Are Course Withdrawals a Useful Student Success Strategy?

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Course withdrawals have significant cost and curricular implications for both students and institutions. Yet within the retention literature, little is known about the context or impact of course withdrawals. This study examines course withdrawals of first year students from a sample of nine universities. Data reveal that demographic and contextual factors differentially influence the use of course withdrawals. Further, these data suggest that course withdrawals have negative consequences for second year retention, with nuanced significance when compared to making grades of D or F. We discuss implications for academic advisors, retention specialists, and faculty leaders, as well as policy and future research considerations.

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Withdrawal from college has been an important topic in the higher education literature for a half century. Spady (1970) and Tinto (1975, 1993) referenced an interactionist model of student retention. Theorists Bean (Bean & Eaton, 2002), Astin (1993), and Padilla (1999) have identified individual characteristics (e.g., motivation, self-efficacy) and ecological factors (e.g., cultural relevance) that interact to influence the matriculation and persistence of students in postsecondary education. A diverse body of research has reinforced that the interaction of demographic and contextual factors impacts students' social and academic integration or engagement, persistence, and eventual goals for graduation.

For example, empirical research has examined student and institutional factors that relate to premature departure from college. Scoggin and Styron (2006) found personal, financial, and work reasons the most common explanations. They also identified some gender and race interactions—whereas women cite personal reasons, men more often cite work, and African-American students cite financial reasons more frequently. Meeuwisse, Severiens, and Born (2010) found similar results, concluding that most students depart higher education due to personal or home reasons, followed by job prospects, poor quality of education, ability deficits, and finally a perceived negative culture. While they discovered that low income and minority students drop out at a higher rate, demographic differences were not significant when examining the reasons reported for leaving school. These studies are a sample of a broader body of work that explores themes such as social support and motivation (Christie, Munro, & Fisher, 2004), financial obligations and gender (Davies & Elias, 2003), and culture (Read, Archer, & Leathwood, 2003), among others.

A microcosm of university withdrawal is course withdrawal. Markers or signs of progress, like course completions, are critical to on-time progress and persistence in college. Applying broader theories of retention, course withdrawal too is an interaction between personal and institutional or classroom factors. However, unlike theory and research on retention, research specifically on *course* withdrawal has been sparse, the scholarship is dated, and the quality of studies has varied. To address this gap, we investigate both the predictors and impact of course withdrawal within a large sample of diverse institutions.

Course Withdrawal

According to Stewart and Martinello (2012), "Students' performance and progress in post-secondary education is multidimensional and, we contend, not well captured by a single measure such as final course grades" (p. 28). Students search and sample courses on most campuses during a set drop/add period. Once students remain enrolled past this exploratory period, the only way to leave a course may be course withdrawal. Thus, Adams and Becker (1990) compared students' satisfaction with a course when exploring course withdrawal to customers considering a warranty or return period on merchandise. They contended that course withdrawal could be viewed as an instructional or product failure (by class, not institution). Dunwoody and Frank (1995) suggested that course withdrawal is a complex interaction of student, instructor, and course. Therefore, course withdrawal (leaving a course past the institutional drop window) is a behavioral indicator that may suggest instructional failure, changing personal circumstances, a lack of

academic integration, or a combination of challenges. In all, while not a precise measure of engagement, Adelman (2006) described course withdrawal and its effects on students as "degree-crippling" (p. xxii).

Parallel to the retention literature, the available research on course withdrawal most commonly explored the reasons for student withdrawal from courses. For example, Adams and Becker (1990) examined five large enrollment courses at the University of Minnesota. They found several factors significantly and positively related to course withdrawal, including higher number of credits attempted during the semester, more experience in college, previous withdrawals, and lower GPAs. Several of the factors determined not significant included transfer status, ethnicity, gender, athletic enrollment, income (those receiving financial aid), class size, and whether the course was in the student's major. Oddly, although class size did not appear significant, Adams and Becker found that the faculty with higher teaching loads (the number of students taught) had significantly fewer students withdrawing from their courses. These are the common findings in the aggregate, but Adams and Becker noted that each specific course demonstrated different patterns and significance of factors varied by course.

At one Canadian university, Stewart and Martinello (2012) found that transfer students were less likely to withdraw, although this trend was not statistically significant across different courses. Like Adams and Becker, they found that course type mattered (e.g., withdrawal and course grades differed based on subject matter) and students with more credits were more likely to withdraw, although gender was not a significant factor.

Over time, studies on course withdrawal focused on specific disciplines. For example, Boldt, Kassis, and Smith (2015) suggested that students with a previous history of withdrawals and those on merit scholarships were more likely to withdraw from business classes. Further, course withdrawals were more common in accounting courses as compared to introductory economics of business law classes. Overall, they found that African-American students, students with more credits, and students with higher grade point averages (GPAs) and SAT scores were less likely to withdraw from courses. In a similar study, Nicholls and Gaede (2014) examined withdrawal circumstances in engineering courses. Like Boldt, Kassis, and Smith, they identified a combination of significant (e.g., transfer status, low GPA) and nonsignificant (e.g., gender, race) factors common among students who withdraw and/or extend their time to graduation.

