Leaving late: Understanding the extent and predictors of college late departure

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Research on college dropout has largely attended to early exit from school, overlooking the fact that the pipeline to completion is leaking in many places. In this paper, we offer new evidence on the scope of college late departure. Using administrative data from Florida and Ohio, we find that 14 percent of all entrants to college and one-third of all dropouts completed at least three-quarters of the credits that are typically required to graduate before leaving with no degree. Our results also indicate that the probability of departure spikes as students near the finish line. Amidst considerable policy attention towards improving student outcomes in college, our findings point to promising new avenues for intervention to increase postsecondary attainment.

Keywords: Postsecondary completion; college dropout; late departure; human capital

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I. INTRODUCTION

The returns to higher education have increased dramatically in recent decades with the rise of the global, knowledge-based economy. According to one recent study, high school graduates in 2009 are expected to earn an average of $780,000 over their lifetime compared to $1.2 million among college graduates (Avery and Turner, 2012). Research also shows that the college earnings premium has increased more than 10 percent in the past fifteen years and that the returns are concentrated among college graduates (Carnevale, Rose and Cheah, 2011; Oreopoulos and Petronijevic, 2013). College is also associated with many non-pecuniary benefits including better working conditions, greater life expectancy, and intergenerational social mobility (Baum, Ma & Payea, 2013). Yet in spite of the myriad benefits, many students attending college withdraw before completing their degree. Approximately two-thirds of degree-seeking students who enter community colleges withdraw before earning an associate or bachelor's degree within six years of initial enrollment, while nearly 40 percent of undergraduates first attending four-year institutions leave without a degree.[1]

Although college dropout has been studied widely, most research has focused on early exit from school (Pascarella & Terenzini, 2005; Robbins, Lauver, Le, Davis, & Langley, 2004; Stange, 2012; Stinebrickner & Stinebrickner, 2012). This narrow focus has overlooked that the pipeline to completion is leaking in many places. Recent evidence suggests that more than 40 percent of college students who do not earn degrees leave after their second year of college (Bowen, Chingos, & McPherson, 2009), and among this group are students who have completed most of the credits that are needed to graduate before withdrawing.

In this paper, we offer new evidence on the scope and predictors of college late departure. Given the attention policymakers and institutional leaders are devoting to increasing degree

attainment, understanding how many students withdraw late into college and which students are at risk of late departure are critical questions that remain unanswered.[2] Our findings offer new avenues for supporting students and improving college outcomes in the United States.

To preview our results, we find that late departure is widespread, particularly at two- and open-admission four-year institutions. We calculate that 14 percent of all degree-seeking students who enrolled in college and 33 percent of all college dropouts completed at least three-quarters of the credits typically required to graduate before leaving without a degree. Moreover, we find that the probability of withdrawal spikes near the finish line. The probability of dropout among students who reach the three-quarter credit threshold is nearly 1.5 times greater than the probability of dropout when students have completed at least half, but fewer than three-quarters of their credit requirements. Our results also suggest that students with poor academic preparation, high course failure rates, and non-sequential enrollment histories exhibit disproportionate risk of late departure, even after we account for a rich set of observable characteristics of students and their enrollment experiences in college.

We structure the remainder of this paper into three sections. In Section II, we discuss the barriers to completing college and what is currently known about the late departure phenomenon. In Section III, we describe our data, analytic samples, and key measures in our analysis. We present our results in Section IV and conclude in Section V by discussing the implications of our findings for research and policy.

II. BACKGROUND

Aspects of the traditional college experience may help to explain why many students are susceptible to dropping out late into their college careers. At large, open access colleges and universities students are often required to navigate complex bureaucracies and receive minimal

advising to chart their course. Student-to-counselor ratios at those institutions, which frequently exceed 1,000:1, render environments in which many students are unaware of whom to contact if they need support (Gallagher, 2010; Center for Community College Student Engagement, 2009). As a result, research finds that nearly half of community college students do not understand their graduation requirements and choosing courses at random is commonplace (Rosenbaum, Deil-Amen, and Person, 2006; Grubb, 2006; Nodine, Jaeger, Venezia, and Bracco, 2012; Schneider and Yin, 2011). Furthermore, because students typically have an abundance of choice when deciding which courses to take, they may delay progress to completion by avoiding required classes that are demanding and unpleasant (Bailey, Jeong, & Cho, 2010; Institute for Higher Education Policy, 2011).

The road to completion also becomes an increasingly independent task because colleges frequently assume that students can self-navigate through school after the first year. Support programs primarily target first-year students for this reason, even though initial impacts of first-year interventions, such as learning communities and student success courses, typically fade out in subsequent semesters when students lose access to structured supports (Rutschow, Cullinan & Welbeck, 2012; Visher, Weiss, Weissman, Rudd, & Wathington, 2012). In this isolated environment, the risk of misstep may loom large for students who have made substantial academic progress. Unanticipated obstacles, including changes in financial aid or failing a required course, may derail advanced undergraduates who are committed to graduating and capable of doing so.

In spite of these documented challenges encountered by college-goers, the number of students leaving college after making considerable academic progress is not well known. Dated estimates suggest that nearly 25 percent of traditional-age students from the high school

graduating class of 1992 entered college and completed at least 75 percent of their academic degree requirements before leaving without a degree (IHEP, 2011). However, this two-decade old estimate may no longer reflect the current postsecondary landscape. For example, the growing shift of financial aid from grants to loans in recent decades has increased both the percentage of students that take-on debt to pay for college and average loan amounts (Baum, Elliot and Ma, 2014). If students are less willing to reinvest in additional schooling as debt accumulates, then the rate of late departure may be increasing over time. Alternatively, the problem may be less severe today now that technology innovations offer students more ways to balance school with other responsibilities. In short, too much has changed in higher education to know if and how college late departure has been affected.

More recently, the National Student Clearinghouse (NSC) reported that 20 percent of students are "potential completers", by virtue of completing two or more years of college without earning a credential (Shapiro et al., 2014). Yet this study has several methodological limitations that render the findings problematic, including that students who never intended to earn degrees are included in the analytic sample and the academic progress that students made before discontinuing their studies is not accounted for in the definition of potential completers. Given that many students are assigned to remediation before enrolling in college-level coursework, the duration of time spent in college may not reflect their proximity to degree completion.

This paper contributes to the literature on college persistence and attainment by answering three research questions: 1) how large is the incidence of college late departure, 2) which students are at risk of leaving late, and 3) how is the risk profile for late departure different from the predictors of withdrawal at earlier points along the path to degree completion? Previous work has not explored the relative influence of student demographics, prior

achievement, and college experience factors to predicting late departure. Ours is also the first paper of which we are aware that examines how the probability of departure varies by accumulated credits. By identifying which students are in jeopardy of leaving college just shy of degree attainment and investigating how those students differ from other groups of college dropouts, we provide a more comprehensive portrait of the late departure phenomenon than has been presented before. As we discuss in more detail in our concluding remarks, our findings offer policymakers and institutional leaders new avenues for increasing degree attainment by targeting supports to this oft-overlooked population of students.

III. DATA AND SAMPLES

III.1 Data

Our data are from the Florida Department of Education K-20 Data Warehouse (KDW) and the Ohio Board of Regents (OBR), which maintain longitudinal student-level records at public colleges and universities in Florida and Ohio, respectively. From these systems we have high school and college application records, including demographic and transcript data on students. These data are then linked to records which provide family financial information from the Free Application for Federal Student Aid (FAFSA) and term-by-term college enrollment, course transcript, and degrees awarded at all public two- and four-year institutions in both states. We are therefore able to observe students' credit accumulation in remedial and college-level courses and we can track their progress to degree completion by the number of credits completed over time.

This rich dataset captures college enrollment and completion records for the census of students at Ohio public colleges and for the majority of college-bound, Florida high school graduates.[3] However, a limitation of our data is that we cannot differentiate between students who dropped out and those who transferred to private or out-of-state institutions. Our results

overstate the extent of dropout for this reason, although the magnitude of bias is likely small given that only 6-7 percent of students first attending public institutions in Florida and Ohio subsequently transferred to private or out-of-state colleges, whereas 44 percent of the students in our data withdrew before earning a degree (Shapiro, Dundar, Wakhungu, Yuan, & Harrell, 2015).

III.2 Samples

We explore the scope and determinants of college late departure among a sample of first-time, degree-seeking undergraduates who enrolled at public institutions in Florida and Ohio between the fall 2000 and fall 2001 academic terms. We condition our sample on traditional college entrants, which comprise approximately 80 percent of all first-time college-goers, in order to observe both pre-entry characteristics and the complete enrollment trajectories of students in the data. Specifically, we restrict our sample to include only students who: a) were between the ages of 17-19 at the time of high school graduation, and b) enrolled at least half-time as a degree-seeking student within 16 months of high school completion. We also condition the sample on students with complete demographic, prior achievement and college experience data, given that one major objective of this study is to examine the risk factors of late departure.[4] These restrictions yield a sample of 54,012 unique students, of which 22,499 first attended two-year college, 12,318 first attended an open-admission four-year institution, and 19,195 first attended a selective four-year university.[5] We separately examine our research questions by the type of institution students first attended to allow the magnitude and risk factors of late departure to vary by college sector.[6]

In much of our empirical analysis, we examine the probability of withdrawal by the proportion of college-level credits that students earned. This allows us not only to examine

whether a student left college without earning their degree, but also how much academic progress they made towards degree completion at the time of their departure. For this investigation, we constructed the categorical variable *CRED_CAT*, which is equal to "1" when a student completed fewer than one-quarter of the credits typically required for degree completion; "2" when they completed at least one-quarter but fewer than one-half of their credits; "3" when they completed at least one-half but fewer than three-quarters of their credits; and "4" when they completed three-quarters or more of the credits typically required for degree completion.[7] We next constructed a student-period dataset containing one observation per credit category for each student, with each student contributing as many observations to the sample as the number of credit thresholds they surpassed.[8] The student-period sample is comprised of the same 54,012 unique students and yields 177,682 student-credit category observations.

