

Institutional Aid and Student Persistence: An Analysis of the Effects of Institutional Financial Aid at Public Four-Year Institutions

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This study examines the effects of institutional financial aid on year-to-year persistence for a cohort of first-time, first-year students at three large, doctorate-granting public universities. Though billions of dollars are spent each year on institutional aid, much of the research to date on student persistence does not consider its effects on student departure. Using data from a statewide student unit record database, the effects of institutional aid on persistence were modeled using logistic regression. Findings suggest that institutional financial aid has a positive but modest effect on persisting. Interestingly, the effects of aid were greater for men than for women, all else being equal.

In the last four decades, a large body of research has emerged on factors associated with student persistence. Much of this research has focused on the development and testing of theoretical and conceptual models of student departure. Student persistence models developed by Tinto (1975, 1993) and Bean (1980) and tested by Pascarella and Terenzini (1977, 1979, 1980a, 1980b, 1980c, 1983), Cabrera, Nora, and Castañeda (1993), and Bean and Metzner (1985) dominate this body of literature. More recently, Braxton and colleagues (1997, 2000, 2004) have devoted considerable effort to testing the propositions of the Tinto model and to looking at alternative models of student persistence. In most instances, these studies focused primarily on student goals and student interactions with the collegiate environment.

In the last two decades, scholars such as St. John and colleagues (1989, 1990a, 1990b, 1994, 1995), Cabrera et al. (1993), and Somers et al. (1997) have examined the effects of financial aid on student persistence. These studies look at the effects of state and federal grants, loans, and college work-study awards on student departure behavior.

There is good reason to examine the effects of institutional aid. Martin (2004) provides a thoughtful analysis and critique of the uses and misuses of institutional aid on external measures of institutional quality, of total undergraduate enrollment, and of the fiscal health of colleges and universities. A number of other studies have considered the effects of financial aid on enrollment decisions (see, e.g., DesJardins, Ahlburg, & McCall, 1999; Hossler, Hu, & Schmit, 1999; Hu & Hossler, 2000; McPherson, Schapiro, & Winston, 1993). Singell and colleagues (2002, 2006) have also published a number of studies that focus

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on the effects of institutional aid on student enrollment behaviors, though most of this work does not look at persistence as an outcome variable.

Little is known, therefore, about the effects of institutional aid on student persistence. However, there are strong incentives for institutional and public policy makers to understand better the effects of institutional aid on student persistence. Institutions invested more than \$24 billion in institutional aid in 2004-05 (College Board, 2005). Moreover, state and federal policy makers are demonstrating a growing interest in student persistence. Increasingly, public policy makers are advocating the use of student persistence and graduation rates as indicators of institutional quality. In addition, 20 percent of the formula for calculating the rankings published in *U.S. News and World Report: America's Best Colleges* is based on measures of student persistence (U.S. News and World Report, 2007).

It is evident that there are many reasons to be interested in the impact of institutional aid on student departure behaviors. It behooves institutions not only to understand the effects of their aid expenditures on the matriculation decisions of students but also to examine the effects of campus aid on student persistence.

A recent study on the correlates of graduation rates among low-income students concluded that elite private institutions were better choices for low-income students because students were more likely to persist in them (Mortenson, 2000). Interestingly, however, that study did not consider institutional aid variables in its analysis. Becker (Personal Communication, September 2006) has noted that because elite private colleges provide more generous financial aid packages than other institutions, it is impossible to assess accurately the determinants of persistence at the institutional level without controlling for institutional aid (Personal Communication, September, 2006).

To date, there are few high-quality studies of the effects of institutional financial aid on student persistence. DesJardins, Ahlburg, and McCall (2002) included institutional aid as one measure in their examination of the relationships between financial aid and persistence. Using data from the University of Minnesota, they found that institutional scholarships and grants increased the likelihood of student persistence.

One of the reasons there are few empirical studies of this topic is because there are few data sets that include a comprehensive set of institutional aid data. Singell and Stater (2006), for example, secured data from Colorado University at Boulder, Indiana University Bloomington, and University of Oregon for analytic purposes. It is more difficult to isolate the effects of institutional aid in different state contexts, however, because state aid programs vary. DesJardins et al. (2002), in work on college

choice and student persistence, have used single institution data from the Universities of Iowa and Minnesota. Many state student databases only include state and federal aid information. Thus, despite previous research, and in part because of the structure and availability of databases, an important gap remains in our understanding of how institutional aid affects student persistence.