In addition to these quantitative inquiries on administrative data (e.g., SAT scores), some of the descriptive studies used surveys or interviews to query students about course withdrawals. In one of the earlier studies, Reed (1981) identified satisfaction with performance (i.e., students' confidence), motivation (i.e., relevance to major or academic goals) and impressions of the instructor (i.e., whether they were likable or helpful) as the main factors for students who withdrew from a random sample of five classes from Kansas State University. Although this and other early research (e.g., Bean & Metzner, 1985; Semb, Glick, & Spencer, 1979; Wollman & Lawrenz, 1984) sometimes characterized withdrawal as instructional failure, Dunwoody and Frank (1995) found the main reason for course withdrawals to be work responsibilities or family issues, as over a third of the students cited these personal reasons. Fewer withdrawals were attributed to students not liking the course, not understanding material, or experiencing problems with the faculty. Other studies (Meeuwisse et al., 2010; Scoggin & Styron, 2006) also found personal or home situations to be the most prominent explanation for course withdrawal. Finally, in a recent study, Michalski (2014) analyzed students' written explanations for withdrawals. He found common academic explanations included schedule adjustments, instructional delivery mode, and issues with faculty, while common nonacademic rationales included family, financial, health, and work issues.

In conclusion, results are mixed on why students withdraw from courses, and little is known about the implications of course withdrawal. However, research does indicate that course withdrawal may impact student retention and degree completion. Daubman, Williams, Johnson, and Crump (1985) found that students who withdrew from college often had frequent course withdrawals prior to departure. Adelman (2006) estimated that the probability of earning a degree is reduced by one half, with the majority of students leaving in the first year, if the ratio of courses uncompleted to courses attempted is greater than 20%. We explore both the use and impact of course withdrawals next.

Research Questions

The research literature mostly consists of studies with small sample sizes and few or a narrow array of courses. This body of work has identified possible

variables (e.g., gender) that we utilized in our inquiry. We included multiple universities, thousands of students, and hundreds of courses to explore two primary research questions:

RQ1. What demographic/contextual factors predict student withdrawal from a course?

RQ2. What impact does course withdrawal have on first- to second-year student retention?

We compared these findings to students earning D or F final grades in the same courses to understand the behavior of course withdrawal and its impact on student success.

Methods

Sample

The data for this study included 126,034 students from 9 different universities who first enrolled between August 2009 and September 2014 and were members of the Predictive Analytics Reporting (PAR) Framework division of Hobsons, Inc. The institutions were public four-year universities located in the Upper Midwest and Southeast United States that ranged from inclusive to selective admissions criteria according to Carnegie classifications. Data points were captured within students' first Fall and Spring terms at their institutions.

Participating colleges and universities provided anonymized student level data for all credential-seeking students who first began taking courses in August 2009 or later. An important component of the dataset was the openly published common data definitions by all member institutions. The consistency and the range of variables collected by member institutions made it possible to more effectively control for confounding variables that might be contributing to observed differences between students of interest. While these data sets do not provide the authors a random sample of universities across the United States, they do provide a large sample of diverse universities for which we have clean and complete data to address key questions about withdrawal from courses.

Variables

Similar to previous research, a number of variables were considered as possible predictors of course withdrawals and as control variables in modeling the relationship between course withdrawals and students failing to retain to the next year (i.e., stopping out). Variables were selected based on findings from previous literature and availability. In the models for stop-outs, variables describing course grades and course withdrawals were also included. The full list of variables and descriptions can be found in Table 1. To avoid the possibility of data leakage, a phenomenon in which data not known until a later point in time or data on the outcome variable is inadvertently included among the independent variables, the values for each of these variables represent what was known only as of the student's first term at the university for predicting withdrawals and second term at the university for predicting stop-outs.

Continuous variables were binned to improve interpretability and/or to improve model fit when the relationship between a continuous variable and the log-odds of the outcome was not linear. Importantly, statistical significance did not change for any variables when we used the categorized variables in place of the original continuous variables. For example, we suspected students who entered a university less academically prepared would be more likely to withdrawal from courses. To test this, we used information on students' high school GPAs split into five categories: HS GPA < 2, $2 \leq$ HS GPA ≤ 3, $3 \leq$ HS GPA ≤ 4, HS GPA > 4, and Not Reported. Binning high school GPA in this way resulted in better model fit in most of our models and no worse model fit in all of the models when compared to treating high school GPA as a continuous variable. In another example, credit attempts for a student's first semester were split into three categories: fewer than 12 credits per term, 12–14 credits per term, and greater than 14 credits per term. This categorization was designed to improve interpretability by differentiating students traditionally considered to be part time, students generally considered full time but taking fewer than 15 credits, and students taking 15 or more credits in a term. This categorization also resulted in better model fit than when credits attempted were treated as continuous or binary (i.e., part-time versus full-time).

Finally, in order to assess the relationship between course withdrawals, D or F grades, and student retention, data on a student's course outcomes during their first academic year were included. In an effort to account for the nonlinear relationships between these variables and student retention, the varying number of course credits attempted among students, and to make the results as interpretable as reasonably possible, these variables were binned into distinct