In Table 1, we present descriptive statistics for three samples of students: all first-time, degree-seeking undergraduates who attended public postsecondary institutions in the United States in fall 2003 (column 1), the full sample of public college entrants in Florida and Ohio ages 17-19 at high school graduation who enrolled in college within 16 months of high school completion (column 2), and the subset of those students in our analytic sample (column 3).[9] There are some important differences between all first-time public undergraduates nationwide and those in our analytic sample as a result of the sample restrictions we impose. Because of our age restriction, the students in our analytic sample are younger at entry (18.5 versus 21.3 years old) and a significantly larger share immediately entered college following high school graduation (91 percent versus 65 percent). Conditioning on FAFSA submission also results in an overrepresentation of students who first attended four-year institutions in our sample (58 percent in our sample versus 43 percent nationally). However, on gender and high school GPA, the

students in our sample closely mirror the profile of all incoming undergraduates nationwide. In addition, because the students in our analytic sample closely resemble the full population of traditional college entrants at public institutions in Florida and Ohio, and given the size and diversity of these two postsecondary systems, our findings likely generalize to traditional students in other large public college systems across the country.

IV. RESULTS

IV.1 The Probability of Departure by Proximity to Degree Completion

We begin our results section with a graphical presentation of enrollment outcomes through six years following college entry. Figure 1 shows the share of entrants that dropped out and completed a degree or remained enrolled by institution type.[10] To highlight the scope of late departure, we dichotomize dropouts into two groups in this analysis: those who withdrew prior to earning three-quarters of the college-level credits typically required to graduate (i.e. "early" dropouts) and those who surpassed the three-quarter credit threshold before dropping out (i.e. "late" dropouts). Across all institutions, late dropouts represent 14 percent of all students who ever enrolled in college and one-third of all dropouts. Figure 1 also shows that late departure is especially prevalent at two- and open-admission four-year institutions, representing 20 percent and 14 percent of all students who respectively began their college careers in those sectors. In Figure 2, we disaggregate rates of late departure at two-year institutions by race and Pell Grant eligibility status, which shows that the phenomenon is widespread among students of different backgrounds. Approximately 20 percent of Pell-eligible, Pell-ineligible, White, Black, and Hispanic/Latino students left college without a degree after accumulating three-quarters of their college-level credits. Analogous results in Figure A1 of the appendix also reveal small differences by race and Pell Grant eligibility status at four-year institutions. In Table A1 of the

appendix, we present more detailed departure rates by credit interval and show that late dropouts represent the largest share of withdrawals in each sector.

The fact that late dropouts represent a large share of all college entrants, while many students do not even reach the three-quarter credit threshold, implies that the probability of departure spikes late into college. To show that this is the case, we conduct a discrete survival analysis in which we estimate the conditional likelihood of departure within each of the four credit categories. Given the binary nature of our outcome measure, we fit a logistic regression model of the following form to estimate the likelihood of departure in each credit interval:[11]

(1) $$\Pr(Y_{idc} |\ X_{idc}) = P(\theta_{idc} + \ \omega_s), \text{ where } P(z) = \frac{1}{1+e^{-(z)}}.$$

In this model, we predict the likelihood of dropout for student i who first pursued degree *d* in credit interval *c*. To test whether the probability of dropout varies both by the proportion of credits completed and the type of degree sought, we include indicator variables for each of twelve credit-by-degree categories (θ_{icd}). By including this set of dummy variables, an attractive feature of equation (1) is that we make no assumption as to the functional form of the underlying relationship between credit attainment and college dropout. We also include an indicator of whether the student attended college in Florida or Ohio (ω_s) to account for time-invariant differences in postsecondary attainment across the two state systems.

In Figure 3, we present graphical results from the specification in equation (1). The probability of withdrawal is constant or declines in each of the first three credit categories. For students who first attended two- and open-admission four-year colleges, the probability of departure respectively declines from 0.2 to 0.11 and from 0.13 to 0.11 between the first and third credit intervals. For students who first attended four-year selective institutions, the probability of dropout is approximately .06 in each of the first three credit intervals.

In contrast, the probability of departure increases substantially for all students after they have completed three-quarters of their college-level credits. This spike is largest at non-selective institutions, with dropout probabilities of 0.34 and 0.21 among students first attending two- and open-admission four-year students, respectively. However, students attending four-year selective admissions institutions also experience a large increase in the probability of late departure in relative terms, rising from 0.6 to 0.10 between the third and fourth credit interval.

To examine if the spike in late departure is driven by the changing composition of students along the pathway to degree completion, we augment equation (1) with a rich set of student- and school-level characteristics.[12] We present the results from this model in Table A2 in the Appendix. Notably, most of the departure estimates in the first three credit periods attenuate slightly after the inclusion of covariates, whereas the probability of departure in the fourth period spikes even higher. This suggests that dynamic selection is unlikely to explain the increase in dropout risk late into college. In fact, because unobserved dropout factors will lead to monotonically decreasing departure rates (Singer and Willett, 2003), which we do not observe, the spike in late departure is not attributable to omitted variable bias. To formally test whether the risk of departure differs by progress to degree completion and institution type, we carry out post-estimation General Linear Hypothesis (GLH) tests. As shown in the bottom of Table A1, we reject that the risk of departure is equal in all tests (all p-values are less than .01), indicating that both the spike in late departure and the differences in its pervasiveness by sector are substantively and statistically significant.

IV.2 The Risk Factors for Late Departure

To explore which students are at risk of late departure, we begin by reporting dropout rates in the fourth credit interval by student demographic, prior achievement and college

enrollment characteristics. For ease of interpretation, we present results separately by incoming attributes and enrollment experiences during college in Tables 2 and 3, respectively. Unlike the unconditional dropout rates in Figure 2, the results in Table 2 point to large differences in the conditional probability of late departure on several dimensions, including by race, Pell eligibility status, and high school GPA.[13] The probability of dropout is approximately 1.5 times greater for Pell-eligible students compared to their ineligible peers and for Black and Latino students relative to Whites, while students with high school GPAs in the bottom quartile are 3 times more likely than top-quartile students to leave without a degree late into their college career.

We also find large differences in dropout risk by the experiences of students in college. Consistent with previous work that has linked academic momentum to college success (Adelman, 2006; Attewell, Heil, & Reisel, 2012), the largest contrasts in Table 3 emerge when we compare rates by whether or not students previously stopped out and by the proportion of attempted credits students earned once they reached the three-quarter credit mark. Students who withdrew from college and later returned are three times more likely than continuously enrolled students to dropout late, and students who failed to earn 20 percent or more of their attempted credits each semester, on average, are more than five times as likely to withdraw without earning a degree relative to students who failed no more than 10 percent of their course load each term. Taken together, these results suggest that enrollment momentum and early performance in upper division courses may play important roles in diagnosing which students are at greatest risk of late departure.

In Table 4, we examine the role of academic momentum in more detail by comparing how credit loads, credit attainment, and grade performance evolve over time. For this analysis, we again restrict the sample to students who completed three-quarters of their credits and

compare the academic progression of late dropouts to college graduates and late persisters (i.e. students who persisted to their seventh year of college). The results in panel A indicate that many students attempted fewer credits later in their college careers than at the outset, although the decline is larger on average for students who dropped out. For example, in column 7 we find that graduates and late persisters attempted 13.9 credits per semester before completing one-quarter of their credits versus 12.3 credits per semester once they exceeded the three-quarter credit mark, an 11.6 percent decline in relative terms. By comparison, in column 8 we find that late departers experienced an average credit load decline of 18.1 percent between the first and fourth credit interval.

We observe an even larger discrepancy between late dropouts and graduates/late persisters in panel B of Table 4, which examines the average share of attempted credits that students earned per term in each credit period. Graduates and late persisters not only passed a greater fraction of their early courses compared to late dropouts (0.93 versus 0.87 in column 7), but they also continued to earn nearly all of their attempted credits in the fourth interval as well. On the other hand, late dropouts earned just 76 percent of their attempted credits each semester on average once they reached the three-quarter credit threshold. Between the first and fourth credit interval, the proportion of credits completed per semester by late dropouts thus declined 11.9 percent, while among graduates and late persisters the proportion increased 0.4 percent. The evolution of college grades between late dropouts and their peers is less informative, as the results in panel C suggest. Both groups improved their GPAs with experience, with late dropouts who first attended four-year institutions gaining nearly as much in relative terms as their peers who graduated or re-enrolled. However, late dropouts earned lower grades compared to non-dropouts each semester at both the beginning and the end of college.

Because many observable characteristics of students are correlated, the simple mean differences we report in Tables 2-4 may mask which factors predict dropout over and above others. To obtain a more nuanced portrait of the late departure risk profile and to examine how the dropout profile varies along the pathway to degree completion, we return to our statistical framework. Specifically, we again augment equation (1) by interacting θ_{idc} with the full set of demographic, prior achievement, and college enrollment characteristics. To simplify this analysis, we collapse our student-period sample into two periods: before and after students earned three-quarters of the credits typically required to graduate. In all our subsequent results, which we present in Table 5, we report inference statistics that account for both the correlation of outcomes among students attending the same schools and for multiple testing by controlling the False Discovery Rate (Benjamini, Krieger, and Yekutieli, 2006).[14]

In columns 1, 3 and 5 of Table 6, we report differences in the probability of late departure (in percentage points) for each predictor, which we evaluate at the average values of all other covariates in the model. Whereas the unadjusted differences in Table 2 revealed that low-income and minority students faced greater risk of late departure, in Table 5 we see that those gaps are fully explained by other observable characteristics of students. Across all sectors, the point estimates on the race and Pell eligibility dummies are generally negative or near zero when they are positive. We also find that the relationship between initial enrollment timing and late departure flips signs after we account for student attributes and other enrollment experiences. In column 8 of Table 3, we see that students who delayed attendance following high school graduation were 9.7 percentage points more likely than seamless enrollees to dropout late; yet after controlling for other observables, students who took time off between high school and college were 2.5 – 8.1 points *less* likely to dropout late into college.

