

A Multi-Institution Analysis of the Effects of Campus-Based Financial Aid  
On Student Persistence at Public Four-Year Institutions

Don Hossler, Jacob PK Gross, and Mary Ziskin  
Indiana University

## Abstract

This paper examines the effects of campus-based aid on student persistence. Much of the research to date on student persistence does not consider the effects of financial aid on student departure. Most of the studies that have considered the effects of financial aid on persistence have only had access to the amounts of state and federal financial aid awarded to students. These studies typically lack data elements for campus-based financial aid awards. As a result, institutional and public policy makers know little about the effects of campus-based aid on student persistence and graduation. Using an integrated state database for public four-year institutions, this study examines the unique effects of campus-based financial aid on student departure.

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 et al. (1985a, 1985b) 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 financial aid. Martin (2004) provides a thoughtful analysis and critique of the uses and misuses of campus-based financial 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 (2002a, 2002b, 2002c) have also published a number of studies that focus exclusively 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 better understand the effects of campus-based aid on student persistence. Institutions invested more than \$24 billion in campus-based 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.

It is evident that there are many reasons to be interested in the impact of campus-based financial 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.

#### *Institutional Aid and 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 campus-based aid variables in its analysis. Becker (personal communication, February, 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.

To date, there are few high quality studies of the effects of institutional financial aid on student persistence. DesJardins, Ahlburg, and McCall (2002) included campus-based financial aid as one measure in their examination of the effects. Using data from the University of Minnesota, they found that campus-based 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 campus-based aid data. Singell, for example, has been able to secure data from three public flagship institutions in different states for analytic purposes. In these cases, however, it is more difficult to isolate the effects of institutional aid because state aid programs vary. DesJardins, in some of his work on college choice and student persistence, has 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 campus-based financial aid on student persistence.

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). All key control variables were included in the models where possible. In the case of variables with little variation or for the sake of parsimony, not all of the variables were included in the model. Student major, for example, was omitted. Additionally, because we lacked measures of student engagement once students were enrolled in college, we have excluded that component from this discussion as well.

## 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. As might be expected at three moderately selective universities, students were academically above average, 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 (72.6%). The sample was predominantly White (87.3%). Furthermore, 36.2 percent 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 percent received some form of financial aid (see Table A.2 in Appendix). Of the students who received financial aid, 3,611 (or just over 31%) received some form of need-based aid (see Table A.3 for a full description of student characteristics for aid recipients and nonrecipients).

### *Methods*

Logistic regression was used by the researchers 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 are in dealing with missing data and in controlling for student characteristics.

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). 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. The process of model building and variable inclusion is addressed next.

### *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, below, lists under each category the specific variable employed in our final model.

Table 1. Variables Included in the Logical Model

<b>Financial Aid (Block One)</b>	<b>Student Background (Block Two)</b>	<b>Academic Preparation (Block Three)</b>	<b>College Enrollment (Block Four)</b>
<ul style="list-style-type: none"> <li>• Institutional aid</li> <li>• Grant aid</li> <li>• Loans</li> <li>• Other packages</li> <li>• Unmet need</li> </ul>	<ul style="list-style-type: none"> <li>• Gender</li> <li>• Race &amp; ethnicity</li> <li>• Family income<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>• High school rank</li> </ul>	<ul style="list-style-type: none"> <li>• College GPA</li> <li>• Living on or off campus</li> <li>• Twenty-first Century Scholar<sup>2</sup></li> </ul>

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 previous research, suggest that our logical model was appropriate for testing the effects of institutional aid on student persistence.

Before describing data sources for this study, some further explanation of how variables were constructed is warranted, specifically for institutional aid. From the available data, we were unable to determine whether aid awarded to students was based on merit, need, or some combination of the two. To control for need-based aid to the extent possible, we created a categorical variable as a proxy measure based on students'

---

<sup>1</sup> Family income was included as a categorical variable because data were only available for students who applied for aid. Some research (e.g., King, 2006) suggests that low-income students who are eligible do not apply for aid. In this case, we took a conservative approach in estimating the effects of aid by including cases for whom income data were not available.

<sup>2</sup> Established in 1990 by the Indiana State Legislature, the Twenty-first Century Scholars program is intended to enhance aspirations and preparation in high school and then to provide last-dollar grant support to students who enroll in a postsecondary institution in Indiana, public or private.

receipt of state or federal need-based aid (such as Pell Grants). Future work will benefit from being able to differentiate institutional aid awarded for need and merit.

Because the amount of unmet financial need may play an important role in student persistence we included it in our model. Unmet need was determined from institutional data submitted to the Indiana Department of Education and made available via the state's Integrated Postsecondary Education Data System (IPEDS). Unmet need is the difference between total costs of attendance and total aid received. 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 (not with their family). Total costs included tuition, room, board, fees, books, supplies, and any other campus expenses.

#### *Data Sources*

Our 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 cost data for 2001-2002 came from IPEDS.