Table 1. Variables considered

	Demographics
Age at Entry	Based on the age of the student when they first entered the university, and split into three categories: (1) 18 and Under; (2) 19 to 24; and (3) 25 and Older.
FAFSA	Indicates whether a student filled out a FAFSA prior to enrolling (Yes or No).
Gender	Gender of the student (Female or Male).
Pell	Indicates whether a student received a Pell Grant as of their first (or second) term at the university (Yes or No).
Race	Race of the student, split into four categories: (1) African-American; (2) Hispanic; (3) Other Minority; and (4) White.
	HS/Transfer Information
High school GPA	Student's self-reported high school GPA, split into five categories: (1) HS GPA $<$ 2; (2) 2 $\leq$ HS GPA $\leq$ 3; (3) 3 $\leq$ HS GPA $\leq$ 4; (4) HS GPA $>$ 4; and (5) Not Reported.
Prior credits	The number of academic credits earned by a student prior to entering the university (including credits transferred from another college/university and college credits earned while a student was in high school), split into four categories: (1) 1 to 4; (2) 5 to 30; (3) Greater than 30; and (4) No Prior Credits.
Transfer	Indicates whether a student is a transfer student (Yes or No).
	Major/Course Taking
Course credits attempted	For predicting withdrawals, credits attempted are based on a student's credit attempts in their first term. For predicting retention, credits attempted are cumulative credits attempted as of the end of a second term divided by the number of terms the student was active. This method ensures the variable is on the same scale for students who stopped-out prior to their second term as it is for students who persisted to a second term. For both outcomes, the variable is split into three categories: (1) $<$12 credits attempted; (2) 12–14 credits attempted; and (3) 15 or more credits attempted.
Course delivery mode	If a student is attempting 100% of their credits online, the student's delivery mode is "Fully Online." If the student is attempting 100% of their credits in person, their delivery mode is "Fully On-ground." For students taking both online and in-person courses, their delivery mode is "Blended".
Developmental education taken	Indicates whether a student has attempted developmental education courses (Yes or No).
STEM major	Indicates whether the student is majoring in a STEM field (Yes or No).
Undeclared major	Indicates whether the student's major is undeclared (Yes or No).
	Course Performance*
C ratio	The percentage of credits attempted resulting in grades of C, split into four categories: (1) 0%; (2) 0% $<$ C Ratio $\leq$ 20%; (3) 20% $<$ C Ratio $\leq$ 50%; and (4) Greater than 50%.
D ratio	The percentage of credits attempted resulting in grades of D, split into three categories: (1) 0%; (2) 0% $<$ D Ratio $\leq$ 20%; and (3) Greater than 20%.
F ratio	The percentage of credits attempted resulting in grades of F, split into four categories: (1) 0%; (2) 0% $<$ F Ratio $\leq$ 20%; (3) 20% $<$ F Ratio $<$ 100%; and (4) 100%.
Withdrawal ratio	The percentage of credits attempted that were withdrawn, split into four categories: (1) 0%; (2) 0% $<$ F Ratio $\leq$ 20%; (3) 20% $<$ F Ratio $<$ 100%; and (4) 100%.

Note. FAFSA = Free Application for Federal Student Aid; HS = high school; GPA = grade point average; and STEM = science, technology, engineering, or mathematics. These variables are only considered for the models predicting student retention and are calculated at the end of the student's first academic year, or as of the student's last date active at the institution, whichever occurred first.

categories as outlined in Table 1. The cutoffs for the bins were selected to be intuitive and actionable for university decision makers. For instance, for a student attempting 15 credits per term, withdrawing from 20% of courses corresponds to 3 credits (equal to one course per term in most courses at most institutions). For both F credits and withdrawn credits, it was necessary to create a separate group for those who made Fs in or withdrew from 100% of their attempted credits, as very few of these students retained to their second year. For this reason, and because these students may have had challenges not captured in the data, this report focuses on the middle two levels of F credits and withdrawn credits.

For simplicity, students with 1 to 20% of D credits, F credits, or withdrawn credits will be referred to as students with a low percentage of credits in the respective category, while students with 21% to 99% (or 21% to 100% in the case of D grades) will be referred to as students with a high percentage of credits within the respective category. Binning D grades, F grades, and course withdrawals based on the percentage each comprises of a student's total course-credit outcomes resulted in better model fit than when treating these variables as continuous or binary (i.e., any course withdrawals versus zero course withdrawals). The percentage of course credits resulting in C grades were also included and categorized slightly differently to improve model fit. In short, using percentages rather than withdrawal totals allowed us to account for the fact that withdrawing from a single course may have a differential impact for a student attempting 15 credit hours compared to a student attempting 6 credit hours, and the categorizations of those percentages serve to improve both interpretability and model fit.

Data Analysis

To answer RQ1 of our study—what predictors or student characteristics are associated with course withdrawal—we used binary logistic regression to model whether a student had one or more course withdrawals within the student's first term. We did not look beyond the first term for this question so we could focus on predictors that universities can be aware of before a student begins taking courses and to avoid the challenges of accounting for students who drop out after their first term. For this question, withdrawals were initially considered as a binary variable (i.e., zero withdrawals in the first term, or at least one withdrawal in the first term), an ordinal variable, and a count variable in a negative binomial regression. Because the models in which withdrawals were treated as a binary variable fit the data best based on the Alkaike Information Criterion (AIC), withdrawals were treated as a binary dependent variable thereafter.

Separate models were built for each participating institution, as pooling the data together would introduce a hierarchical structure with students grouped within universities. Failing to account for such a grouped structure could lead to biased estimates of standard errors. Other alternatives included both fixed- and random-effects multilevel regression models to account for the hierarchical structure while still pooling the data in a single model. However, because a fixed-effects model assumes the coefficients for independent variables do not vary by each level (or, in our case, universities), we determined this would be an inappropriate choice for our data, as we observed differences in coefficients for many of the independent variables when modeling each institution separately. Furthermore, a random-effects model would assume the universities in our study were selected randomly from a theoretical population of interest (Snijders, 2005). Because this was not the case for our dataset, we chose to build separate models for each participating institution.