In column 7 of Table 5, we also report the results of GLH tests that examine whether the conditional risk factors of late departure are equal across sectors. On most dimensions we reject that the risk profile is the same across institution type. In general, where we find differences by sector, the associations are strongest for students who first attended two-year institutions. Whether students transferred institutions is one notable exception to this typical pattern. On this dimension, students who attended more than two institutions are no more likely than non-transfer students to dropout late if they first attended a two-year college, while transfer students who first attended four-year institutions are more likely than their non-transferring peers to leave college without earing an associate or bachelor's degree once they completed ninety college-level credits.

Our results in Table 5 also reveal that incoming achievement and academic momentum in college remain strong predictors of late departure. All else equal, we find that students with high school GPAs one standard deviation above the mean are 2-5 percentage points less likely to drop out in the fourth credit interval. Students who enrolled in remedial coursework at two-year institutions are also 11 percentage points more likely than non-remedial students to dropout late. Students who withdrew from college and later returned are at particularly high risk of late departure, ranging from 6.8 points at selective four-year universities to 19.2 points at two-year colleges, as are students who struggled to earn passing grades in their coursework once they completed three-quarters of their credits.

On several dimensions we also find that the late departure risk profile is distinct from the predictors of dropout at earlier points along the credit continuum. In columns 2, 4 and 6 of Table 5, we compare the conditional risk of dropout in the fourth credit interval to the risk of withdrawal in the first three intervals. Three results stand out in particular from these

comparisons, all of which hold across sectors. First, the relationship between initial enrollment timing and dropout changes direction as students accumulate three-quarters of their credits. For example, among students who first attended two-year colleges, students who matriculated immediately following high school graduation were 21.4 percentage points less likely than delayed enrollees to dropout before completing three-quarters of their credits, but 8 percentage points *more* likely to exit without a degree once they surpassed the threshold.[15] Second, we find that while students who previously stopped out experienced high risk of late departure, non-sequential enrollment is a much stronger predictor of earlier dropout. Differences in the probability of dropout between continuous and discontinuous enrollees are nearly twice the magnitude before students complete three-quarter of their credits compared to afterwards. Lastly, high course failure rates more strongly predict late departures than earlier dropouts. A one-half standard deviation increase from the average proportion of credits earned per term is associated with 13.6 and 10.3 percentage point declines in the probability of dropout in the fourth interval at two- and open-admission four-year institutions, respectively, versus declines of less than 5 percentage points when students earned fewer than three-quarters of their credits to degree completion.[16] Taken together, these results reveal that the risk profile for departure varies in meaningful ways with proximity to degree completion.

IV.3 Policy Application: Using Predictive Models to Target Students for Intervention

Whereas the results in Table 5 identify the characteristics that differentiate late dropouts from other students, they do not reveal how well prediction models distinguish between students who are and are not at risk of dropping out late. Yet this question is especially policy relevant because it can help institutional leaders pinpoint which students on campus may stand to benefit from late-stage intervention. We therefore evaluate the performance of candidate prediction

models and present the results in Table 6. For this analysis, we conditioned the sample on students who completed at least three-quarters of the credits typically required to graduate. After running logistic regression models separately by institution type and predicting the probability of late departure for every student, we derived probability cut-offs to categorize students as either at-risk or not at-risk of late dropout.[17] We then calculated the percentage of students correctly assigned to the risk group that matched their observed enrollment behavior. To evaluate how well the cut-offs generalize out-of-sample, we randomly split the sample into development and validation subsamples. All models are estimated on the development subsample, but we present results for both the development (columns 1-3) and validation (columns 4-6) subsamples in Table 6. We also report results from two prediction models. Because many standalone institutions are unable to observe prior enrollment histories for transfer students, we test a parsimonious model in panel A containing only those predictors which most colleges are likely to observe for all students.[18] In panel B, we present results from a model that includes the full set of predictors from Table 5 for point of comparison.

The results in Table 6 show that the prediction models correctly classify the majority of students in the development and validation subsamples. Across both models and subsamples, the percent of students assigned to the risk group that matched their observed enrollment behavior ranges from 70 percent to 83 percent. In addition, no fewer than 68 percent of late dropouts are classified as at-risk and no fewer than 69 percent of graduates/active enrollees are assigned to the non-risk group. Comparing the results in columns 1-3 to those in columns 4-6 also indicates that the predictive models perform well out-of-sample. For example, in columns 1 and 4 of panel A the percent of students correctly classified is nearly identical across the two subsamples (67.6

percent versus 67.8 percent among late dropouts and 71.3 percent versus 70.8 percent among non-late dropouts).

We also find that institutions can identify most students at-risk of dropping out late using just a few basic demographic variables and their recent past performance in school. The model in panel B leads to only small improvements in correctly classifying students, ranging from 1.3 percent (column 6) to 3.4 percent (column 2). The concordance statistic, which reports the probability that a randomly selected late dropout has a higher predicted probability of withdrawal than a randomly selected graduate/active enrollee, is also near 0.8 or 0.9 in panel A and increases by no more than 5 percent in panel B. Both of the models we tested therefore exhibit strong predictive power.

One caveat to these largely favorable results is that a large share of students assigned to the at-risk group did not, in fact, drop out. Although this largely reflects the size of the non-late dropout group and not the performance of the prediction models (i.e. most students who reach the three-quarter credit threshold do not drop out late), relying on predictive models that generate a large number of "false positives" will lead to targeting many inframarginal students for intervention. However, in Figure 4 we show that the share of inframarginal students decreases considerably as the predicted probability of late departure rises. Among students who first attended two-year colleges, more than two-thirds of students with predicted probabilities greater than or equal to 0.5 actually dropped out late and nearly three-quarters of students with predicted probabilities of 0.6 or higher did so. Resource-constrained institutions can therefore ensure that investments reach students most in need by establishing more stringent cut-offs for intervention.

V. DISCUSSION

The results of our analysis suggest that late departure is widespread, especially at two- and open-admission four-year institutions, where nearly 20 percent and 14 percent of students respectively began their college careers but left with no degree after earning at least three-quarters of the credits typically required to graduate. At greatest risk of late departure are students poorly prepared for the academic rigor of college and those who struggle to maintain momentum, in terms of both their persistence from one semester to the next and their success at completing attempted coursework late into college. Although providing causal explanations for these patterns is beyond the scope of this analysis, the strong relationship between momentum and late departure that we document reinforces the notion that many students may stand to benefit from more robust guidance and supports throughout their time in school.

It is also noteworthy that students who immediately transitioned from high school to college were more likely to leave late once we account for other factors that influence their likelihood of withdrawal. A number of possible explanations exist for this finding. For one, time off from school may persuade individuals to make a more active decision to attend college, which in other contexts has been shown to increase goal attainment (Carrol, Choi, Laibson, Madrian, and Metrick, 2009; Park, Whan, and MacInnis, 2000). In addition, delayed enrollees may be able to leverage formative out-of-school experiences that seamless enrollees cannot when late-stage obstacles to completion arise; as such, their motivation and resilience to persist in the face of such adversity may be higher than their peers who seamlessly transitioned from high school to college.

Although this analysis goes further than any others in investigating the extent and predictors of college late departure, there are important aspects of the phenomenon we have not

addressed that deserve attention. These include the role of changes in financial aid along the college pipeline, for which there is some evidence that advanced undergraduates are significantly less likely to persist in college when need-based aid eligibility expires (Mabel, 2016). We also do not directly investigate the role of behavioral factors, such as impatience and time-inconsistent preferences, that have also been shown to predict college late departure (Cadena & Keys, 2015). Finally, it is important to note that given the heterogeneity in returns to college degrees, it is reasonable to assume that some students who leave late would have experienced below-average returns if they completed their degree. As a result, late departure may be an optimal human capital investment decision for some students. Nevertheless, given the extent of the phenomenon and the high returns to degree completion for most college-goers, efforts to mitigate late departure would likely benefit many students who dropout late.

Initiatives undertaken in recent years to mitigate late departure have focused almost exclusively on re-engaging individuals after they have withdrawn from school. For instance, through Project Win-Win, a partnership between the Institute for Higher Education Policy and the State Higher Education Executive Officers, sixty postsecondary institutions attempted to contact individuals who needed 9 or fewer credits to earn an associate degree and provide them with templates for finishing their degree (IHEP, 2011). Unfortunately, efforts to retroactively support late departers have achieved only modest success because they require labor-intensive investments to identify and contact eligible individuals (Adelman, 2013).

Alternative strategies have also emerged to simplify the college decision environment for students by changing the structure of degree programs. For example, some four-year institutions have begun to award associate degrees to students en route to a bachelor's degree, either by acquiring associate degree-granting authority or by establishing new partnerships with

community colleges (Bragg, Cullen, Bennett, & Ruud, 2011). Others, such as the community and technical colleges participating in Washington State's I-BEST program and Guttman Community College in New York City, offer highly structured programs that constrain student choices in order to increase completion rates and accelerate time to degree receipt (Weinbaum, Rodriguez, & Bauer-Maglin, 2013). Early evidence suggests these efforts can substantially increase credit and credential attainment (Zeidenberg, Cho, & Jenkins, 2010). However, all of these interventions are quite radical in the context of higher education, and as a result, the majority of students at risk of late departure are not receiving support during the most promising time to intervene: while they are still enrolled.

