, passing a college-level reading course does not seem to be consequential for this educational outcome. After controlling for these intermediate outcomes, the coefficient for being academically unprepared changes only slightly: students who were not academically prepared were still almost 50 percent less likely to make the transition to four-year institutions than their academically prepared peers.

Table 4:
Estimated Odds Ratios for Hazard Models, Intermediate Outcomes

Variable	Odds (SE) Model 1	Odds (SE) Model 2	Odds (SE) Model 3	Odds (SE) Model 4	Odds (SE) Model 5
Academically Unprepared	0.510 (0.021)**	0.526 (0.021)**	0.576 (0.024)**	0.620 (0.026)**	0.591 (0.027)**
College-Level Courses					
Passed First College Math Course	2.233 (0.067)**				
Passed First College Writing Course	0.950 (0.043)				
Credit Thresholds					
Earned 24 Credits		4.738 (0.299)**			
Earned 36 Credits			11.388 (0.684)**		
Earned 48 Credits				14.512 (0.591)**	
Completion					
Associate of Arts					37.308 (1.500)**
Number of Observations	144,208	144,208	144,208	144,208	144,208
Number of Groups	20,900	20,900	20,900	20,900	20,900
Deviance	35,633.31	35,500.14	33,576.54	31,400.08	27403.65
Change in Deviance	-731.04 [†]	-864.21 [†]	-2,787.81 [†]	-4,964.27 [†]	-8,960.70 [†]

**p < 0.01. [†]Denotes significance at 0.01, Chi-squared test, for 1 and 2 degrees of freedom depending on number of covariates added.

Notes: Standard errors are in parenthesis. All models include 15 time dummies and control variables included in Table 3. Deviance tested against Model 2 in Table 3.

The next set of models show a strong and statistically significant relationship between each of the credit thresholds and the likelihood of transfer, with students completing 48 credits being almost 15 times as likely to transfer as students not passing this credit threshold. After controlling for credit thresholds, the disadvantage associated with poor academic preparation declines. Among students who passed the 48-credit threshold, academically unprepared students were 38 percent less likely than their academically prepared counterparts to make the transition to a four-year institution. Comparing the model with the 48-credit threshold to the baseline model (Model 2 in Table 3), the gap in transfer between academically prepared and unprepared students decreases by 14 percentage points (from 52 percent to 38 percent).

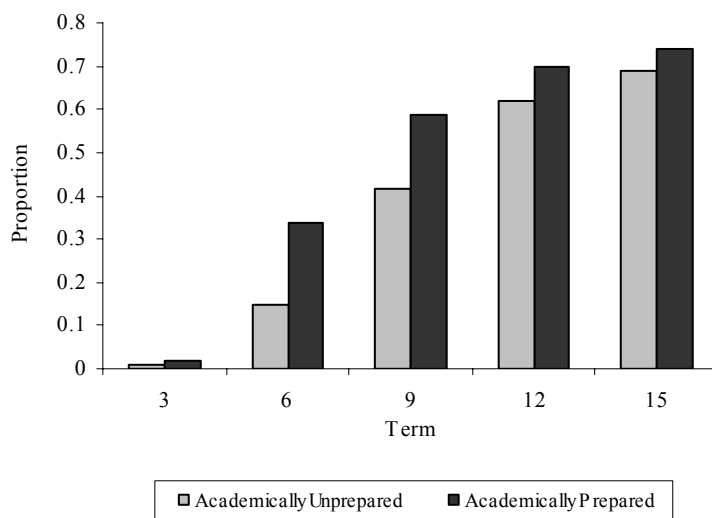
A similar finding is reported in the final model in Table 4. Students who completed AA degrees were almost 40 times as likely to transfer as those who did not. The magnitude of this

finding is likely unique to the Florida context, reflecting the role of AA degrees in the state's articulation policy. Due to the state-mandated articulation policy, students with AA degrees from Florida's community colleges are guaranteed a place in the State University System. The AA degree is thus one of the key gatekeepers for access to four-year institutions. Among students who earned an AA degree, the gap in the probability of transfer between students who were academically prepared and those who were not is smaller than in the baseline model.