The second goal of the study was to estimate the impact of course withdrawals on student retention and to compare the impact of withdrawals to that of D grades and F grades. These variables were captured at the end of a student's first year. Additionally, the student's course delivery mode and course credits attempted were updated to reflect their values at the end of the first academic year. Once again, binary logistic regression was used to estimate the relationship between withdrawing from courses and stopping out (or not retaining enrollment to the following year) prior to the student's second year. All models in the study were checked for multicollinearity among the independent variables by dummy coding variables in a linear regression and assessing the variance inflation factor (VIF). No variable in any of the regression models had a VIF greater than 10, a common rule of thumb used when checking for multicollinearity (Dormann et al., 2013).

Effect sizes for independent variables were expressed as odds ratios, a commonly used metric to measure relationships between categorical variables in logistic regression (Allison, 2012). Odds ratios greater than one indicate greater odds

of stopping out, while odds ratios below one indicate lesser odds. The further the odds ratio is from 1.0, the stronger the relationship between the predictor and the outcome.

Results

Predicting Withdrawals

The first phase of the study was to determine what variables might predict a student's decision to withdraw from a course in their first term. The overall percentage of students who withdrew from at least one course in their first term was approximately 20%. This figure ranged from 15%–25% across the nine universities, suggesting some variability in the number of students withdrawing from courses across institutions. For brevity, the results will focus on relationships that were found to be statistically significant at the alpha = .05 level.

After building logistic regression models for each institution, a handful of common predictors emerged. Among the demographic variables considered, Pell recipients had greater odds of withdrawing from at least one course at seven of the universities (odds ratios ranged from 1.13 to 1.85). At six of the universities, African-American students had greater odds of withdrawing from at least one course than white students (odds ratios ranged from 1.24 to 1.47). At four universities, female students had lower odds of withdrawing from at least one course when compared to male students (odds ratios ranged from 0.82 to 0.93). Additionally, students at four institutions who were between 19 and 24 years old at entry had higher odds of withdrawing from at least one course than students who were 18 or younger (odds ratios ranged from 1.16 to 1.38), and students at two universities who filled out a FAFSA had slightly higher odds of withdrawing.

Among the High School/Transfer variables, we found that students at seven institutions who reported high school GPAs above 4.0 had much lower odds of withdrawing from at least one course than students reporting high school GPAs below 2.0 (odds ratios ranged from 0.10 to 0.60). It's worth noting that there was some correlation between transfer students and prior credits, but not enough to warrant concerns of multicollinearity. Among these two variables, the most noteworthy finding was that students at four institutions who entered with 4-30 prior credits had lower odds of withdrawing from at least one course than students entering with no prior credits (odds ratios ranged from 0.69 to 0.87). Students entering with over 30 prior credits had lower odds of withdrawing from three of those same institutions. Transfer students were more likely to withdraw at two of these four institutions and at one of the universities where having 4–30 or over 30 prior credits was not a significant predictor.

The final group of variables considered for predicting withdrawals were those related to a student's major at entry and the number and types of course credits a student attempted in their first term. The strongest finding among the course-taking and major variables was that students attempting 15 or more credits in their first term had much greater odds of withdrawing from at least one course than both students attempting fewer than 12 credits and students attempting 12 to 14 credits at all nine institutions. At five universities, students who attempted at least one developmental education (Dev. Ed.) course had greater odds of withdrawing than students who had attempted zero Dev. Ed. courses (odds ratios ranged from 1.16 to 1.45). We did not find that fully online students generally had greater odds of withdrawing from a course, as this was the case at only one of the nine universities. In fact, at two of the universities, fully online students actually had lower odds of withdrawing when compared to fully on-ground students, and course delivery mode was not a significant predictor at a majority of the institutions. Undeclared majors also had greater odds of withdrawing at three of the universities. Odds ratios for each level of the independent variables and the corresponding significance level for each institution can be found in Table 2.

The Impact of Ds, Fs, and Withdrawals on Retention

The distributions of withdrawn credits during a student's first year at the institution are heavily skewed. A majority of students had zero withdrawals, and over 75% of students had 3 withdrawn credits or fewer. Table 3 shows how retention rates varied by the D, F, and withdrawal ratios across the full dataset. Differences between 0% and 1% to 20% (where 1% to 20% would correspond to one or two 3 credit courses for a student attempting 30 credits over two terms) were small for each of the three ratios. Much larger differences were observed among students withdrawing from over a fifth of their course credits. Retention rates were also lower for those withdrawing from a high percentage of their course credits than for those making Ds in a high

Table 2. Odds ratio estimates for predicting course withdrawals across all institutions