Our findings suggest that colleges may be able to substantially increase degree attainment by targeting interventions to students who have made considerable academic progress but remain at risk of dropping out. For instance, in light of our finding that students who stop out but later return to college are at high risk of permanent withdrawal, schools could provide extra support to students with discontinuous enrollment histories. One model already adopted by a few states provides returning students with a single point-of-contact on campus to address their barriers to re-enrollment (Michelau & Lane, 2010). Our findings also suggest an important role for upper-division academic supports that help students maintain academic momentum as the rigor of their coursework escalates. While it is too soon to know which interventions are most effective and the contexts in which they work best, one thing is clear: helping more students complete their final steps to a degree requires paying more attention to the late departure phenomenon and further investigating its origins and consequences.

NOTES

1. Authors' calculations using the National Center for Education Statistics, 2004/2009 Beginning Postsecondary Students Survey.
2. Efforts to increase the share of Americans with college degrees have been advanced in recent years by foundations and elected officials alike. These include the Lumina Foundation's Goal 2025, which aims to produce over 60 million college graduates and credential holders by 2025, and President Obama's College Completion Goal to restore the U.S. as the top producer of graduates worldwide by 2020.
3. KDW records capture the census of Florida public high school graduates, not the census of college-bound students as in Ohio. In the 2000-01 academic year, 85 percent of all first-time freshmen at public institutions in Florida were in-state residents (authors' calculations using IPEDS). We therefore observe most, though not all students who first attended public colleges and universities in Florida.
4. Because family income is a predictor of interest in our models, this condition restricts the sample to the 65 percent of college entrants that submitted a FAFSA application at the time of entry. Likewise, this condition excludes 40 percent of college entrants for whom we do not observe high school GPA.
5. We classified four-year universities as selective if Barron's Profiles of American Colleges categorized the institution as "very", "highly" or "most competitive" in the 2000-01 school year. Nine of the 24 public universities in Florida and Ohio met this criterion.
6. As a robustness check, we also conducted analyses on a sample in which we assigned students to their last institution attended. The results we present throughout the paper are robust to whether students are assigned to the first or last school that they attended.
7. Because we do not observe programs of study for most students in our sample, we assume students must earn 60 and 120 college-level credits to graduate from two- and four-year institutions, respectively. These thresholds are consistent with the graduation requirements for most majors published on institutional websites in Florida and Ohio (e.g. see https://catalog.ufl.edu/ugrad/current/liberalarts/Majors/home.aspx). We assigned students to either the 60 or 120 credit threshold according to the degree type they first pursued; however, we counted all students who completed an associate or bachelor's degree, regardless of which credential they initially pursued, as degree earners. This ensures that the departure rates we estimate are not inflated by changes to degree intentions over time. In addition, in analyses not shown we excluded all students (24 percent of the sample) who ever enrolled at both two- and four-year institutions between 2000-01 and 2006-07. The results from this sample are consistent with our full-sample estimates and are available upon request.
8. For example, a student who earned 20 of the 120 credits typically required to earn a bachelor's degree would only contribute a single observation to the student-period dataset, corresponding to the interval when fewer than one-quarter of the requisite credits to graduate had been earned. Another student who earned 90 credits would contribute four observations to the student-period dataset, given that they completed three-quarters of the credits typically required for a degree.
9. The statistics in column 1 are from the National Center for Education Statistics, 2003-04 Beginning Postsecondary Students Longitudinal Study.
10. The dropout outcome is equal to "1" if a student did not earn an associate or bachelor's degree within six years of initial enrollment in college and was not enrolled in college at the

start of their seventh year, and is set to "0" otherwise. By construction, all students assigned a value of "0" had either graduated within six years or were still enrolled in their seventh year and presumed to be working towards their degree.

11. In addition to standard logistic models, we also fit random intercept logistic models that account for the clustering of students within schools as well as discrete time proportional (complementary log-log) hazard models. Our substantive conclusions are unaltered by these modeling decisions and we therefore present results from standard logistic regression models for simplicity and computational efficiency.
12. We include the following student-level covariates in the model: indicators for gender, race and Pell Grant eligibility status; high school GPA and GPA squared; whether the student entered college immediately following high school graduation; whether the student took one or more remedial education courses; whether the student stopped out at least once prior to exceeding credit interval *c*; whether the student ever transferred schools prior to exceeding credit interval *c*; age at the time the student exceeded credit interval *c* and the second order polynomial of this term; average term GPA in each credit period; average number of credits attempted per semester in each credit period; and the average proportion of credits earned per semester in each credit period.
13. The divergent findings between Figure 2 and Table 2 can be explained by differences in the size of the initial enrollment cohort across student subgroups. For example, for every Black student that first attended a two-year institution in our sample, nearly 4 white students enrolled. Because the share of late dropouts among all college entrants is similar for Blacks and Whites, it must therefore be the case that the probability of dropout is higher for the subset of Black students that reached the three-quarter credit mark.
14. The False Discovery Rate (FDR) controls the proportion of rejections that are Type I errors, i.e. false discoveries. The FDR reduces the penalty to multiple hypothesis testing in cases where some Type I error is acceptable. This approach is appropriate for exploratory analyses like ours because it allows for some Type I error in exchange for greater statistical power.
15. The relationship we document between enrollment timing and early departure is consistent with previous research. See, for example, Bozick and DeLuca (2005) and NSC (2015).
16. We report differences from a one-half standard deviation increment from the mean because a full standard deviation increment exceeds the ceiling of 1.0 in our sample.
17. We set the cut-offs to equal the probability (to the nearest five points) that most closely equated the percentage of late dropouts classified as at-risk (i.e. model sensitivity) and the percentage of graduates/active enrollees classified as not at-risk (i.e. model specificity).
18. Those predictors are: indicators for gender, race and Pell Grant eligibility status; age at the time the student exceeded the three-quarter credit threshold; whether the student entered as a transfer student; and mean academic performance in the fourth credit period (i.e. the average term GPA, average number of credits attempted per term; and the average proportion of credits earned per term after exceeding the three-quarter credit threshold).

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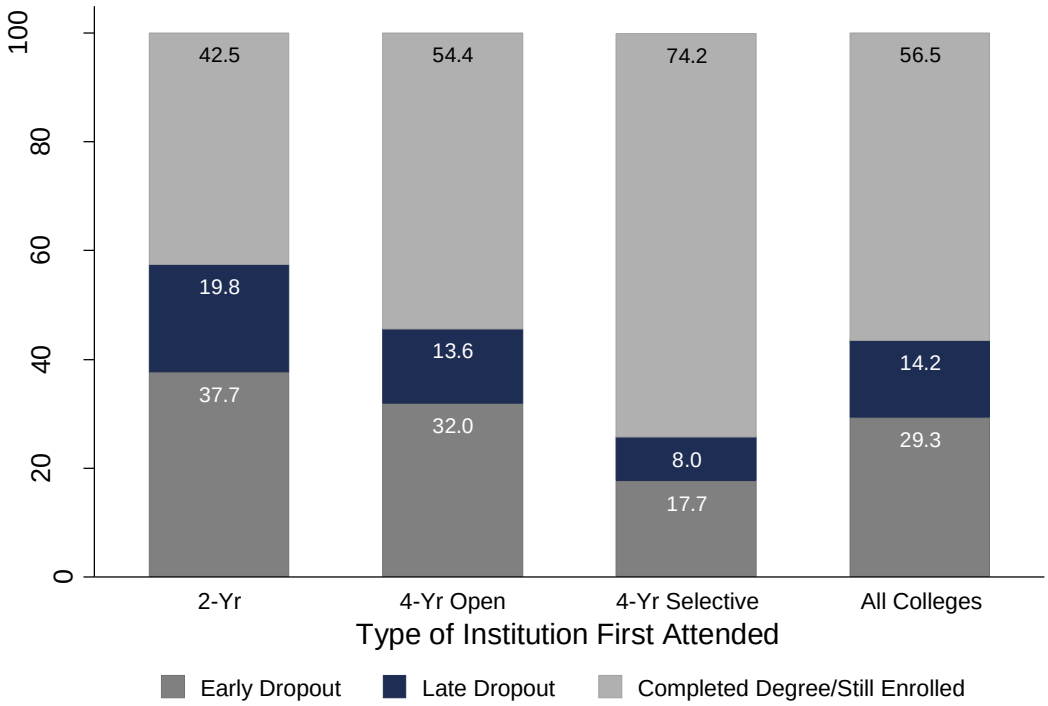
Figure 1. The share of college entrants that are late dropouts, by institution type



Notes: Outcomes are reported through six years following initial college enrollment. Early dropouts capture students who withdrew prior to earning three-quarters of the college-level credits typically required to graduate. Students who surpassed the three-quarter credit threshold before dropping out are captured as late dropouts. Students who graduated within six years of entry or who were actively enrolled in year 7 are captured in the completed degree/still enrolled category.