## Findings and Implications

### *Descriptive Findings*

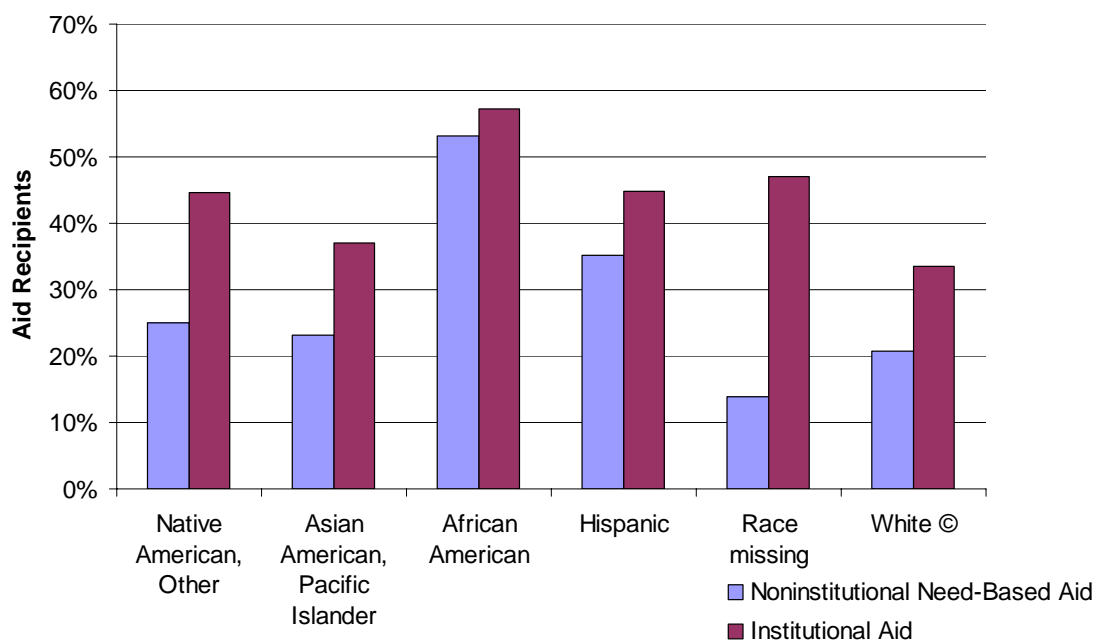
Over 85 percent of students persisted from the 2001-2002 to the 2002-2003 academic year. A similarly high proportion of persisters received some form of financial aid (86.1%) including institutional aid, while 35.1 percent of students received institutional aid (see Tables A.2 and A.3, in the Appendix). A higher percentage of those who 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%), though students from families earning between \$30,000 and \$70,000 persisted at a similarly high rate of 86.1 percent. Students from families whose income was not reported persisted at a rate of 84.6 percent, whereas students from the lowest-income families persisted at the lowest rate of all income groups (82.3%). 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. Average Aid Amounts by Type Among All Aid Recipients

	Minimum	Maximum	Average
<b>Institutional Gift Aid</b>	\$ 0	\$ 29,756.00	\$ 1,643.98
<b>Grants</b>	\$ 0	\$ 17,548.00	\$ 1,272.44
<b>Loans</b>	\$ 0	\$ 30,667.00	\$ 3,775.23
<b>Other Gift Aid</b>	\$ 0	\$ 26,866.00	\$ 781.87
<b>Unmet Need</b>	\$ (19,113.00)	-	\$ (796.39)
N=11,489			

When disaggregated by race and ethnicity (Figure 1, below) we find that the greatest proportion<sup>3</sup> of need-based aid recipients were African Americans (53%), followed by Hispanics (35%), Native Americans and Other Race (25%), Asian American and Pacific Islander (23%), Whites (21%), and finally Race Missing (14%). Similarly, 57 percent of African Americans received some form of institutional aid, followed by Race missing (47%), Hispanics (45%), Native American and Other Race (45%), Asian American and Pacific Islanders (37%), and Whites (33%). It is important to note again that institutional aid could not be disaggregated by merit versus need. Need-based aid discussed here includes only that received from state or federal sources.

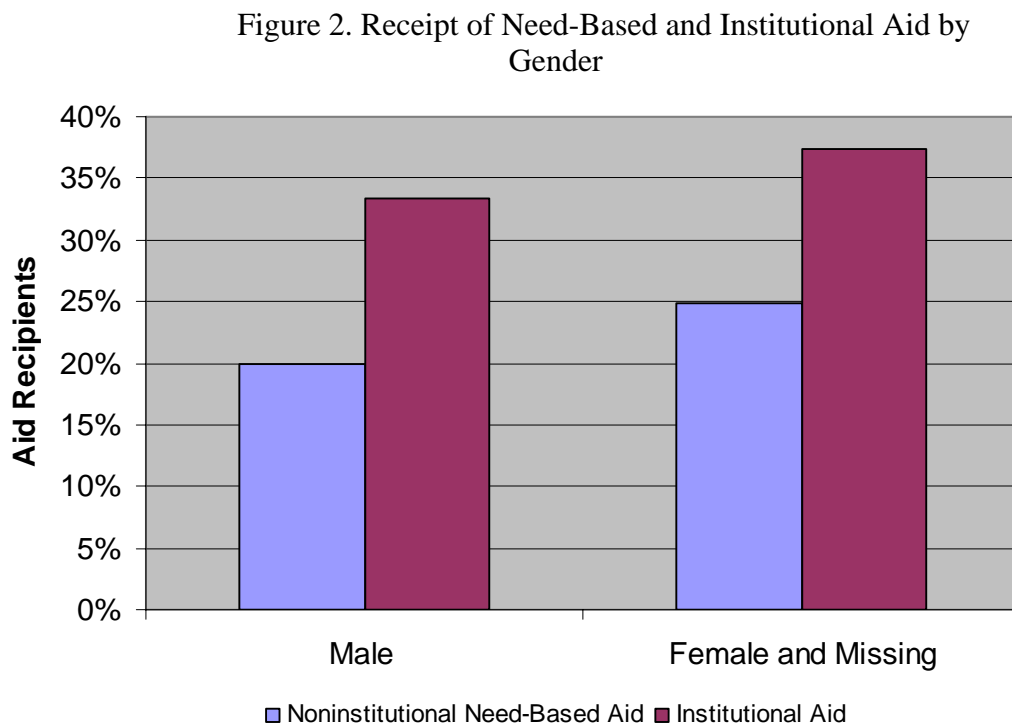
Figure 1. Receipt of Need-Based and Institutional Aid by Race and Ethnicity