Variable/ Institution	1	2	3	4	5	6	7	8	9
STEM major, no vs. yes	1.04	1.03	1.21***	0.97	1.08	0.76	0.85*	0.95	0.94
FAFSA, no vs. yes	0.93	0.89*	0.93	0.78**	0.95	0.83	1.02	1.00	0.93
Race, African-American vs. White	1.07	1.37**	1.45**	1.10	1.25**	1.24*	1.36*	1.47**	1.39
Race, Hispanic vs. White	1.06	1.25**	1.33**	1.10	1.24	1.13	1.47*	1.26	1.03
Race, other minority vs. White	0.97	1.11	1.07	1.01	1.21**	1.01	1.46*	1.32**	1.18
Pell Grant, yes vs. no	1.22***	1.47***	1.20**	1.85***	1.13*	1.40***	1.33***	1.19	0.90
Undeclared major, yes vs. no	1.27***	1.29***	1.27***	1.20	1.12	1.13	1.12	0.96	N/A
Delivery mode, all others vs. fully online	1.72***	1.13	1.96**	0.78	1.29**	1.07	1.30	1.53	0.60
Delivery mode, fully on-ground vs. fully online	1.48***	0.68***	1.94**	0.74	0.97	0.94	1.21	1.43	0.46
Gender, female vs. male	0.93*	0.82***	1.04	0.87	1.03	1.05	0.84**	0.82**	0.97
Attempted dev. ed., yes vs. no	1.13*	1.16*	0.88*	1.45***	1.18*	n/a	1.28***	0.91	1.12
Transfer student, no vs. yes	1.09	0.83*	0.58***	0.98	1.06	0.86	0.81	0.75	0.64**
HS GPA, 2–3 vs. <2	1.17	0.63	1.47	0.86	1.40	0.95	0.60	1.23	1.16
HS GPA, 3–4 vs. <2	0.91	0.30***	0.81	0.56	1.00	0.69**	0.30***	0.83	0.74
HS GPA, >4 vs. <2	0.54***	0.11***	0.30***	0.10***	0.43	0.60**	0.14***	0.19***	0.48
HS GPA, not reported vs. <2	1.03	0.44***	0.93	0.89	1.15	0.79	0.58***	0.93	1.07
Prior credits, 1–4 vs. no prior credits	0.81**	0.92	0.71***	0.75	0.63**	0.96	1.44	1.09	na
Prior credits, 4–30 vs. no prior credits	0.87**	0.81**	0.69***	0.75*	1.10	1.08	1.44**	0.97	na
Prior credits, >30 vs. no prior credits	1.04	0.85**	0.64***	0.67*	0.85	0.97	1.07	0.83	na
Student age at entry, 19–24 vs. 18 and under	1.16*	1.23**	1.07	1.04	1.21**	1.15	0.94	1.38**	1.12
Student age at entry, 25 and older vs. 18 and under	1.08	1.21**	1.09	1.13	1.54**	1.23	0.88	1.63**	1.13
Credits attempted, less than 12 vs. 15 or more	0.47***	0.25***	0.45***	0.40***	0.40***	0.45***	0.49***	0.42***	0.44***
Credits attempted, 12–14 vs. 15 or more	0.42***	0.45***	0.49***	0.60***	0.40***	0.66***	0.53***	0.42***	0.52***

Note. * = $p < .05$; ** = $p < .01$; *** = $p < .001$. STEM = science, technology, engineering, or mathematics; FAFSA = Free Application for Federal Student Aid; HS = high school; and GPA = grade point average.

Table 3. Percent of students retained by ratio of D grades, F grades, and withdrawn courses

Ratio of Credits with Letter Grade to All Credit Attempts	0%		1% to 20%		21% to 99% (21% to 100% for D Ratio)		100%	
N / % retained	*N*	%	*N*	%	*N*	%	*N*	%
D grade ratio	78,930	76%	21,319	80%	25,785	70%	N/A	N/A
F grade ratio	86,280	82%	22,439	81%	22,439	54%	2,643	18%
Withdrawal ratio	82,706	79%	17,133	79%	17,133	61%	1,667	15%

percentage of their course credits and lower still for those making Fs in a high percentage of their course credits. However, these are only raw retention rates, and controlling for possible extraneous variables will help better estimate the relationship between D grades, F grades, and course withdrawals and student retention.

Once again, logistic regression models were built, this time to examine the likelihood that a student would stop out and not return to a second year. We started by exploring the results of students having at least one course withdrawal but no more than 20% of course credits withdrawn from, and we then compared these effects to similar levels of D and F credits. Controlling for C, D, and F grades and the contextual variables mentioned above, we found that students having a low percentage of withdrawals resulted in 1.13 to 1.51 times greater odds of stopping out than students with no withdrawals at four universities and no significant effect at the other five. To frame this around the typical full-time college student attempting 30 credits over two terms, we have some evidence that withdrawing from one or two 3 credit courses had a slightly negative relationship with student retention.

At six universities, students who had a small percent of D credits had lower odds of stopping out than students with zero D credits. Across all institutions, students who made zero Ds tended to do very well academically, as the median GPA for this group was 3.24 and the median pass rate for all courses attempted was 100%.

At seven of the nine institutions, students with low percentages of F grades had slightly higher odds of stopping out than students failing zero courses. To frame this in a meaningful way, for the average student attempting 30 credits in their first two terms, making D grades in one or two courses was not generally a significant risk factor according to our data, while withdrawing from one or two courses was a small but significant risk factor at four of the nine universities. Finally, failing one or two courses was a small but significant risk factor at seven of the participating universities. Odds ratios for these effects, along with 95% confidence intervals and levels of statistical significance, are displayed for each institution in Table 4.

As observed in Table 5, higher levels of withdrawal ratios had a stronger effect on the odds a student would stop out. Students in our sample who withdrew from more than a fifth of their attempted credits (but not from all of their attempted credits) had 1.65 to 3.01 times greater odds of stopping out than students who withdrew from zero credits. This effect was significant at the lowest alpha level for all nine institutions. We also observed a small negative association between a high percentage of D grades at four of the nine institutions and the chances a student would retain. Having a high percentage of F grades substantially increased a student's odds of stopping out at all nine institutions and was significant at the smallest alpha level reported. Viewing this through the lens of the average student attempting 30 credits over two terms, making D grades in three or more 3 credit courses still only had a slight association with retention and was only significant for four of the universities studied. However, if the same hypothetical student made F grades in three or more 3 credit courses (excluding those who failed all course attempts), the student would have 2.52 to 5.85 times greater odds of stopping out depending on the university. A similar number of course withdrawals would result in 1.65 to 3.01 times greater odds of stopping out in our sample. Full results for the other variables in the retention model can be found in Table 6.