Although the gap between academically prepared and unprepared students decreases as students successfully complete intermediate outcomes, it remains substantial. The persistence of the gap is perhaps most remarkable among students who completed an AA degree. Even among students who earned this crucial credential, academically unprepared students were 41 percent less likely than their prepared student counterparts to make the transition to four-year institutions. Since earning an AA degree essentially guarantees transfer, it is crucial to explore in future research why academically unprepared students continued to lag behind. These results may reflect individual differences not captured by our control variables. For example, it is possible that these students did not intend to transfer in the first place, that they changed their transfer aspirations and decided to pursue a different path, or that they did not get accepted in the school/program of their choice. While we do not have the data to explore these possibilities, this is an area ripe for future study.

Supplemental descriptive results suggest that research and policy endeavors may be most needed in the early years of community college enrollment. Figure 2 presents the cumulative proportions of Associate of Arts degree recipients who transferred to public four-year institutions in Florida within different time frames. The results indicate that the overall increase in transfer rates is greatest during the early time periods. Moreover, the gap in transfer between academically prepared and unprepared AA recipients is greatest at 6 and 9 terms (19 and 17 percentage points, respectively), but decreases and almost disappears in later time periods: the gap at 15 terms is only 5 percentage points. Providing support early in students' enrollment in community colleges may help to increase overall transfer as well as decrease the gap between academically prepared and unprepared students. Further study of the mechanisms underlying different transfer patterns for academically prepared and unprepared AA recipients could provide important insights into the transfer process and illuminate policies that could assist students in making the transition to four-year institutions.

**Figure 2:
Proportion of AA Recipients Transferring to Four-Year Institutions**



Note: All differences between academically prepared and unprepared students are significant at $p < 0.05$.

Are Intermediate Outcomes More Consequential for Academically Unprepared Students?

The results presented thus far raise another question: Are intermediate outcomes more consequential for academically unprepared students? While academically unprepared students lagged behind their more prepared counterparts, even conditional on completing different intermediate outcomes, there may be an interaction between academic preparation and intermediate outcomes. Table 5 considers this possibility. The first two rows report odds ratios and standard errors for academically unprepared students and intermediate outcomes, respectively. These two rows replicate the previously reported results: academically unprepared students were less likely to make the transition to four-year institutions, while completing intermediate outcomes increased the odds of making this transition.

Table 5:
Estimated Odds Ratios for Hazard Models, Interactions between Academic Preparation and Intermediate Outcomes

Variable	Intermediate Outcome Attained					
	College-level Courses		Credits Earned			Completion
	Passed First College Math Course	Passed First College Writing Course	Earned 24 Credits	Earned 36 Credits	Earned 48 Credits	Associate of Arts
Academically Unprepared	0.116** (0.018)	0.116** (0.018)	0.086** (0.021)	0.122** (0.023)	0.238** (0.027)	0.504** (0.027)
Intermediate Outcome	1.905** (0.063)	0.791** (0.038)	3.554** (0.235)	8.809** (0.552)	11.750** (0.59)	33.244** (1.456)
Interaction (Academically Unprepared x Intermediate Outcome)	2.265** (0.18)	3.091** (0.479)	6.748** (1.664)	5.405** (1.061)	3.187** (0.385)	1.849** (0.179)
Deviance	35419.45		35399.04	33461.93	31287.00	27363.15
Change in Deviance [†]	-944.90 [†]		-965.31 [†]	-2902.42 [†]	-5077.35 [†]	-9001.20 [†]

**p < 0.01. [†]Denotes significance at 0.01, Chi-squared test, for 1 and 2 degrees of freedom depending on number of covariates added. Notes: Standard errors are in parenthesis. Each column is a different regression. All models include 15 time dummies and control variables included in Table 3. Deviance tested against Model 2 in Table 3.

The third row presents the odds ratios and standard errors for interaction terms. An interaction term close to 1 would indicate that there is not much observed difference between students who were academically prepared and those who were not. However, interaction terms for all intermediate outcomes are positive and significant, indicating that successful completion of intermediate outcomes is significantly more important for academically unprepared students.