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

<sup>3</sup> By proportion, we mean the ratio of a given category of students relative to their overall number in the student population. For example, of the 684 African Americans in the sample, 363 (53%) received need-based aid of some form. This was the method used to calculate all proportions discussed in this section of the paper.

noninstitutional need-based aid (25% versus 20%) (see Figure 2, below). In addition, a higher proportion of women than men received institutional aid.



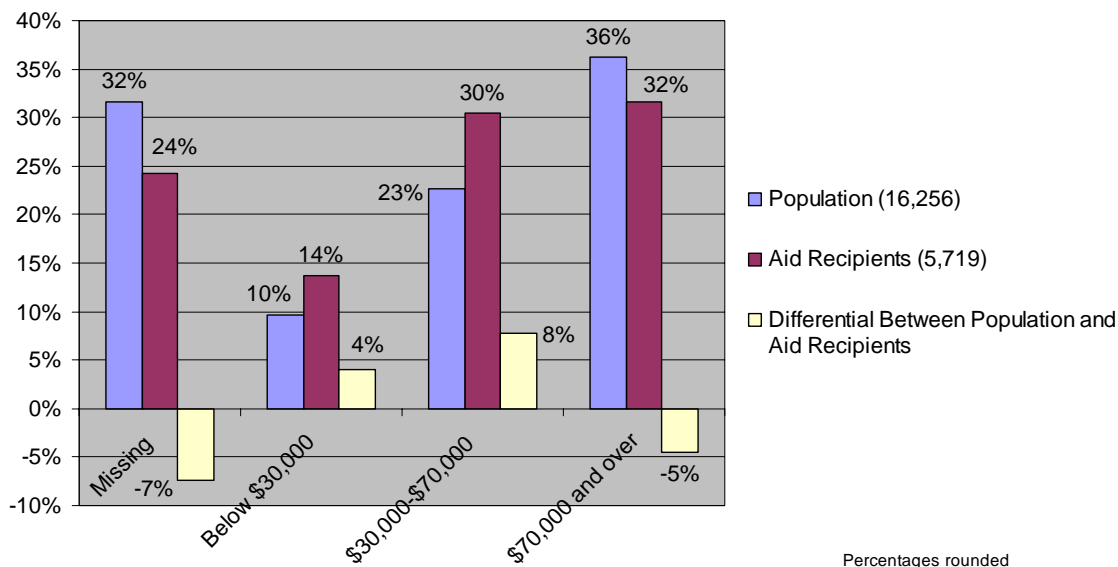
Exploration of aid patterns by income groups revealed that the highest proportion of both need-based and institutional aid recipients were students from the lowest-income (below \$30,000) families. Over 50 percent of lowest-income students received institutional aid while nearly 80 percent received need-based aid. Nearly equal proportions of middle-income students received need-based (52.5%) and institution-based (47.2%) aid.

Figure 3. Receipt of Need-Based and Institutional Aid by Income Group



It is instructive to explore in more detail the degrees to which income groups were over- or underrepresented in terms of receipt of need-based and institutional aid. For example, though the highest proportion of institutional aid recipients was from high-income families (32%), this income group also represented a greater percentage of the population than any other income group (36%). Figure 4 represents the proportion of each income group by total population and total number of institutional aid recipients. The differential proportions show that the highest-income students and students whose families had no reported income were under-represented among institutional aid recipients. Students from lowest- and middle-income families were overrepresented by 4 percent and 8 percent respectively.

Figure 4. Proportional Representation of Institutional Aid Receipt by Income Group



### *Inferential Findings*

Findings suggest that institutional aid has a significant and positive effect on the likelihood of student persistence (Tables A.6 and A.7). A \$1,000 increase in institutional aid increased the likelihood of persistence by 4 percent, holding all else constant. Institutional aid was positively related to persistence both when controlling for and not controlling for student background, academic preparation, and college enrollment characteristics, though the effect size decreased slightly. Grant aid and loans were also positively associated with persistence. A \$1,000 increase in grant aid increased likelihood of persistence by just over 5 percent, while a similar increase in loans increased likelihood of persistence by 2.4 percent, controlling for all else. Curiously, perhaps, a \$1,000 increase in unmet need was positively associated with persistence, increasing the likelihood by 2.5 percent. 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. Students who 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, even though institutional selectivity and student academic characteristics were similar across institutions.

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 percent 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 percent, *ceteris paribus*.