Discussion

Naturally, a student's ability to continue their educational path with numerous course failures in their first year is challenging. Even so, these data reveal that course withdrawal is nearly as damaging for first- to second-year retention. It does not appear that course withdrawals are a viable student success strategy in most circumstances. Although course withdrawal may allow students to protect their GPAs, it may result in academic disengagement nearly as damaging as course failure. At best, course withdrawal appears to be most beneficial when a student is certain to fail, or when the student must maintain a certain GPA or full-time enrollment status due to scholarship requirements. Even then, there may be learning gains from persistence in a course and grade substitution policies that might mitigate a low GPA. It is clear that academic advisors and faculty have complicated yet key roles in advising students who navigate this landscape.

We cannot be definitive or precise about the reason for course withdrawal. Research from a variety of scholars (e.g., Mertes & Jankoviak, 2016) highlighted motivation, quality, cost, administrative issues, dissatisfaction, and unmet

Table 4. Odds ratio estimates of stopping-out for D, F, and withdrawal ratios of 1%–20% by institution

Variable/Institution	1	2	3	4
D grade ratio 1%–20% vs. 0%	0.87*	0.91	0.97	1.01
	(0.79, 0.96)	(0.81, 1.02)	(0.87, 1.08)	(0.80, 1.27)
F grade ratio 1%–20% vs. 0%	1.35***	1.38***	1.52***	1.52**
	(1.21, 1.50)	(1.21, 1.58)	(1.34, 1.72)	(1.17, 1.96)
Withdrawal ratio 1%–20% vs. 0%	1.18***	1.13*	1.17**	1.14
	(1.09, 1.27)	(1.02, 1.25)	(1.06, 1.28)	(0.93, 1.39)

Note. * = $p < .05$; ** = $p < .01$; *** = $p < .001$. The numbers in parentheses display 95% profile likelihood confidence intervals for the odds ratio estimates D grade ratio, F grade ratio, and withdrawal ratio refer to the ratio of credits that resulted in that particular outcome to all credits attempted. For example, if a student attempted 15 credits and 3 of those credits resulted in a grade of D, their D grade ratio would be 3/15 or 20%.

expectations among a host of demographic and learning or personal circumstances. In our data, demographic and contextual factors demonstrate findings that confirm previous research (e.g., higher withdrawals with low GPA; Adams & Becker, 1990; Nicholls & Gaede, 2014), but also contradict previous research (e.g., significantly lower use of course withdrawals by African-American students and higher use of course withdrawals by online students; Boldt et al., 2015). This suggests that some patterns likely vary from one institution to the next, or that such findings are influenced by methodological choices. For example, the unit of analysis we utilized (course outcomes) differs from that in the Bolt et al. study (individual units). Even so, our finding that Pell recipients were more likely to withdraw from a course at seven of the nine universities in this study suggests that financial barriers indeed factor into a student's decision to withdraw from a course.

Of the independent variables that were most consistent in our data, the strongest predictors of course withdrawals were low high school GPAs and higher numbers of credit hours attempted (15+). This is not surprising, as we would expect students with stronger high school records would be less likely to withdraw from courses, but is important nonetheless as it indicates universities may be able to use students' high school GPAs to better assess which students may be at risk of withdrawing from courses within their first term. Coupled with the finding that students who entered with prior credits were less likely to withdraw at some of the institutions in this study, academic preparedness appears to be a relevant factor in university course withdrawal.

Although 15 credit hours per term appears to be a new standard for students' timely college completion (Fain, 2016), there may be a connected risk in increased course withdrawal behavior. This result likely reflects that students attempting more

Table 5. Odds ratio estimates for D ratios of 20%–100% and F and withdrawal ratios of 20%–99% by institution

Variable/Institution	1	2	3	4
D grade ratio 20%–100% vs. 0%	1.49***	1.31***	1.20**	0.95
	(1.37, 1.61)	(1.19, 1.45)	(1.09, 1.32)	(0.78, 1.15)
F grade ratio 20%–99% vs. 0%	5.80***	3.84***	3.53***	3.94***
	(5.35, 6.29)	(3.48, 4.25)	(3.22, 3.88)	(3.29, 4.73)
Withdrawal ratio 20%–99% vs. 0%	1.97***	1.73***	2.15***	2.81***
	(1.78, 2.17)	(1.58, 1.90)	(1.96, 2.35)	(2.37, 3.34)

Note. * = $p < .05$; ** = $p < .01$; *** = $p < .001$. The numbers in parentheses display 95% profile likelihood confidence intervals for the odds ratio estimates D grade ratio, F grade ratio, and withdrawal ratio refer to the ratio of credits that resulted in that particular outcome to all credits attempted. For example, if a student attempted 15 credits and 6 of those credits resulted in a grade of D their D grade ratio would be 6/15 or 40%.

Table 4. Odds ratio estimates of stopping-out for D, F, and withdrawal ratios of 1%–20% by institution (extend.)