Figure 2. The share of college entrants that are late dropouts at two-year institutions, by Pell Grant eligibility status and race/ethnicity

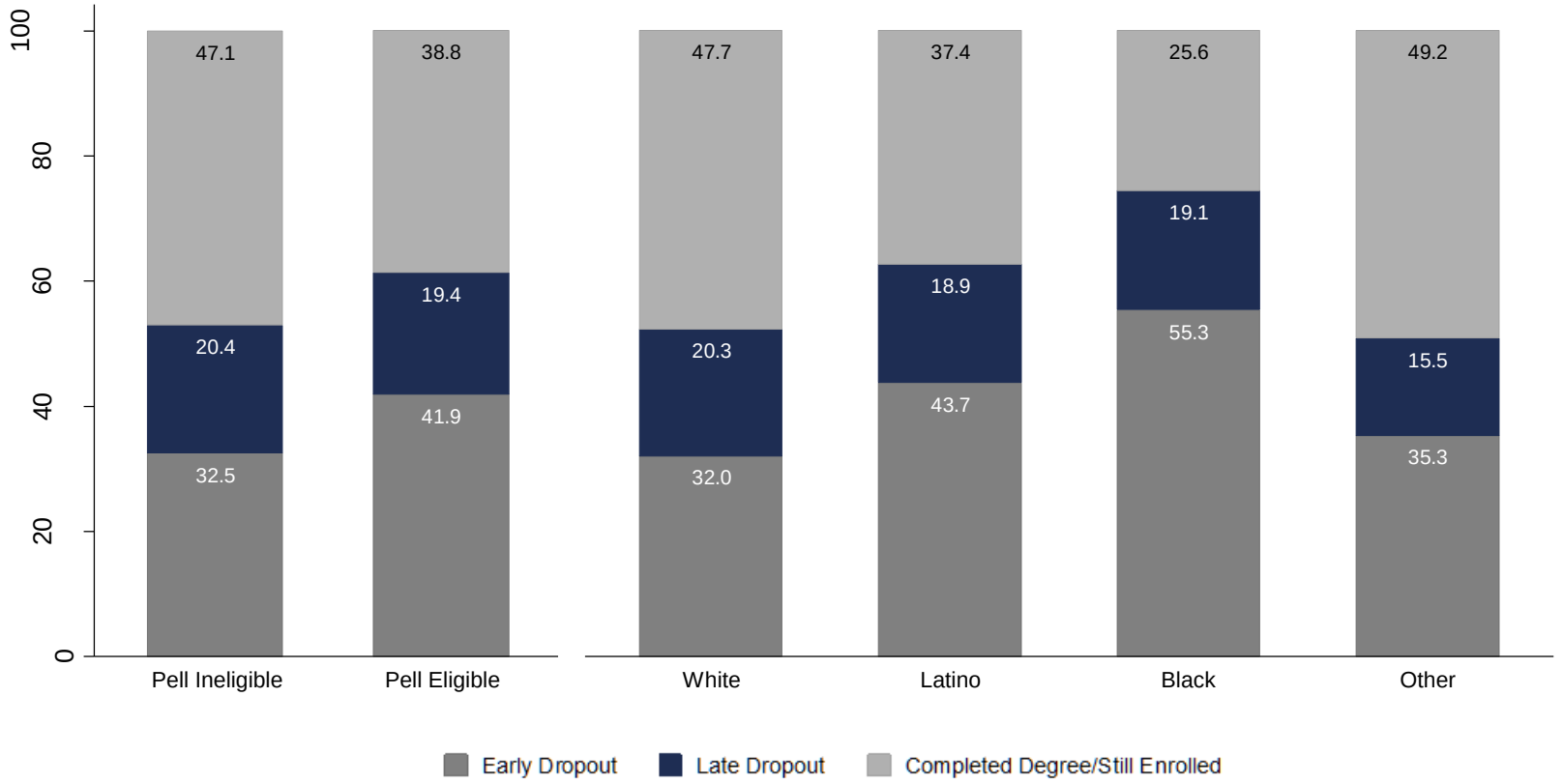
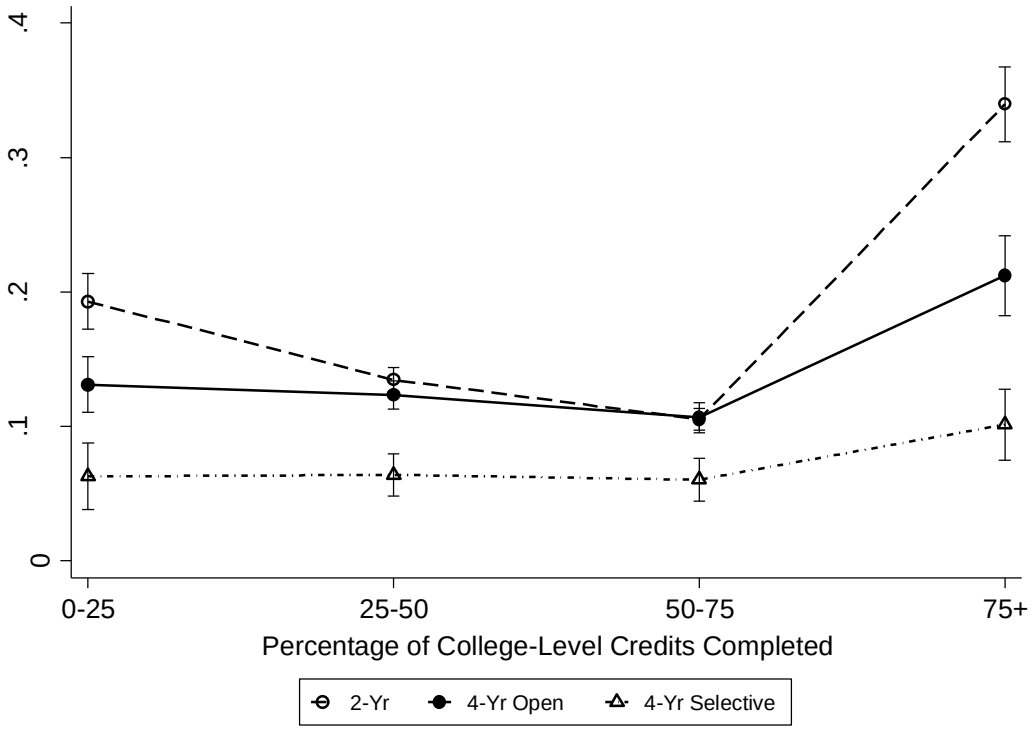
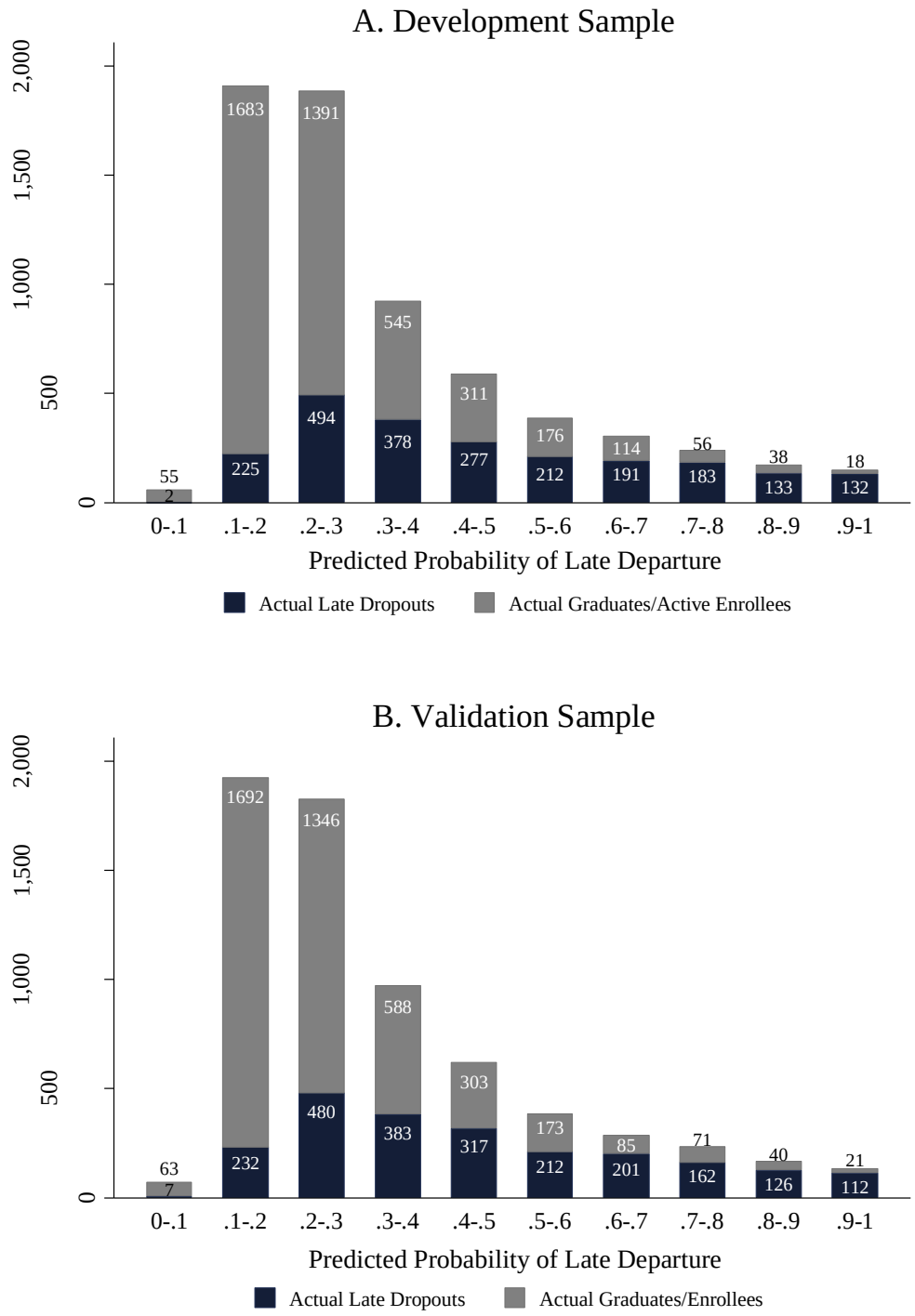


Figure 3. Fitted probabilities of dropout, by credits completed and college sector



Note: Fitted probabilities are estimated from a logit regression that includes twelve credit-by- degree categories and a constant. Ninety-five percent confidence intervals are shown around each point estimate.