*Effects of Institutional Aid on Grade Point Average*

Further analysis into the effects of institutional aid on student persistence focused on the relationship between receipt of the aid and a student's cumulative GPA at the end of the 2001 academic year. Most institutions have formal policies establishing minimum GPA requirements for continued enrollment and good academic standing.

In our study, institutional aid had a robust, but overall modest effect on cumulative GPA. Controlling for all else, a \$1,000 increase in institutional aid resulted in a 0.04 increase in GPA (Table 3, below). Although statistically significant and positively related, the effect of income on GPA was almost nonexistent. Curiously, unmet financial need was also positively associated with an increase in GPA. As expected, ranking relatively higher in high school was associated with overall higher GPA. Being male, African American, Hispanic, or Native American and Other were each associated negatively with GPA, holding all else constant.

Table 3. Effects of Institutional Aid on Cumulative Grade Point Average, 2001

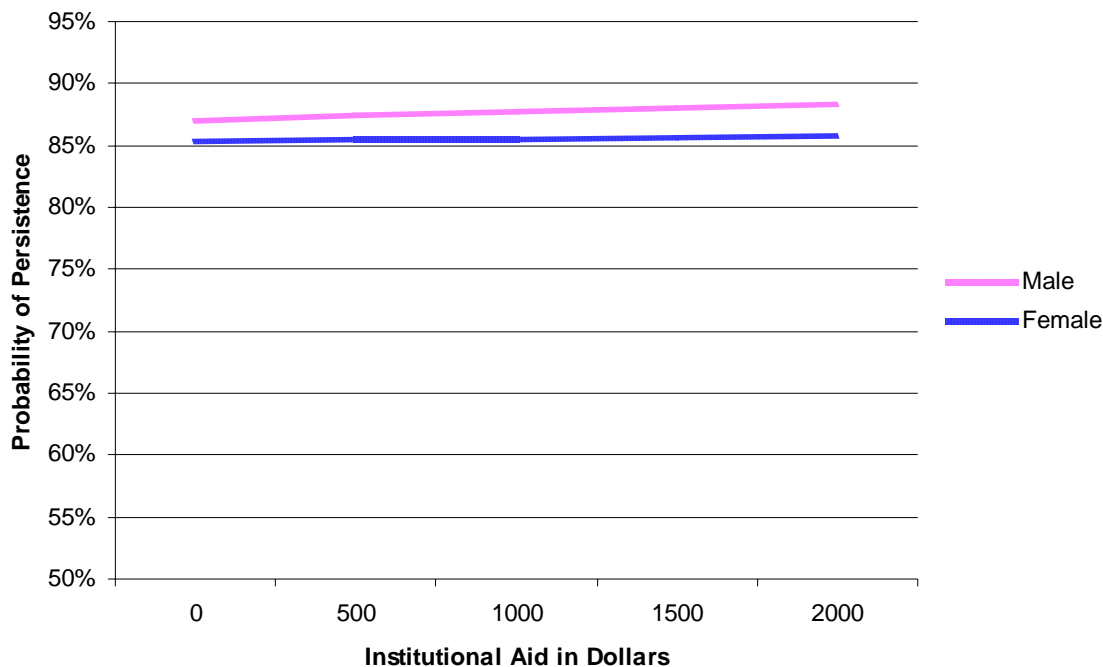
Variable	Coefficient	Std. Error	Sig.
<b>Total Institutional Gift Aid</b>	0.037	0.002	****
<b>Total Grants</b>	-0.003	0.004	
<b>Total Loans</b>	0.000	0.002	
<b>Other Aid Packages</b>	0.062	0.004	****
<b>Work-Study*</b>	-0.034	0.027	
<b>Unmet Need</b>	0.015	0.001	****
<b>Males Compared to Females &amp; Missing</b>	-0.174	0.011	****
<b>Compared to White Students</b>			
<b>African American*</b>	-0.331	0.028	****
<b>Hispanic*</b>	-0.203	0.041	****
<b>Asian American, Pacific Islander*</b>	-0.042	0.028	
<b>Native American, Other*</b>	-0.187	0.090	**
<b>Race Missing*</b>	0.038	0.034	
<b>Income</b>	0.001	0.000	****
<b>Compared to Top Quartile High School Rank</b>			
<b>Second Quartile*</b>	-0.399	0.013	****
<b>Third Quartile*</b>	-0.611	0.021	****
<b>Lowest Quartile*</b>	-0.569	0.066	****
<b>Missing</b>	-0.214	0.016	****
<b>On- Compared to Off-Campus Housing*</b>	0.041	0.017	**
<b>Twenty-first Century Scholar*</b>	-0.039	0.034	
N=16,256			
Durbin-Watson			
	1.96		
Adjusted R-square			
	0.171		
F-statistic			
	177.0		
*Denotes categorical variable			
Aid amounts in units of \$1,000			
Outcome: Cumulative GPA, 2001			
****p<0.001, ***p<0.01, **p<0.05, *p<0.10			

### *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, 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 5, below, models the effects of institutional aid on the probability of men and women persisting from one academic year to the next.

Figure 5. 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 campus-based aid are particularly interesting in that they 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 campus 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) has 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) has hypothesized that financial concerns can be a reason to drop out. Hossler (1984) has suggested that campus-based 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 campus-based scholarships to our models revealed that campus aid did have a statistically significant effect on persistence, it did not have a large impact on the overall fit of the model. This suggests that while campus-based aid is important, it does not have a dramatic impact on the likelihood that recipients will persist, when controlling for other factors. This may not be surprising.