In this study, we employ constructs from the “nexus model of college choice” (St. John, Paulsen, & Carter, 2005) to identify predictors of college persistence from students’ first year to their sophomore year. More specifically, we seek to determine the unique effects of institutional aid on student persistence. *Institutional aid* as defined in the Indiana unit-record database includes need and non-need based institutional gift aid, athletic scholarships, fee remission provided as employee benefits, and state entitlement programs, such as those provided to police and children of disabled veterans. This does not include aid awarded from institutional endowments or Title IV funds, such as Federal Work-study, Supplemental Educational Opportunity Grants, or Federal Pell Grants.

The nexus model posits that the decision to go to college, the selection of a specific college, the choice of major, and the decision to persist can be best understood as a series of interrelated decisions. The model proposes that analyses of persistence should include measures of student background characteristics, the educational aspirations of high school students, high school academic preparation and involvement, college grade point average (GPA), major choice, college engagement, and financial aid. These variables are commonly used in most studies of student persistence (Bettinger, 2004; DesJardins, Ahlburg, & McCall, 2002; Cabrera, Nora, & Castañeda, 1993; Pascarella & Terenzini, 1983; Paulsen & St. John, 2002; St. John, Paulsen, & Carter, 2005). In this study, we include key control variables in the models, such as those representing student background characteristics, academic preparation, and college enrollment characteristics. Model building proceeded from existing theory and research along with consideration of available data. For example, because we lacked measures of student engagement once students were enrolled in college and high school grade point average, these variables were not included in our models.

Methodology

Sample Characteristics

This study focused on the 2001 cohort of first-time, full-time students ($N = 16,256$) enrolled in three doctorate-granting, public, Midwestern institutions. Student characteristics were similar across all three institutions. Students were academically above average relative to less-selective public four-year institutions in the state, with a disproportionate number coming from the top quartile of their high school class (just over 44%) and most earning As and Bs in their first year of college (72.6%). The sample was predominantly White (87.3%). Furthermore, 36.2% of students

came from families with reported incomes above \$70,000. The preponderance of students (87.6%) lived on campus, most were state residents (about 69%), and 70% received some form of financial aid. Of the students who received financial aid, 3,611 (or just over 31%) received some form of need-based aid.

Data Sources

Student data came from the Indiana Commission for Higher Education (ICHE), whose data derive from the student information systems (SIS) of all public universities, colleges, and community colleges in Indiana. SIS data are collected at the student level, usually for enrollment related transactions, for example, registering for courses, assigning student grades, or awarding financial aid. Institutional price data for 2001-2002 came from the Integrated Postsecondary Education Data Systems (IPEDS). We use institutional price data along with receipt of aid data for each student to calculate unmet need. Here unmet need does not include expected family contribution (as these data were unavailable), but rather is calculated as the difference between total costs of attendance less total aid received (including all forms of aid). Costs were calculated for full-time, first-time, degree-seeking students, including those who were residents and nonresidents and who lived on or off campus (i.e., not with their family). Total costs included tuition, room, board, fees, books, supplies, and other on campus expenses as reported by the institutions. Room and board costs, as reported by institutions to IPEDS, are differentiated based on whether a student lived on- or off-campus

From the available data, we were unable to determine whether aid awarded to students was based on academic merit, financial need, athletic ability, artistic talent, or some combination. As a proxy for financial need, we created a dichotomous variable based on students' receipt of state or federal need-based aid (e.g., Pell Grant). Future work will benefit from being able to differentiate institutional aid awarded for need and merit.

Methods

We used logistic regression because the outcome of interest was dichotomous, i.e., whether a student persisted from the 2001-2002 to the 2002-2003 academic year. Regression analysis enabled us to control for factors known from previous research and theory to affect student persistence—such as student background, academic preparation, college enrollment characteristics, and financial aid—to isolate and explore causal relationships among the variables of interest.

Our research has followed the “workable models approach” (St. John, 1992), which advocates using existing admission and institutional records for policy research. It builds on theory and research from sociology, economics, and higher education. Two key strengths of this model relate to dealing with missing data and controlling for student characteristics.