Figure 4. Observed enrollment outcomes by the predicted probability of late departure, among students who first attended two-year colleges



Notes: The sample is conditioned on students who completed at least three-quarters of the credits typically required to earn a degree. Predicted probabilities are derived from logit regression models that include the predictors in Model 1 of Table 6. See Table 6 for details.

Table 1. Descriptive statistics for national, state, and analytic samples

	(1) National Sample	(2) State Sample	(3) Analytic Sample
	First-time degree-seeking undergraduates	*Enrolled in college w/in 16 months of hs graduation*	*Subset of students from column 2 with complete data*
Female	0.562	0.563	0.595
White	0.651	0.760	0.718
Black	0.124	0.125	0.157
Latino	0.126	0.084	0.094
Other Race	0.099	0.031	0.030
		[99,648]	
Age at college entry	21.300	18.508	18.481
	(0.140)	(0.489)	(0.480)
Pell eligible		0.458	0.451
		[65,516]	
HS GPA	3.105	3.019	3.016
	(0.786)	(0.613)	(0.617)
		[60,868]	
Seamless enrollee	0.654	0.887	0.909
First attended:			
2-Yr college	0.572	0.481	0.417
4-Yr open admissions college		0.191	0.228
4-Yr selective admissions college		0.328	0.355
Number of students	16,100†	101,103	54,012

Notes: Column 1 reports sample-weighted statistics computed by the authors using NCES PowerStats. The sample in column 1 is comprised of first-time degree-seeking undergraduates attending public colleges and universities in fall 2003. The samples in columns 2 and 3 are comprised of degree-seeking undergraduates ages 17-19 at high school graduation who enrolled at least half-time at public postsecondary institutions in Florida and Ohio within 16 months of high school completion. Unweighted means are reported in columns 2 and 3 with standard deviations in parentheses and the number of observations in brackets if less than the full sample. HS GPA is on a 4.0 scale. Seamless enrollees first entered college in the same year as their graduation from high school.

† Sample size is estimated

Sources: Florida Department of Education; Ohio Board of Regents; U.S. Department of Education, National Center for Education Statistics, 2003-04 Beginning Postsecondary Students Longitudinal Study.

Table 2. Sample departure rates conditional on completing 75% or more of college-level credits, by college sector and student attributes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
College sector first attended	2-Yr		4-Yr Open Admissions		4-Yr Selective		All	
A. Gender	%	N	%	N	%	N	%	N
Female	0.316	8,223	0.200	4,648	0.088	9,349	0.196	22,220
Male	0.371	5,005	0.231	3,252	0.123	5,801	0.236	14,058
B. Race								
White	0.315	9,707	0.191	5,678	0.094	12,229	0.192	27,614
Black	0.463	1,628	0.295	1,342	0.142	1,552	0.303	4,522
Latino	0.364	1,584	0.244	634	0.136	740	0.281	2,958
Other	0.249	309	0.187	246	0.107	629	0.160	1,184
C. Pell Eligibility Status								
Eligible	0.357	6,788	0.235	3,355	0.139	4,676	0.261	14,819
Ineligible	0.316	6,440	0.196	4,545	0.085	10,474	0.178	21,459
D. High School GPA (cumulative)								
Top Quartile	0.185	1,416	0.169	734	0.068	2,720	0.117	4,870
3rd Quartile	0.250	2,567	0.146	2,646	0.075	6,333	0.130	11,546
2nd Quartile	0.330	4,296	0.217	2,506	0.130	4,286	0.227	11,088
Bottom Quartile	0.432	4,949	0.311	2,014	0.176	1,811	0.351	8,774

Notes: The sample is comprised of degree-seeking undergraduates ages 17-19 at high school graduation who enrolled at least half-time at public postsecondary institutions in Florida and Ohio within 16 months of high school completion and completed 75% or more of the college-level credits typically required to graduate. Upper bound points for GPA quartiles (on 4.0 scale) are: Q1 =2.5; Q2 = 3.0; Q3 = 3.44.

Sources: Florida Department of Education; Ohio Board of Regents.

Table 3. Sample departure rates conditional on completing 75% or more of college-level credits, by college sector and experiences in college

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
College sector first attended	2-Yr		4-Yr Open Admissions		4-Yr Selective		All	
A. Initial Enrollment Timing	%	N	%	N	%	N	%	N
Immediately after high school	0.339	11,691	0.211	7,687	0.102	14,960	0.207	34,338
Delayed 1 or more semesters	0.326	1,537	0.254	213	0.111	190	0.297	1,940
B. Remediation Status								
Enrolled in remedial coursework	0.416	6,775	0.276	2,237	0.190	1,629	0.352	10,641
Did not enroll	0.254	6,453	0.188	5,663	0.091	13,521	0.154	25,637
C. Number of Schools Attended								
One	0.380	6,096	0.166	5,387	0.065	10,784	0.175	22,267
Two or more	0.300	7,132	0.313	2,513	0.194	4,366	0.269	14,011
D. Number of Stopouts								
None	0.251	8,681	0.152	6,371	0.074	13,196	0.146	28,248
One or more	0.501	4,547	0.466	1,529	0.292	1,954	0.443	8,030
E. Age at Time of Completing 75% of credits								
Less than 23	0.297	6,991	0.136	2,922	0.048	8,486	0.157	18,399
23 and older	0.382	6,237	0.258	4,978	0.171	6,664	0.268	17,879
F. Average Credits Attempted per Term								
Less than 12 credits	0.360	8,268	0.272	3,206	0.126	6,311	0.261	17,785
12 or more credits	0.299	4,960	0.172	4,694	0.084	8,839	0.164	18,493
G. Proportion of Credits Completed per Term								
Less than 0.80	0.614	3,549	0.579	1,165	0.466	1,470	0.572	6,184
0.80 to 0.90	0.350	2,471	0.293	1,097	0.150	1,826	0.270	5,394
0.90 to 1.0	0.196	7,208	0.121	5,638	0.049	11,854	0.109	24,700
H. Term GPA in College								
Top Quartile	0.262	2,814	0.170	1,885	0.069	4,370	0.150	9,069
3rd Quartile	0.213	3,318	0.171	1,795	0.066	3,957	0.141	9,070
2nd Quartile	0.295	3,246	0.184	2,048	0.090	3,775	0.184	9,069
Bottom Quartile	0.534	3,850	0.311	2,172	0.210	3,048	0.372	9,070

Notes: The sample is comprised of degree-seeking undergraduates ages 17-19 at high school graduation who enrolled at least half-time at public postsecondary institutions in Florida and Ohio within 16 months of high school completion and completed 75% or more of the college-level credits typically required to graduate. The number of schools, stopouts, and age at enrollment are calculated through the term in which students reached the 75 percent credit completion threshold. College academic measures are calculated as per-term averages over all terms following the completion of 75 percent of credits. Upper bound points for college GPA quartiles (on 4.0 scale) are: Q1 =2.06; Q2 = 2.61; Q3 = 3.28.

Sources: Florida Department of Education; Ohio Board of Regents.

Table 4. The evolution of academic performance among students completing 75% or more of college-level credits, by college sector and late departure status

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2-Yr		4-Yr Open Admissions		4-Yr Selective Admissions		All	
Outcome	Graduated or Still Enrolled	Dropped Out	Graduated or Still Enrolled	Dropped Out	Graduated or Still Enrolled	Dropped Out	Graduated or Still Enrolled	Dropped Out
A. Average credits attempted per term								
Credit interval 1 (0-25%)	13.228	12.805	14.643	14.261	14.058	13.774	13.931	13.318
Credit interval 4 (75% or more)	11.389	10.321	13.162	11.797	12.524	11.618	12.314	10.904
Percent change from interval 1 to interval 4	-13.9%	-19.4%	-10.1%	-17.3%	-10.9%	-15.7%	-11.6%	-18.1%
B. Proportion of credits completed per term								
Credit interval 1	0.916	0.865	0.930	0.866	0.940	0.874	0.930	0.867
Credit interval 4	0.905	0.752	0.939	0.788	0.951	0.773	0.934	0.764
Percent change from interval 1 to interval 4	-1.3%	-13.1%	0.9%	-9.0%	1.2%	-11.6%	0.4%	-11.9%
C. Term GPA in college								
Credit interval 1	2.428	2.130	2.273	2.040	2.410	2.041	2.386	2.092
Credit interval 4	2.705	2.250	2.677	2.367	2.813	2.364	2.750	2.299
Percent change from interval 1 to interval 4	11.4%	5.7%	17.7%	16.0%	16.7%	15.8%	15.3%	9.9%
Observations	8,769	4,459	6,221	1,679	13,608	1,542	28,598	7,680

Notes: The sample is comprised of degree-seeking undergraduates ages 17-19 at high school graduation who enrolled at least half-time at public postsecondary institutions in Florida and Ohio within 16 months of high school completion and completed 75 percent or more of the college-level credits typically required to graduate. Academic performance measures are constructed as per-term averages over all terms following completion of 75 percent of credits.

Sources: Florida Department of Education; Ohio Board of Regents.