As we have already noted, we were not able to determine whether campus-based aid went to students to meet need or to reward merit. However, in the context of Heller’s (2006) recent observation that more and more campus-based 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, campus-based financial aid may be going disproportionately to students who are more likely to persist overall.

These findings bring us back to the original purpose of this study. As Becker 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 dramatic 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, academic success, *and* 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.

The differences between the effects of campus-based financial aid on the persistence of men and women are intriguing. At the moment, we cannot offer definitive insights into these results. Hossler et al. (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 campus-based financial aid and gender on students' persistence, grades, engagement, and college choice decisions clearly merit further study.

## References

- Bean, J. P. (1980). Dropouts and turnover: The synthesis of a causal model of attrition. *Research in Higher Education, 12*, 155-187.
- Bean, J. P. (1985a). Interaction effects based on class level in an explanatory model of college student dropout syndrome. *American Educational Research Journal, 22*, 35-64.
- Bean, J. P., & Metzner, B. S. (1985b, winter). A conceptual model of nontraditional undergraduate student attrition. *Review of Educational Research, 55*(4), 485-540.
- Bettinger, E. (2004). How financial aid affects persistence. In C. Hoxby (Ed.), *College choices: The economics of where to go, when to go, and how to pay for it* (pp. 207-238). Chicago: University of Chicago Press.
- Braxton, J. M. (Ed.). (2000). *Reworking the student departure puzzle*. Nashville, TN: Vanderbilt University Press.
- Braxton, J. M., Hirschy, A. S., & McClendon, S. A. (2004). *Understanding and reducing college student departure*. ASHE-ERIC Higher Education Report, Vol. 30, No. 3. San Francisco, CA: Jossey-Bass.
- Braxton, J. M., Sullivan, A. S., & Johnson, R. M. (1997). Appraising Tinto's theory of college student departure. In J. C. Smart (Ed.), *Higher education: A handbook of theory and research*, Vol. 12 (pp. 107-164). New York: Agathon Press.
- Cabrera, A. F., Nora, A., & Castañeda, M. B. (1993). College persistence: Structural equations modeling test of an integrated model of student retention. *The Journal of Higher Education, 64*(2), 123-139.
- College Board. (2005). *Trends in student aid 2003*. Washington, DC: Author.

- DesJardins, S. L., Ahlburg, D. A., & McCall, B. P. (2002). Simulating the longitudinal effects of changes in financial aid on student departure from college. *Journal of Human Resources*, 37(3), 653-679.
- Heller, D. (September 25, 2006). The elephant in the student aid office. *Inside Higher Education*. <http://insidehighered.com/views/2006/09/25/heller>.
- Hosmer, D. W., & Lemeshow, S. (2000). *Applied logistic regression* (2<sup>nd</sup> ed.). New York: John Wiley & Sons, Inc.
- Hossler, D. (1984). *Enrollment management: An integrated approach*. New York: College Board.
- Hossler, D., Hu, S., Schmit, J. (1999, winter). Predicting student sensitivity to tuition and financial aid. *Journal of Student Financial Aid*, 28(4), 17-33.
- Hossler, D., Schmit, J., & Vesper, N. (1999). *Going to college: How social, economic, and educational factors influence the decisions students make*. Baltimore, MD: Johns Hopkins University Press.
- Hu, S., & Hossler, D. (2000). Willingness to pay and preferences for private institutions. *Research in Higher Education*, 41(6), 685-701.
- Martin, R. E. (2004). Tuition discounting without tears. *Economics of Education Review*, 23, 177-189.
- McPherson, M. S., Schapiro, M. O., & Winston, G. C. (Eds.). (1993). *Paying the piper: Productivity, incentives, and financing in U.S. higher education*. Ann Arbor, MI: University of Michigan Press.
- Mortenson, T. (2000). Postsecondary Education OPPORTUNITY. (No.91, 2000). Oskaloosa, IA.

- Pascarella, E., & Terenzini, P. (1977). Patterns of student-faculty informal interaction beyond the classroom and voluntary freshman attrition. *Journal of Higher Education, 52*, 197-210.
- Pascarella, E. T., & Terenzini, P. T. (1979). Interaction effects in Spardo's and Tinto's conceptual models of college drop-out. *Sociology of Education, 52*, 197-210.
- Pascarella, E., & Terenzini, P. (1980a). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. *Journal of Higher Education, 51*(1), 60-75.
- Pascarella, E. T., & Terenzini, P. T. (1980b). Predicting voluntary freshman year persistence and withdrawal behavior in a residential university: A part analytic validation of Tinto's model. *Journal of Educational Psychology, 51*(1), 60-71.
- Pascarella, E., & Terenzini, P. (1980c). Student-faculty and student-peer relationships as mediators of the structural effects of undergraduate residence arrangement. *Journal of Educational Research, 73*(6), 343-353.
- Pascarella, E., & Terenzini, P. (1983). Predicting voluntary freshman year persistence/withdrawal behavior in a residential university: A path analytic validation of Tinto's model. *Journal of Educational Psychology, 75*(2), 215-226.
- Paulsen, M. B., & St. John, E. P. (2002). Social class and college costs: Examining the financial nexus between college choice and persistence. *The Journal of Higher Education, 73*(3), 189-236.
- St. John, E. P. (1989). The influence of student aid on persistence. *Journal of Student Financial Aid, 19*(3), 52-68.