The odds ratios for the interaction terms indicate the advantage associated with passing a certain intermediate outcome for academically unprepared students. For example, the interaction term of 2.265 for passing the first college-level math course indicates that the benefit associated with passing this course was approximately twice as large for academically unprepared students. Stated differently, an academically prepared student who passed the first college-level math course was 1.905 times more likely to transfer than an academically prepared student who did not pass this course. However, an academically unprepared student who passed the first college-level math course was 4.3 times more likely (1.905 x 2.265) to transfer than an academically unprepared student who did not pass this course. The same pattern of results holds for other intermediate outcomes. For example, the odds ratio for passing a 36-credit threshold is over 5 times greater for students who were not academically prepared than for those who were. Also,

earning an Associate of Arts degree is associated with an increase in the probability of transfer for all students, but the odds ratio is almost twice as large for students who entered community college with low levels of academic preparation.

We would like to emphasize that reported interaction results need to be interpreted with caution. The results are based on observational data and thus cannot establish causality. Positive interaction terms in Table 5 do not imply a causal link between completing intermediate outcomes and transfer. Stated differently, the results presented do not imply that completing an intermediate outcome causes an increase in the probability of transfer. Interaction results are useful in that they reveal a complex relationship between academic preparation and intermediate outcomes in the data, illuminating an important area for future research. For example, developing an experimental study in which a group of academically unprepared students are offered additional assistance in completing intermediate outcomes while another group of students simply follows the regular curriculum could provide crucial insights into whether and how community colleges could utilize intermediate outcomes to facilitate the success of academically unprepared students.

Discussion and Conclusion

One of the longstanding missions of community colleges has been to prepare students for transfer to four-year colleges and universities. Indeed, a majority of community college students express a desire to transfer to four-year institutions. But a much smaller proportion actually make the transition. Numerous factors contribute to this outcome, one of which is academic preparation: students often enter community college without being adequately prepared for college-level work. Thus, the question is not only whether community colleges can facilitate student success, but whether and how they can assist academically unprepared students on their journeys through higher education. To provide some insights on this issue, we addressed two questions: To what extent do academically unprepared students transfer to four-year institutions? And, what role does successful completion of intermediate outcomes play in facilitating transfer and mediating the negative effects of inadequate academic preparation?

The results presented in this study indicate that community colleges can indeed serve as an alternative road of access to four-year institutions, even for academically unprepared students:

almost 20 percent of students in our sample who entered community colleges unprepared for college-level work made the transition to four-year institutions. Moreover, we found that successful completion of intermediate outcomes enhances the probability of transfer. However, the ability of community colleges to mitigate the negative effects of inadequate academic preparation on transfer is limited; regardless of the intermediate outcome completed, academically unprepared students continued to lag substantially behind their more prepared counterparts.

These results have important policy implications. They highlight the importance of taking a holistic view of education. Traditionally, transfer between community colleges and four-year institutions has been viewed as “a community college issue.” However, some factors influencing transfer, such as academic preparation, *precede* students’ entry into community college. Although community colleges can provide opportunities for transfer, there is a high cost to entering higher education without adequate academic preparation, which reverberates throughout students’ educational careers. One important approach for enhancing transfer would be to improve academic preparation in the K-12 sector. Crucially, such an approach ought not be considered simply a “K-12 issue” but should rather become a joint endeavor of education leaders across the educational system, including community colleges and four-year institutions. Indeed, many states are developing a range of initiatives aimed at aligning expectations and preparation between different segments of public education. Florida, for example, has initiated an effort to build one seamless K-20 educational system. This would provide an opportunity for a system-wide dialogue about academic preparation and the development of policies and programs to ensure that students entering higher education are indeed prepared for college-level work. Recognizing the importance of a holistic approach to education, which aims to improve academic preparation across the entire system, will likely be beneficial in helping students successfully navigate the community college curricula and transfer to four-year institutions.

It is also the case that descriptive results from our study reveal notable differences in transfer rates over time, suggesting that timing requires careful attention in future policy and research development. In our sample, transfer rates increased the fastest at the beginning of community college enrollment, with the majority of students transferring in their second or third year. The growth in transfer slowed down after the 9th term and was quite small after the 12th term. This pattern held for all students as well as for AA recipients. Moreover, the gap in transfer between academically prepared and unprepared AA recipients was greatest in the 6th and 9th

terms and diminished afterward. Providing support for students early in their community college careers may thus both increase overall transfer as well as decrease the gap in transfer between AA recipients who enter community college with varying degrees of academic preparation.

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