Table 5. Conditional risk factors for departure by credit completion status and college sector (N = 90,290)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
College sector first attended	2-Yr		4-Yr Open Admissions		4-Yr Selective Admissions		
	Completed 75% or more credits	Difference (75+ minus 0-75)	Completed 75% or more credits	Difference (75+ minus 0-75)	Completed 75% or more credits	Difference (75+ minus 0-75)	χ^2 test: Risk of late departure equal across sectors?
Female	**-0.037**	-0.011	-0.006	0.027	**-0.010**	0.001	4.251
	(0.007)	(0.331)	(0.354)	(0.140)	(0.026)	(0.476)	(0.108)
Latino	**-0.055**	**-0.067**	-0.002	0.009	0.007	0.008	**8.547**
	(0.001)	(0.042)	(0.481)	(0.440)	(0.411)	(0.409)	(0.019)
Black	-0.002	**-0.073**	0.021	0.043	-0.002	0.006	0.659
	(0.469)	(0.003)	(0.306)	(0.165)	(0.440)	(0.409)	(0.426)
Other race	**-0.107**	**-0.128**	-0.034	0.034	-0.006	0.012	**13.950**
	(0.001)	(0.003)	(0.138)	(0.264)	(0.426)	(0.368)	(0.003)
Pell eligible	**-0.022**	-0.016	**-0.015**	0.004	0.004	0.004	**11.810**
	(0.031)	(0.191)	(0.038)	(0.411)	(0.110)	(0.321)	(0.001)
HS GPA (cumulative)	**-0.049**	**-0.025**	**-0.049**	-0.017	**-0.019**	-0.012	**6.605**
	(0.001)	(0.015)	(0.006)	(0.206)	(0.025)	(0.130)	(0.042)
Seamless enrollee	**0.081**	**0.295**	**0.042**	**0.202**	**0.025**	**0.082**	**20.860**
	(0.001)	(0.001)	(0.007)	(0.001)	(0.001)	(0.004)	(0.001)
Took remedial coursework	**0.110**	-0.010	0.019	0.000	**0.020**	0.011	**36.510**
	(0.001)	(0.401)	(0.206)	(0.511)	(0.011)	(0.274)	(0.001)
Attended 2 or more schools	-0.029	**0.062**	**0.070**	0.014	**0.057**	0.007	**16.070**
	(0.163)	(0.015)	(0.001)	(0.255)	(0.001)	(0.264)	(0.001)
Stopped out at least once	**0.192**	**-0.167**	**0.185**	**-0.120**	**0.068**	**-0.067**	**48.800**
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.086)	(0.001)

Table 5, Cont'd.

Age	-0.046	-0.011	-0.002	0.030	0.021	0.028	2.459
	(0.106)	(0.426)	(0.496)	(0.370)	(0.346)	(0.272)	(0.235)
Credits attempted	-0.014	0.007	**-0.050**	-0.025	-0.015	-0.002	4.048
	(0.361)	(0.440)	(0.003)	(0.163)	(0.108)	(0.440)	(0.115)
Proportion of credits completed	**-0.136**	**-0.090**	**-0.103**	**-0.058**	**-0.031**	**-0.021**	**25.790**
	(0.001)	(0.001)	(0.001)	(0.024)	(0.009)	(0.053)	(0.001)
College GPA (term)	-0.024	-0.020	**-0.030**	**-0.046**	**-0.016**	**-0.015**	1.237
	(0.175)	(0.236)	(0.014)	(0.001)	(0.016)	(0.045)	(0.354)

Notes: The sample is comprised of degree-seeking undergraduates ages 17-19 at high school graduation who enrolled at least half-time at public postsecondary institutions in Florida and Ohio within 16 months of high school completion. The number of schools, stopouts, and age measures are calculated through the term in which students completed the upper bound of each credit interval. College academic variables are calculated as the per semester average within each credit interval. Conditional risk factors are reported in percentage points and estimated from a fully interacted logit regression model evaluated at the average values of all covariates in the model. See text for model details. Estimates for high school and college GPA, age, and credits attempted are percentage point differences associated with a standard deviation increase from the mean. Estimates for the proportion of credits completed are percentage point differences associated with a one-half standard deviation increase from the mean. Adjusted p-values that account for multiple hypothesis testing and the clustering of students within schools are reported in parentheses. Point estimates in bold are statistically significant at the .10 level.

Sources: Florida Department of Education; Ohio Board of Regents.

Table 6. Student risk classifications from prediction models of college late departure by college sector

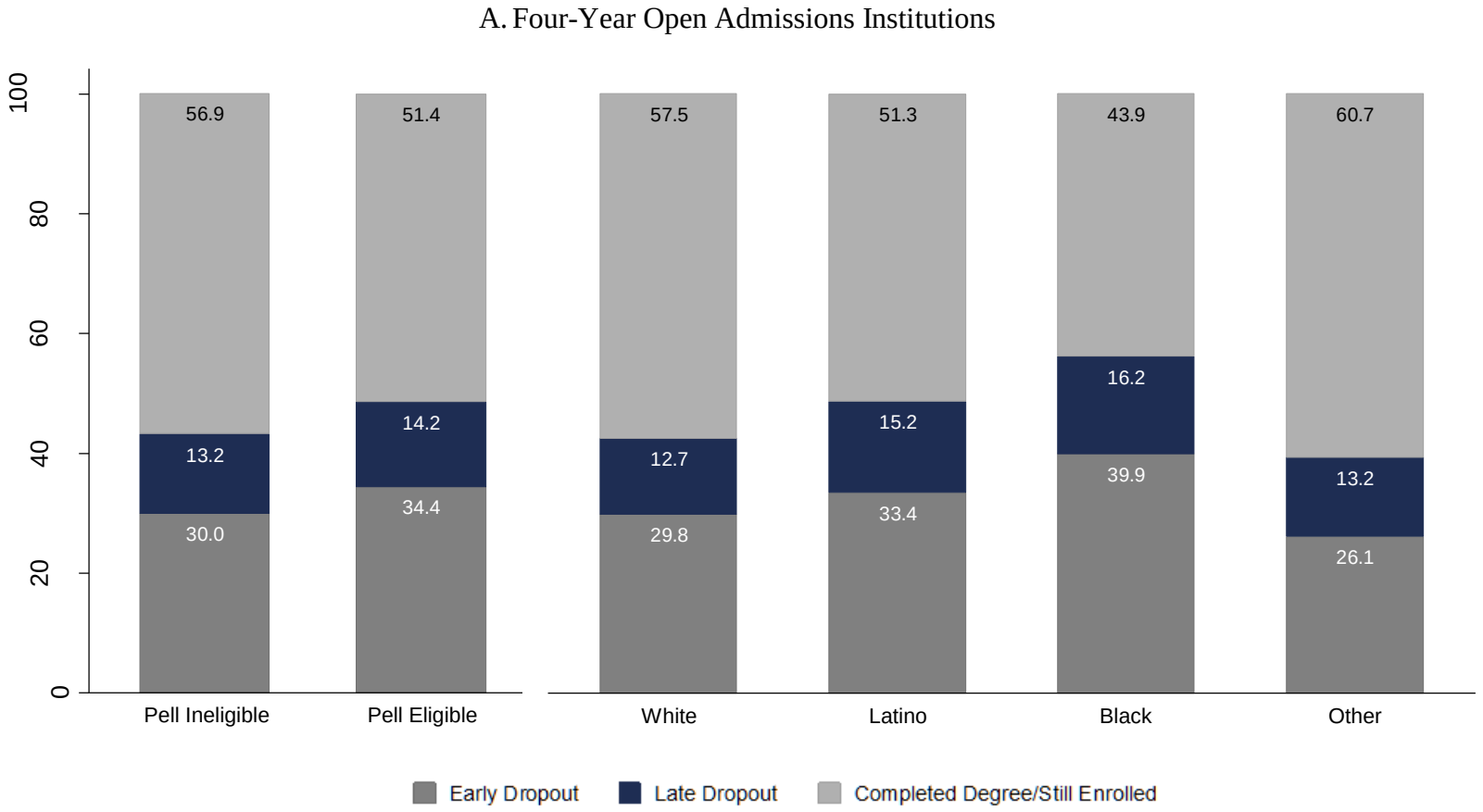
	(1)	(2)	(3)	(4)	(5)	(6)
	Development Sample			Validation Sample		
	2-Yr	4-Yr Open Admissions	4-Yr Selective Admissions	2-Yr	4-Yr Open Admissions	4-Yr Selective Admissions
A. Model 1: In absence of cross-institutional tracking						
Percent at-risk | late dropout	67.6	72.3	75.1	67.8	68.0	75.9
Percent not at-risk | not late dropout	71.3	76.6	81.3	70.8	77.5	81.7
Percent late dropout | at-risk	54.5	45.5	31.1	54.2	44.9	32.2
Percent not late dropout | not at-risk	81.3	91.1	96.7	81.2	90.0	96.7
Percent of students correctly classified	70.1	75.7	80.7	69.8	75.5	81.1
Concordance statistic	0.77	0.81	0.85	0.76	0.79	0.86
B. Model 2: In presence of cross-institutional tracking						
Percent at-risk | late dropout	74.3	76.3	78.6	73.8	73.7	79.3
Percent not at-risk | not late dropout	69.7	78.8	83.1	69.2	78.7	82.4
Percent late dropout | at-risk	55.5	49.3	34.3	55.0	48.3	34.1
Percent not late dropout | not at-risk	84.2	92.5	97.2	83.8	91.7	97.2
Percent of students correctly classified	71.3	78.3	82.7	70.7	77.6	82.1
Concordance statistic	0.80	0.85	0.88	0.79	0.83	0.88
Probability cut-off used to assign risk status	0.3	0.2	0.1	0.3	0.2	0.1
Observations	6,614	3,950	7,575	6,614	3,950	7,575

Notes: The sample is comprised of degree-seeking undergraduates ages 17-19 at high school graduation who enrolled at least half-time at public postsecondary institutions in Florida and Ohio within 16 months of high school completion and completed at least three-quarters of the credits typically required to earn a degree. Risk classifications are derived from logit regression models used to predict the probability of late departure. The predictors in Model 1 include: indicators for gender, race and Pell Grant eligibility status; age at the time the student exceeded the three-quarter credit threshold and the square of this term; whether the student transferred schools prior to exceeding the three-quarter credit threshold; and the average term GPA, average number of credits attempted per term; and the average proportion of credits earned per term after reaching the three-quarter credit threshold. Model 2 includes all predictors from Model 1 as well as the full set of prior achievement and college experience predictors specified in Table 5.