- St. John, E. P. (1990a). Price response in enrollment decisions: An analysis of the High School and Beyond sophomore cohort. *Research in Higher Education, 31*(2), 161-176.
- St. John, E. P. (1990b). Price response in persistence decisions: An analysis of the High School and Beyond senior cohort. *Research in Higher Education, 31*(4), 387-403.
- St. John, E. P. (1992). Workable models for institutional research on the impact of student financial aid. *Journal of Student Financial Aid, 22*(3), 13-26.
- St. John, E. P. (2004). *The nexus between finances and student involvement in persistence*. Paper presented at the American Education Research Association Annual Meeting, San Diego, CA.
- St. John, E. P., & Andrieu, S. C. (1995). The influence of price subsidies on within-year persistency by graduate students. *Higher Education, 29*, 143-168.
- St. John, E. P., Andrieu, S. C., Oescher, J., & Starkey, J. B. (1994). The influence of student aid on within-year persistence in four-year colleges. *Research in Higher Education, 35*(4), 455-480.
- St. John, E. P., Paulsen, M. B., & Carter, D. F. (2005). Diversity, college costs, and postsecondary opportunity: An examination of the college choice-persistence nexus for African Americans and Whites. *The Journal of Higher Education, 76*(5), 545-569.
- Singell, L. D., Jr. (2002a). Merit, need, and student self-selection: Is there discretion on the packaging of aid at a large public university? *Economics of Education Review, 21*, 445-454.

- Singell, L. D., Jr., & Curs, B. R. (2002b). An analysis of the application process and enrollment demand for in-state and out-of-state students at a large public university. *Economics of Education Review*, 21, 111-124.
- Singell, L. D., Jr., & Stone, J. A. (2002c). The good, the poor and the wealthy: Who responds most to college financial aid? *Bulletin of Economic Research*, 54(4), 393-407.
- Somers, P. A., & St. John, E. P. (1997). Analyzing the role of financial aid in student persistence. In J. S. Davis (Ed.), *Student aid research: A manual for financial aid administrators* (pp. 127-138). Washington, DC: National Association of Financial Aid Administrators.
- Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *The Journal of Higher Education*, 45(1), 89-125.
- Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2<sup>nd</sup> ed). Chicago: University of Chicago Press.

## Appendix

Table A.1. Descriptive Characteristics for Student Population

		<b>Count</b>	<b>Col %</b>
Persistence, 2001-2002 to 2002-2003	Nonpersister	2379	14.63
	Persister	13877	85.37
Received financial aid	No ©	4767	29.32
	Yes	11489	70.68
Tuition category	Nonresident, off-campus	302	1.86
	Nonresident, on-campus	4600	28.30
	Resident, off-campus	1721	10.59
	Resident, on-campus	9633	59.26
Gender	Male	8384	51.57
	Female and missing©	7872	48.43
Race/Ethnicity	Native American, Other	56	0.34
	Asian American, Pacific Islander	607	3.73
	African American	684	4.21
	Hispanic	279	1.72
	Race missing	432	2.66
	White ©	14198	87.34
Income level, 2001	Below \$30,000	1561	9.60
	Missing	5131	31.56
	\$70,000 and over	5883	36.19
	\$30,00-\$70,000 ©	3681	22.64
High School Rank-Categorical	Missing	2993	18.41
	Lowest quartile	108	0.66
	Third quartile	1293	7.95
	Second quartile	4633	28.50
	Top quartile ©	7229	44.47
College GPA	A	3156	19.41
	C or Less	4416	27.17
	Missing	29	0.18
	B ©	8655	53.24
Student Housing, 2001	On-campus	14233	87.56
	Others including off-campus ©	2023	12.44
Twenty-first Century Scholar	No ©	15705	96.61
	Scholar	551	3.39
<b>Total</b>		<b>16256</b>	<b>100.00</b>

Table A.2. Student Characteristics by Financial Aid Nonrecipients and Recipients

		Received financial aid			
		No ©		Yes	
		Count	Col %	Count	Col %
Persistence, 2001-2002 to 2002-2003	Nonpersister	786	16.5	1593	13.9
	Persister	3981	83.5	9896	86.1
Tuition category	Nonresident, off-campus	115	2.4	187	1.6
	Nonresident, on-campus	1643	34.5	2957	25.7
	Resident, off-campus	400	8.4	1321	11.5
	Resident, on-campus	2609	54.7	7024	61.1
Need-based aid recipient	No	4767	100.0	7879	68.6
	Yes©		0.0	3611	31.4
Gender	Male	2691	56.5	5693	49.6
	Female and missing©	2076	43.5	5796	50.4
Race/Ethnicity	Native American, Other Asian American, Pacific Islander	13	0.3	43	0.4
	African American	257	5.4	350	3.0
	Hispanic	38	0.8	646	5.6
	Race missing	55	1.2	224	1.9
	White ©	131	2.7	301	2.6
		4273	89.6	9925	86.4
Income level, 2001	Below \$30,000	32	0.7	1529	13.3
	Missing	3374	70.8	1757	15.3
	\$70,000 and over	1110	23.3	4773	41.5
	\$30,00-\$70,000 ©	251	5.3	3430	29.9
High School Rank-Categorical	Missing	1119	23.5	1874	16.3
	Lowest quartile	32	0.7	76	0.7
	Third quartile	516	10.8	777	6.8
	Second quartile	1619	34.0	3014	26.2
	Top quartile ©	1481	31.1	5748	50.0
College GPA	A	697	14.6	2459	21.4
	C or Less	1342	28.2	3074	26.8
	Missing	8	0.2	21	0.2
	B ©	2720	57.1	5935	51.7
Student Housing, 2001	Others including off-campus ©	515	10.8	1508	13.1
	On-campus	4252	89.2	9981	86.9
Twenty-first Century Scholar	No ©	4767	100.0	10938	95.2
	Scholar			551	4.8
Total		4767	100.0	11489	100.0