5	6	7	8	9
0.80**	0.71***	0.81**	0.80**	0.70***
(0.69, 0.91)	(0.60, 0.84)	(0.71, 0.94)	(0.67, 0.94)	(0.59, 0.82)
1.44***	1.02	1.31**	1.17	1.32**
(1.25, 1.66)	(0.84, 1.24)	(1.13, 1.52)	(0.96, 1.43)	(1.10, 1.58)
1.11	0.85	1.51***	1.10	1.11
(0.98, 1.25)	(0.72, 1.00)	(1.33, 1.72)	(0.93, 1.28)	(0.94, 1.30)

than 15 credits have more credits from which they can withdraw, especially since the outcome modeled is binary rather than reflecting the percentage of credits withdrawn. Additionally, students attempting 15 or more credits may have more flexibility in that they can withdraw from a course while still maintaining full-time status for financial aid purposes. While discussion on the causal relationship between higher credit attempts and student retention is beyond the scope of this paper, we do observe that attempting 15 or more credits was a significant predictor for students withdrawing from one or more courses at each of the universities in this study.

Even though our data suggest a higher probability of course withdrawals for students with traditional risk characteristics (e.g., Pell recipients, male, and those in developmental education courses), these factors familiar to retention specialists were not significant at every university in our sample. For example, students taking developmental education courses were more likely to withdraw from a course at two universities, while at a third university they were significantly less likely to withdraw from a course. It appears that predicting students who might withdraw, while valuable to prevent or monitor, is a precarious endeavor. Though some common predictors were observed, particularly regarding academic preparation and course attempts, individual institutions will get the most utility from identifying the strongest predictors of course withdrawal specific to their institutions.

Our data are clearer on the impact of course withdrawals. Earning a D in a course had a much smaller association with stopping-out as compared to an F grade or course withdrawal. Even if an institution does not count a D toward graduation, earning a D in a course might indicate a level of effort or resilience and include additional learning of course material that may not be present in either course withdrawal or an F grade. Although we could not locate previous research on the impact of course withdrawals on retention to the second year, we wonder if there are some psychological benefits of staying in the course parallel to the persistence of staying at an institution despite academic difficulties. There may be additional options for students including audits or grade replacement policies that also will impact decisions to avoid withdrawal.

Table 5. Odds ratio estimates for D ratios of 20%–100% and F and withdrawal ratios of 20%–99% by institution (extend.)

5	6	7	8	9
1.09	0.93	1.19**	0.92	1.00
(0.96, 1.22)	(0.80, 1.08)	(1.05, 1.35)	(0.79, 1.08)	(0.86, 1.15)
4.88***	2.52***	3.28***	3.32***	3.44***
(4.35, 5.48)	(2.20, 2.88)	(2.90, 3.71)	(2.87, 3.86)	(3.01, 3.94)
1.65***	1.88***	3.01***	2.00***	1.92***
(1.45, 1.88)	(1.62, 2.17)	(2.65, 3.41)	(1.71, 2.34)	(1.64, 2.25)

Table 6. Odds ratio estimates for predicting stop outs across all institutions

Variable/Institution	1	2	3	4	5	6	7	8	9
STEM major, no vs. yes	1.19**	1.14**	1.16**	0.83	1.02	0.58***	1.02	1.21*	0.95
FAFSA, no vs. yes	1.02	1.32***	0.99	1.03	1.46***	2.06***	1.46***	1.82***	1.09
Race, Black or African-American vs. White	0.68***	0.85	0.56***	1.32	0.72***	0.80**	0.74**	0.78**	0.82
Race, Hispanic vs. White	0.87	0.98	0.96	1.58**	1.11	1.19	0.74	1.06	0.96
Race, other minority vs. White	0.94	1.42***	0.85*	1.17	0.84**	1.08	0.88	0.99	1.03
Pell Grant, no vs. yes	1.05	1.18**	0.84**	0.99	1.05	2.80***	1.58***	1.97***	0.90
Undeclared major, no vs. yes	0.84***	0.60***	0.53***	0.62*	0.75***	0.40***	0.69***	0.84*	N/A
Delivery mode, all others vs. fully online	0.77**	0.64***	0.42***	0.65**	0.61***	1.01	0.72	0.47***	0.23*
Delivery mode, fully on-ground vs. fully online	1.02	0.91	0.53***	0.98	0.83	1.35**	0.99	0.43***	0.37
Gender, female vs. male	1.02	1.11*	1.22***	0.83*	0.88**	0.88*	0.98	1.07	0.96
Attempted dev. ed., no vs. yes	0.92	0.78**	0.63***	0.77**	0.90	N/A	0.84**	0.86*	0.84*
Transfer, no vs. yes	1.36***	0.85*	0.91	1.18	1.77***	0.81*	1.78***	1.00	1.89***
Age at entry, 18 and under vs. 25 and older	0.82*	1.09	0.80*	0.72*	0.72**	0.87	0.90	0.81	0.50***
Age at entry, 19–24 vs. 25 and older	0.96	1.18*	0.91	0.88	0.87	1.15	1.10	0.90	0.75**
Credits attempted, 12–14 vs. less than 12	0.49***	0.37***	0.61***	0.73**	0.64***	0.71***	0.74**	0.52***	0.61***
Credits attempted, 15 or more vs. less than 12	0.48***	0.26***	0.38***	0.48***	0.66***	0.74***	0.55***	0.54	0.56***

Note. * = $p < .05$; ** = $p < .01$; *** = $p < .001$. STEM = science, technology, engineering, or mathematics and FAFSA = Free Application for Federal Student Aid.