Missing data can be a problem when working with large, statewide, transactional data systems. For example, students who do not apply for financial aid would have no data on family income, or institutions with open admissions are unlikely to have much information about academic preparation, such as high school rank. Like most research approaches, the workable models approach requires weighing tradeoffs in deciding whether to incorporate data via design set coding. Use of design set coding to preserve missing data enables the institutional researcher to preserve cases, preventing loss of information (Hosmer & Lemeshow, 2000). For example, missing data for key variables were included as a category under this approach. However, missing data are not necessarily interpretable outside known contexts. For example, income or high school rank data may be missing for different reasons in different institutional contexts. Therefore, caution must be used when incorporating missing data as categorical variables because interpretation may be more difficult. Nonetheless, using institutional data generated from transactional systems allows for proxy measurement and control of key student characteristics, such as background and academic preparation.

Logical Models

Four conceptual categories comprised the model: (a) financial aid and college costs, (b) student background, (c) academic preparation, and (d) college enrollment characteristics. From this foundation, a combination of parsimony and pragmatism guided the inclusion of specific variables. We weighed a variable's adequacy as a proxy measurement for the construct of interest along with the availability of data. For example, in deciding whether to use SAT data or high school rank data as our proxy for academic preparation, we determined that more data were available for high school rank. Though one might argue SAT score provides a better criterion of academic preparation than high school rank, we weighed the benefits of having information for more students against the costs of not using the more standardized measure. Table 1 lists under each category the specific variable employed in our final model.

In initial testing of the logical models, each category of variables was entered into the regression as a block to determine whether the category itself significantly contributed to the overall explanatory power of the model. Based on chi-square tests of statistical significance, we determined that each block improved our model at the 0.05 level of significance. These findings, considered together with findings from the research cited above, suggest that our logical model was appropriate for testing the effects of institutional aid on student persistence.

Descriptive Findings

In total, over 85% of students persisted from the 2001-2002 to the 2002-2003 academic year. A higher percentage of those who

Findings and Implications

Table 1
Variables Included in the Logical Model

Student Characteristics	Academic Preparation	College Enrollment	Financial Aid
<ul style="list-style-type: none"> • Gender • Race & ethnicity • Family income 	<ul style="list-style-type: none"> • High school rank 	<ul style="list-style-type: none"> • College GPA • Living on or off campus • Twenty-first Century Scholar^a 	<ul style="list-style-type: none"> • Institutional aid • Other grant aid • Loans • Other gift aid • Unmet need

^aThe Twenty-first Century Scholar program is a means tested, early commitment, last-dollar aid program designed to promote college participation among low-income and first-generation students.

received institutional aid persisted than students who did not (88.2% and 83.8% respectively). A slightly lower percentage of students who received need-based aid persisted than students who did not (84.7% versus 85.6%). Students from families with incomes over \$70,000 persisted at the highest rate (86.4%), while 86.1% of students from families earning between \$30,000 and \$70,000 persisted. Students from the lowest-income families persisted at the lowest rate among all income groups (82.3%). Among those students who received aid ($N=11,489$), the average institutional aid award was just over \$1,600, though the awards ranged as high as nearly \$30,000. The average amount of loans among all aid recipients was just over \$3,700 (Table 2).

When disaggregated by race and ethnicity, we find that 57% of African Americans received some form of institutional aid, Hispanics (45%), Native American and Other Race (45%), Asian American and Pacific Islanders (37%), and Whites (33%). Disaggregated by gender and controlling for numbers of men and women in the population, we find that a greater proportion of women than men received non-institutional need-based aid (25% versus 20%). In addition, a higher proportion of women than men received institutional aid.

Table 2
Average Aid Amounts by Type Among All Aid Recipients
($N = 11,489$)

Type of Aid	Maximum	Average
Institutional Aid	\$29,756.00	\$1,643.98
Grants (Non-Institutional)	\$17,548.00	\$1,272.44
Loans	\$30,667.00	\$3,775.23
Other Gift Aid	\$26,866.00	\$781.87

Inferential Findings

Results from the regression models suggest that institutional aid has a statistically significant and positive though overall moderate effect on the likelihood of student persistence. A \$1,000 increase in institutional aid increased the likelihood of persistence by about four percent, holding all else constant (see Table 3).