Table A.3. Characteristics of Need-Based Aid Nonrecipients and Recipients

		Need-Based Aid Recipient			
		No		Yes <sup>©</sup>	
		Count	Col %	Count	Col %
Persistence, 2001-2002 to 2002-2003	Nonpersister	1827	14.4	552	15.3
	Persister	10818	85.6	3059	84.7
Tuition Category	Nonresident, off-campus	267	2.1	35	1.0
	Nonresident, on-campus	3925	31.0	675	18.7
	Resident, off-campus	1298	10.3	423	11.7
	Resident, on-campus	7155	56.6	2478	68.6
Gender	Male	6715	53.1	1669	46.2
	Female and missing <sup>©</sup>	5930	46.9	1942	53.8
Race/Ethnicity	Native American, Other	42	0.3	14	0.4
	Asian American, Pacific Islander	466	3.7	141	3.9
	African American	321	2.5	363	10.1
	Hispanic	181	1.4	98	2.7
	Race missing	372	2.9	60	1.7
	White <sup>©</sup>	11263	89.1	2935	81.3
Income Level, 2001	Below \$30,000	337	2.7	1224	33.9
	Missing	5104	40.4	27	0.7
	\$70,000 and over	5457	43.2	426	11.8
	\$30,00-\$70,000 <sup>©</sup>	1747	13.8	1934	53.6
High School Rank—Categorical	Missing	2543	20.1	450	12.5
	Lowest quartile	81	0.6	27	0.7
	Third quartile	997	7.9	296	8.2
	Second quartile	3559	28.1	1074	29.7
	Top quartile <sup>©</sup>	5465	43.2	1764	48.9
College GPA	A	2592	20.5	564	15.6
	C or Less	3157	25.0	1259	34.9
	Missing	23	0.2	6	0.2
	B <sup>©</sup>	6873	54.4	1782	49.3
Student Housing, 2001	Others including off-campus <sup>©</sup>	1565	12.4	458	12.7
	On-campus	11080	87.6	3153	87.3
Twenty-first Century Scholar	No <sup>©</sup>	12523	99.0	3182	88.1
	Scholar	122	1.0	429	11.9
Total		12645	100.0	3611	100.0

Table A.4. Characteristics of Institutional Aid Nonrecipients and Recipients

		Receipt of Institutional Aid			
		No		Yes	
		Count	Col %	Count	Col %
Persistence, 2001-2002 to 2002-2003	Nonpersister	1703	16.2	676	11.8
	Persister	8834	83.8	5043	88.2
Need-Based Aid Recipient	No	8938	84.8	3707	64.8
	Yes <sup>©</sup>	1599	15.2	2012	35.2
Gender	Male	5589	53.0	2795	48.9
	Female and missing <sup>©</sup>	4948	47.0	2924	51.1
Race/Ethnicity	Native American, Other	31	0.3	25	0.4
	Asian American, Pacific Islander	382	3.6	225	3.9
	African American	293	2.8	391	6.8
	Hispanic	154	1.5	125	2.2
	Race missing	229	2.2	203	3.5
	White <sup>©</sup>	9448	89.7	4750	83.1
Income Level, 2001	Below \$30,000	778	7.4	783	13.7
	Missing	3747	35.6	1384	24.2
	\$70,000 and over	4071	38.6	1812	31.7
	\$30,00-\$70,000 <sup>©</sup>	1941	18.4	1740	30.4
High School Rank—Categorical	Missing	1952	18.5	1041	18.2
	Lowest quartile	78	0.7	30	0.5
	Third quartile	1005	9.5	288	5.0
	Second quartile	3446	32.7	1187	20.8
	Top quartile <sup>©</sup>	4056	38.5	3173	55.5
College GPA	A	1543	14.6	1613	28.2
	C or Less	3173	30.1	1243	21.7
	Missing	28	0.3	1	0.0
	B <sup>©</sup>	5793	55.0	2862	50.0
Student Housing, 2001	Others including off-campus <sup>©</sup>	1353	12.8	670	11.7
	On-campus	9184	87.2	5049	88.3
Twenty-first Century Scholar	No <sup>©</sup>	10297	97.7	5408	94.6
	Scholar	240	2.3	311	5.4
Total		10537	100.0	5719	100.0

Table A.5. Characteristics of Persisters and Nonpersisters, 2001-2002 to 2002-2003