Sources: Florida Department of Education; Ohio Board of Regents.

APPENDIX

Figure A1. The share of college entrants that are late dropouts at four-year institutions, by Pell Grant eligibility status and race/ethnicity



B. Four-Year Selective Admissions Institutions

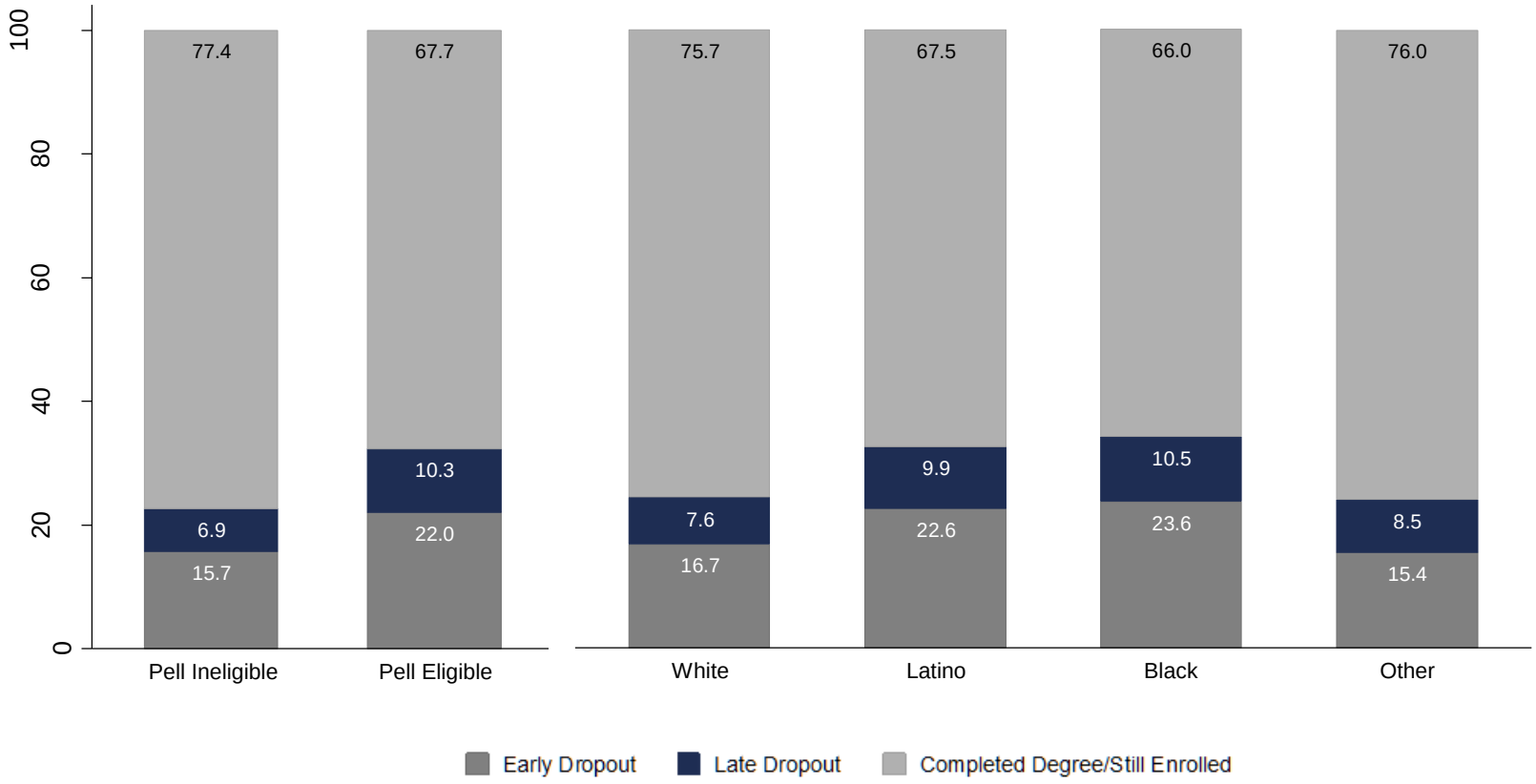


Table A1. Sample departure rates by credit completion status and college sector

Type of institution first attended	(1) 2-Yr	(2) 4-Yr Open Admissions	(3) 4-Yr Selective	(4) All
Share of departures among students that…	Panel A. Before 25% of credits completed			
Ever enrolled in college	0.197	0.133	0.064	0.135
Reached the credit threshold	0.197	0.133	0.064	0.135
	[22,499]	[12,318]	[19,195]	[54,012]
Ever dropped out	0.343	0.291	0.248	0.310
	Panel B. 25-50% of credits completed			
Ever enrolled in college	0.108	0.108	0.061	0.091
Reached the credit threshold	0.136	0.125	0.065	0.106
	[17,915]	[10,614]	[17,881]	[46,410]
Ever dropped out	0.188	0.236	0.235	0.209
	Panel C. 50-75% of credits completed			
Ever enrolled in college	0.072	0.080	0.053	0.067
Reached the credit threshold	0.106	0.108	0.061	0.088
	[15,259]	[9,120]	[16,603]	[40,982]
Ever dropped out	0.124	0.175	0.205	0.153
	Panel D. 75% or more of credits completed			
Ever enrolled in college	0.198	0.136	0.080	0.142
Reached the credit threshold	0.337	0.213	0.102	0.212
	[13,228]	[7,900]	[15,150]	[36,278]
Ever dropped out	0.345	0.299	0.312	0.327

Notes: The sample is comprised of 1999-2000 degree-seeking undergraduates ages 17-19 at high school graduation who enrolled at least half-time at public postsecondary institutions in Florida and Ohio within 16 months of high school. The number of students that ever enrolled at 2-, 4-year open admission, and 4-year selective institutions are 22,499, 12,318, and 19,195, respectively. The numbers of students that ever dropped out are 12,943, 5,618, and 4,947, respectively. The numbers of students that reached each credit threshold are reported in brackets.

Sources: Florida Department of Education; Ohio Board of Regents.

Table A2. Conditional probability of departure by credit completion status and college sector (N = 177,682)

	(1)	(2)	(3)	(4)	(5)	(6)
		Model 1			Model 2	
Proportion of college-level credits completed	2-Yr	4-Yr Open Admissions	4-Yr Selective Admissions	2-Yr	4-Yr Open Admissions	4-Yr Selective Admissions
0-25%	0.193	0.131	0.063	0.161	0.101	0.047
	(0.172 - 0.214)	(0.110 - 0.152)	(0.038 - 0.088)	(0.151 - 0.171)	(0.090 - 0.112)	(0.039 - 0.056)
25-50%	0.135	0.123	0.064	0.115	0.114	0.060
	(0.126 - 0.144)	(0.113 - 0.134)	(0.048 - 0.080)	(0.106 - 0.124)	(0.105 - 0.123)	(0.054 - 0.066)
50-75%	0.105	0.106	0.060	0.106	0.126	0.066
	(0.097 - 0.113)	(0.095 - 0.118)	(0.045 - 0.076)	(0.094 - 0.118)	(0.112 - 0.139)	(0.054 - 0.078)
75% or more	0.340	0.212	0.101	0.409	0.288	0.144
	(0.312 - 0.367)	(0.182 - 0.242)	(0.075 - 0.128)	(0.371 - 0.447)	(0.257 - 0.319)	(0.120 - 0.169)
χ^2 test: Is the probability of departure equal across credit intervals?	**782.8** (0.001)	**39.23** (0.001)	**14.33** (0.006)	**184.9** (0.001)	**105.7** (0.001)	**88.20** (0.001)
χ^2 test: Is the probability of late departure equal across college sectors?		**149.2** (0.001)			**220.5** (0.001)	
Demographic + college experience controls					✓	

Notes: The sample is comprised of degree-seeking undergraduates ages 17-19 at high school graduation who enrolled at least half-time at public postsecondary institutions in Florida and Ohio within 16 months of high school completion. Conditional probabilities of departure are estimated from logit regression models. The covariates in Model 2 include: indicators for gender, race and Pell Grant eligibility status; high school GPA and GPA squared; whether the student entered college immediately following high school graduation; whether the student took one or more remedial education courses; whether the student stopped out at least once prior to exceeding credit threshold c; whether the student ever transferred schools prior to exceeding credit threshold c; age at the time the student exceeded credit threshold c and the square of this term; average term GPA in each credit period; average number of credits attempted per semester in each credit period; and the average proportion of credits earned per semester in each credit period. Lower and upper bounds of the 95% confidence interval around fitted probabilities are displayed in parentheses and account for the clustering of students within schools. Adjusted p-values that account for multiple hypothesis testing are displayed in parentheses below chi-square statistics. Point estimates in bold are statistically significant at the .10 level.

Sources: Florida Department of Education; Ohio Board of Regents.