Table 3
Results from Logistic Regression, Student Persistence
from 2001-2002 to 2002-2003
(N = 16,256)

Variables	Student Characteristics		Academic Preparation		College Enrollment		Financial Aid	
	Sig.	Odds Ratio	Sig.	Odds Ratio	Sig.	Odds Ratio	Sig.	Odds Ratio
Institutional gift aid							****	1.042
Grant aid (non-institutional)							**	1.052
Loans							**	1.024
Private gift aid								1.00
Work-study participants compared to nonparticipants								0.87
Unmet need							****	1.025
Men compared to women		0.98		1.01	****	1.21	****	1.201
Compared to whites								
Native American and Other	**	0.46	**	0.482	**	0.523	**	0.523
Asian American/Pacific Islander		1.09		1.11		1.12		1.05
African American	*	0.82		0.853		1.007		0.98
Hispanic		0.96		0.99		1.10		1.08
Race missing		0.93		0.97		0.94		0.90
When compared to middle-income students								
High-income (>\$70,000)		1.01		1.01	**	0.88	**	0.874
Lowest income (<\$30,000)	**	0.77	**	0.796	**	0.796	**	0.729
Income not reported and missing	**	0.87		0.922	****	0.778	****	0.726
When compared to students in top-quartile of high school class								
Second quartile			****	0.78	**	1.124	*	1.113
Third quartile			****	0.71	**	1.232	**	1.220
Lowest quartile				0.84		1.41		1.42
Missing			****	0.76		0.948	*	0.879
College GPA					****	2.23	****	2.209
Living on- compared to off-campus					**	1.24	**	1.182
Twenty-first Century Scholars compared to non-Scholars					*	1.30		1.22
Percent correctly predicted		57.167		51.870		65.717		66.000
Nagelkerke		0.003		0.007		0.083		0.086

Note. Aid and cost amounts in units of \$1000. Sig. = Significance.

*p < 0.10. **p < 0.05. ***p < 0.01. ****p < 0.001.

Non-institutional grant aid and loans were also positively associated with persistence. A \$1,000 increase in grant aid increased likelihood of persistence by just over five percent, while a similar increase in loans increased likelihood of persistence by 2.4%, controlling for all else. Curiously, perhaps, a \$1,000 increase in unmet need was positively associated with persistence, increasing the likelihood of persistence by 2.5%. On closer look we noted a high positive correlation between unmet need and student loans. This could indicate that at moderately selective institutions with a disproportionate number of high-income students, student willingness to incur debt was related to overall commitment to the educational goal.

Several student background characteristics were also found to be significantly related to persistence. Men were more likely than women to persist, which we discuss in detail later. Students identified as Native American or Other Race were less likely to persist than White students. All income groups—missing, low, and middle—were less likely to persist than the highest-income group.

Findings for the effects of academic preparation at first glance may appear counterintuitive. When institutional aid was excluded from the model, students in the third quartile of their high school class were more likely to persist than students in the top quartile. The inclusion of institutional aid increased the statistical significance of the coefficient for the effect of being ranked in the third quartile of high school. In addition, having a missing high school rank became marginally significant at the 0.1 level. These results may be an artifact of differences in reporting data at the institutions included in the study. For example, one institution had a greater proportion of missing data for high school rank than other institutions because of different reporting approaches. Although institutional selectivity and student academic characteristics were similar across all institutions, the overrepresentation of missing data on high school rank at one of the three institutions can be expected to inflate the significance of the missing category.

Finally, both college GPA and living on campus were positively associated with persistence. A one-point increase in overall grade average resulted in an over 200% increase in the likelihood of persistence, controlling for all else. Living on campus rather than off campus increased the likelihood of persistence by just over 18%, other things being the same.

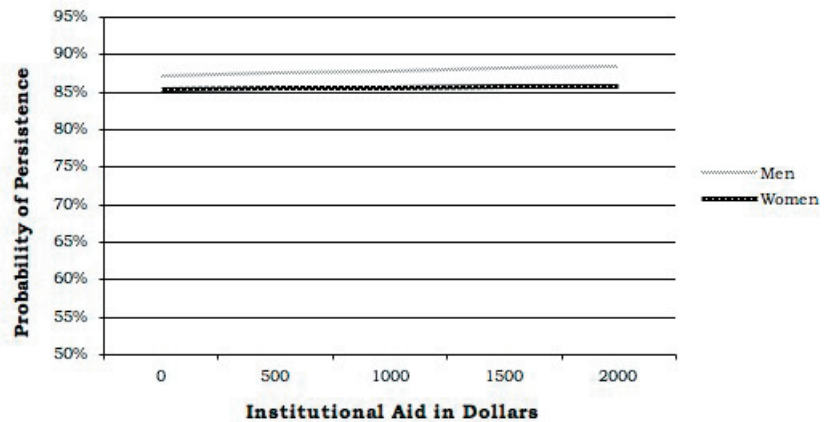
Relationship between Institutional Aid and Gender