		Persistence, 2001-2002 to 2002-2003			
		Nonpersister		Persister	
		Count	Col	Count	Col
Tuition Category	Nonresident, off-campus	29	1.2	273	2.0
	Nonresident, on-campus	545	22.9	4055	29.2
	Resident, off-campus	347	14.6	1374	9.9
	Resident, on-campus	1458	61.3	8175	58.9
Gender	Male	1239	52.1	7145	51.5
	Female and missing©	1140	47.9	6732	48.5
Race/Ethnicity	Native American, Other	15	0.6	41	0.3
	Asian American, Pacific Islander	84	3.5	523	3.8
	African American	123	5.2	561	4.0
	Hispanic	42	1.8	237	1.7
	Race missing	70	2.9	362	2.6
	White ©	2045	86.0	12153	87.6
Income Level, 2001	Below \$30,000	276	11.6	1285	9.3
	Missing	790	33.2	4341	31.3
	\$70,000 and over	803	33.8	5080	36.6
	\$30,00-\$70,000 ©	510	21.4	3171	22.9
High School Rank–Categorical	Missing	493	20.7	2500	18.0
	Lowest quartile	17	0.7	91	0.7
	Third quartile	223	9.4	1070	7.7
	Second quartile	733	30.8	3900	28.1
	Top quartile ©	913	38.4	6316	45.5
College GPA	A	367	15.4	2789	20.1
	C or Less	1011	42.5	3405	24.5
	Missing	25	1.1	4	0.0
	B ©	976	41.0	7679	55.3
Student Housing, 2001	Others including off-campus ©	376	15.8	1647	11.9
	On-campus	2003	84.2	12230	88.1
Twenty-first Century Scholar	No ©	2304	96.8	13401	96.6
	Scholar	75	3.2	476	3.4
Total		2379	100.0	13877	100.0

Table A.6. Results from Logistic Regression, *Excluding* Institutional Aid, Student Persistence from 2001-2002 to 2002-2003

Variable	Sig.	OR	Sig.	OR	Sig.	OR	Sig.	OR
<b>Institutional Aid</b>								
Grant Aid							**	1.040
Loans							**	1.016
Other								0.991
<b>Work-Study Participants Compared to Nonparticipants</b>								0.901
<b>Unmet Need</b>							**	1.016
<b>Men Compared to Women and Missing</b>		0.984		1.011	****	1.212	****	1.212
<b>Compared to White Students</b>								
Native American and Other Race	**	0.464	**	0.482	**	0.523	**	0.534
Asian American and Pacific Islander		1.095		1.113		1.121		1.079
African American	*	0.817		0.853		1.007		1.043
Hispanic		0.963		0.985		1.100		1.118
Race Missing		0.932		0.972		0.940		0.929
<b>Compared to Middle-Income Students</b>								
High-Income (Greater than \$70,000)		1.011		1.013	**	0.876	**	0.865
Lowest-Income (Less than \$30,000)	**	0.772	**	0.796	**	0.796	**	0.733
Income Not Reported and Missing	**	0.875		0.922	****	0.778	****	0.739
<b>Compared to Students in Top Quartile of High School Class</b>								
Second Quartile			****	0.777	**	1.124		1.097
Third Quartile			****	0.714	**	1.232	**	1.208
Lowest Quartile				0.839		1.412		1.421
Missing			****	0.761		0.948		0.899
<b>College GPA</b>					****	2.230	****	2.239
<b>On-Campus Compared to Off-Campus Students</b>					**	1.241	**	1.204
<b>Twenty-first Century Scholars Compared to Non-Scholars</b>					*	1.301		1.198
% Correctly Predicted		57.167		51.870		65.717		66.062
Nagelkerke		0.003		0.007		0.083		0.085
N=16,256								

Outcome: Persistence, 2001-2001 to 2002-2003

Aid amounts in units of \$1000

\*\*\*\*p<0.001, \*\*\*p<0.01, \*\*p<0.05, \*p<0.10

Table A.7. Results from Logistic Regression, *Including* Institutional Aid, Student Persistence from 2001-2002 to 2002-2003

Variable	Sig.	OR	Sig.	OR	Sig.	OR	Sig.	OR
<b>Institutional Aid</b>							****	1.042
<b>Grant Aid</b>							**	1.052
<b>Loans</b>							**	1.024
<b>Other</b>								1.00
<b>Work-Study Participants Compared to Nonparticipants</b>								0.87
<b>Unmet Need</b>							****	1.025
<b>Men Compared to Women and Missing</b>		0.98		1.01	****	1.21	****	1.201
<b>Compared to White Students</b>								
Native American and Other Race	**	0.46	**	0.482	**	0.523	**	0.523
Asian American and 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
<b>Compared to Middle-Income Students</b>								
High-Income (Greater than \$70,000)		1.01		1.01	**	0.88	**	0.874
Lowest-Income (Less than \$30,000)	**	0.77	**	0.796	**	0.796	**	0.729
Income Not Reported and Missing	**	0.87		0.922	****	0.778	****	0.726
<b>Compared to Students in Top Quartile of High School Class</b>								
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
<b>College GPA</b>					****	2.23	****	2.209
<b>On-Campus Compared to Off-Campus Students</b>					**	1.24	**	1.182
<b>Twenty-first Century Scholars Compared to Non-Scholars</b>					*	1.30		1.22
% Correctly Predicted		57.167		51.870		65.717		66.000
Nagelkerke		0.003		0.007		0.083		0.086
N=16,256								

Outcome: Persistence, 2001-2001 to 2002-2003

Aid amounts in units of \$1000

\*\*\*\*p&lt;0.001, \*\*\*p&lt;0.01, \*\*p&lt;0.05, \*p&lt;0.10