In contrast, these data clearly demonstrate that a grade of F or a choice to withdraw results in a much greater chance of stopping out. One of the more surprising findings regarding D grades was that students who had zero Ds were more likely to stop out than students who made Ds in at least one and as many as 20% of their courses. Again, we can only speculate here about possible transfer or other noise in the data related to reasons for stopping out. Although this collection of findings is clearer, the implications of these findings indicate the complex issues academic advisors must balance.

Implications for College Faculty and Advising Staff

Even though course withdrawal is not a precise measure of retention, as students can enroll in the course again later (Stewart & Martinello, 2012), we believe there are detrimental costs. According to Dunwoody and Frank (1995), students report that withdrawals are a significant waste of both time and money. In fact, Adeleman (2006, p. 161) noted that course withdrawals are:

> . . .damaging to degree completion, these are just as damaging to time to degree. Yes, we can keep students continuously enrolled, but if much of that enrollment is nullified by withdrawals and repeats, we have what Tinto calls retention without education. It's worse, though, because every seat at every available hour in every facility of an institution of higher education is at stake, and every seat marked with a W bars another student from sitting down. When the blocked seats reach a critical mass, general access is impeded as well. This observation is worth repeating.

Even beyond the clear impact on student retention, it is apparent that course withdrawals can be problematic for the ecosystem of higher education.

Faculty members play a core role in course withdrawal. Although personal reasons may be students' primary reason for withdrawal, context is key. We note that previous research (Dunwoody & Frank, 1995) suggested faculty members perceived non-academic reasons for withdrawal

as much more prominent than academic reasons. Even so, actionable academic data may be available in learning management systems (LMS) to prevent course withdrawal. It may be possible to create models that include variables such as frequency of access to faculty members, duration of connection, and interactivity with the system that may better predict student success for advisement on course withdrawal. There is promising research (e.g., Arnold & Pistilli, 2012) toward this path already available.

Advisors are presented with a difficult task in circumstances where academic performance hovers around D or F. Stewart and Martinello (2012) noted that course withdrawals may look better on transcripts than certain grades, but our data suggest concerns around retention may be more important than transcript appearance. Wheland, Butler, Qammar, Katz, and Harris (2012) suggested advisors must push self-authorship for students, where advisors explain the consequences clearly on course withdrawals and have students connect choices to academic resilience and future goals. We encourage advisors to recommend course withdrawal carefully and consider the benefits of a course grade of D and the retention risk for each student individually.

Nicholls and Gaede (2014) suggested university policies matter a great deal in course withdrawal. We were not able to make connections to policies in this research as the withdrawal policies from universities in our sample have varied over the extended inquiry (2009–2014). Humphrey and Yanochik (2008) suggested limiting students to five course withdrawals (12% of hours required for graduation) with only extreme exceptions (e.g., military requirements). Adams and Becker (1990) noted a policy at Stanford University where students may withdraw all the way up to the final exam. While this may be feasible at institutions with fewer retention concerns, it seems to be an anomaly. It appears course withdrawal policies and processes vary considerably. Withdrawal paper forms required with or without signatures, computer processes, faculty approval, hour limitations, and time period for drop/add or course withdrawal can all be considerations worthy of investigation.

Limitations and Future Research

Like most research, our conclusions are specific to or limited by sample and methodological choices. One such limitation in our study is that the institution participants were not a random sample of universities across the country (which dictated our separate models by institution), meaning that our findings are not necessarily generalizable to other institutions. While the data reveal important concerns about the risks associated with withdrawing from courses, it is important for decision makers in higher education to consider how the effects may be similar or different at their institution(s).

Most of the retention research utilizes grades as part of the modeling. But withdrawals are not necessarily grades. They are an indication of academic behavior and commitment to the particular class. Large-scale data modeling with a range of universities can be useful, but course- and departmental-level qualitative analyses are also necessary. Institutional research on DFW rates in bottleneck courses will be key for practice, and it may be more prudent to separate withdrawals from language around grades. Additionally, analyzing the relationship between credit attempts and chosen major may also be beneficial in predicting course withdrawal. If a student's course load is too heavy for their major, for example, this may lead to withdrawal from a course, while students with a similar number of credits in a different major may have a lower risk of withdrawing. Gathering information on advising structure and registration holds could also be useful for better understanding both reasons of course withdrawal and the relationship between course withdrawal and retention. It is possible that more lenient withdrawal policies or less structured advising may lead to higher rates of course withdrawal and subsequently lower retention rates, for example.

Qualitative focus groups may shed light on reasons for withdrawal that are not available in most datasets. For instance, data on financial needs that goes beyond Pell status may be difficult to obtain, and other more personal reasons may be more likely to emerge in small focus groups rather than large datasets. At minimum, it may be useful to consider DWF rates rather than DF rates based on our findings. There is a vast amount to learn about the impact of course withdrawals.

Conclusion

Reforms to increase college access have been a focus for decades, and results have been promising. According to the National Center for Educational Statistics (NCES), ''in fall 2014, total

undergraduate enrollment in degree-granting post-secondary institutions was 17.3 million students, an increase of 31 percent from 2000, when enrollment was 13.2 million students" (2019, p. 1). During this same time frame, Hispanic student enrollment more than doubled and African-American student enrollment increased by more than 50%. Increased enrollment, especially for under-represented minority students, can be transformative for society. Even so, college success (completion/credential) is a much more important metric. It is an institution's ethical responsibility to not only increase college access but provide the optimal conditions for college success. Course withdrawals appear to be a significant variable in the student success equation.

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