The statistically significant relationship between gender and likelihood of persistence warranted further investigation. A third model was developed to explore the possible interaction of institutional aid and gender. A cross-product term representing the relationship between being male and receipt of institutional aid was included. When entered as a separate block in the model,

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the cross-product term improved overall model fit and was statistically significant. This suggests that the effect of institutional aid was greater for men than for women. Figure 1 models the effects of institutional aid on the probability of men and women persisting from one academic year to the next.

Figure 1
Impact of Institutional Aid on
Probability of Persistence by Gender



Discussion and Implications

Most of the results of this study are consistent with extant literature on persistence. The effects of institutional aid suggest that colleges and universities may be able to improve student persistence rates by awarding financial aid to a greater number of enrolled students. The results also raise the possibility that the average amount of institutional aid awarded to students at a campus may help explain campus retention and graduation rates.

The effects of financial aid on student departure decisions may be due to several factors. St. John (2004) found that financial aid has an indirect effect on the level of student engagement. He posits that financial aid reduces the need for students to work, thus allowing them more time to be engaged in the collegiate experience. Bean (1980) hypothesized that financial concerns can be a reason to drop out. Hossler (1984) suggested that institutional financial aid can be viewed as a form of “courtship” during the recruitment process, thus strengthening students’ feelings of belongingness and commitment to the institution.

Although adding the amount of institutional aid to our models revealed that institutional aid did have a statistically significant effect on persistence, it did not have a large impact on the overall explanatory power of the model. This suggests that while institutional aid is important, it is one factor among many that contribute to student’s persistence. This may not be surprising.

As we have already noted, we were not able to determine whether institutional aid went to students to meet need or to recognize merit. However, in the context of Heller's (2006) recent observation that more and more institutional aid is going for merit purposes in public universities, it is possible that campus aid dollars on the campuses included in this study are disproportionately for merit rather than need. Thus, institutional financial aid may be going disproportionately to students who are more likely to persist overall. It is possible that institutional need and merit aid produces different effects on the persistence of students. This is an area that deserves additional research.

These findings bring us back to the original purpose of this study. As Becker (Personal Communication, September 2006) suggested, the higher persistence rates at more elite colleges may, at least in part, be due to the more generous financial aid packages they are able to offer. Our results, however, do not indicate a large effect based solely on differences in institutional aid packages. We hypothesize that higher rates of persistence are not only a function of student background characteristics and academic success in addition to institutional aid packages, but are also a function of latent student characteristics that are more difficult to measure. Hossler, Schmit, and Vesper (1999) found that some students started planning for postsecondary education and looking at colleges earlier than other students. Professional wisdom among admissions practitioners holds that students who apply earlier are more motivated and more likely to enroll (and these attributes are not perfectly correlated with family education and income). We posit that more selective residential institutions are also more likely to enroll students who have spent more time and effort investigating the colleges and universities they subsequently attend and, thus, are more committed to those institutions. Greater levels of institutional commitment, as Tinto (1975, 1993) suggests, lead to higher rates of persistence.

Finally, the differences between the effects of institutional financial aid on the persistence of men and women are also intriguing. At the moment, we cannot offer definitive insights into these results. Hossler, Schmit, and Vesper (1999) found that women had consulted with a wider range of people and had more sources of support for their educational plan than their male counterparts. Could it be that—in lieu of many other sources of support—financial aid has a more direct effect on the persistence plans for male students? This question is speculative; however, as this area needs more research.

The effects of institutional financial aid and gender on students' persistence, grades, engagement, and college choice decisions clearly merit further study. The effects of institutional financial aid on student departure behaviors and student success represent important new lines of inquiry for scholars. A better understanding of the effects of campus aid may help campus

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and public policy makers assess more carefully the effects of all forms of aid on student persistence, assisting in the development of comprehensive policies to enhance student success.

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