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# The Effect of Price on Within-Year Persistence

By Patricia A. Somers

*Researchers disagree on the impact of financial aid on student persistence. This paper describes the development and testing of an econometric model that allows any institution to study the effect of aid and other variables on within-year persistence. Among the five conclusions reached are that both the total amount of aid, and the amounts of grants and loans are significant in promoting persistence.*

The research literature on college student persistence is ambiguous on the question of how financial aid affects student persistence. Sociological studies, of which there are many, ignore aid. A small number of persistence studies have examined the impact of aid, and the results are contradictory. Since much of the dropout from higher education is during the first year, within-year persistence is particularly important to examine. This paper presents and tests a logical model for studying the impact of aid on within-year persistence.

## Background

Sociological studies of persistence focus on background, academic, and social integration variables (Spady, 1971; Rootman, 1972; Tinto, 1975 & 1982; Pascarella, Duby, Miller, & Rasher, 1981; Pascarella & Terenzinni, 1977, 1979, & 1983). Taken as a body, however, these studies have several shortcomings. First, much of the research uses supplementary data collection. These surveys are limited in their sample size and are difficult for many institutions with limited resources to perform. Second, the impact of economic variables, especially financial aid, is usually not examined. Given the intended role of federal financial aid in promoting persistence, this oversight is troublesome. Third, while the notion of academic and social integration is intriguing, operationalizing the corresponding variables and collecting data are difficult.

Recently, several studies have incorporated financial aid variables in persistence models. However, the results are contradictory and the outcome measures vary (Astin, 1975; Moline, 1987; St. John, 1991a; Leslie & Brinkman, 1988; Vorhees, 1985; and Tinto, 1990). Moreover, much of the research has been done at the national level, using large databases collected by various agencies.

Vorhees (1985) finds that National Direct Student Loans (now Federal Perkins Loans) and College Work-Study (now Federal Work-Study), along with cumulative grade point average have the greatest impact on persistence. Moline (1987), in a single-institution study, finds no significant relationship between aid and persistence. In a national study, Astin (1975) looks at the differential impact of aid on persistence to completion of the college degree. He finds that participation in work-study, support from ROTC, and receipt of scholarships or grants increase the chance of persistence. He discovers a negative role for loans in first-to-second-year persistence.

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Using national data, Terkla (1985) examines the role of financial aid in withdrawal from the higher education system in general; the three variables with the strongest direct effects are degree-level goal, high school grades, and financial aid. In a national study, Carroll (1987) suggests a "threshold" effect, finding that, overall, grants are effective in promoting persistence but that larger grants may be effective while smaller grants are not.

In another national study, St. John, Kirshtein, and Noell (1990) conclude that social and educational background can have differing effects on persistence at different points in college. The college experience (full-time attendance and grades) and financial aid have a positive effect on persistence for each year of attendance. Finally, they find that federal grants and loans have an impact on persistence, especially long-term persistence (St. John, 1991b).

St. John (1989a) examines the influence of student financial aid using cohorts from 1972, 1980, and 1982. Loans alone had a negative influence on persistence in the 1970s, but a positive influence in the 1980s. With this exception, both loans and grants have a positive impact on persistence during the first three years of college. However, no form of aid is significant in the fourth-to-fifth-year transition (graduation). This implies that the closer a student comes to graduation, the less aid influences persistence.

In another national study, St. John (1990b) examines how the amounts of financial aid and tuition charges affect year-to-year persistence. Using data from the early 1980s, he finds that persistence decisions are more responsive to increases in aid (grants, loans, and work-study) than increases in tuition. In this study, students are more responsive to changes in tuition only between the second and third years of college. This finding represents a significant departure from the student demand studies, and may signal a shift in student response.

Several of these institutional studies are contradictory. St. John (in press) suggests:

One possible explanation for the discrepancies in findings from institutional studies is that the students in the same institutions are subject to the same tuition charges and the same packaging philosophies. . . . Another possibility is that there are differences in logical and statistical models used at the institutional levels that result in discrepancies in the effects of student aid when institutional studies are compared.

The implications of this are important for researchers. If these discrepancies are a result of the relatively little variation in tuition pricing and financial aid awards, this could place an important limitation on research on the impact of financial aid at the institutional level. If, however, the discrepancies are a result of shortcomings in the logical models used, this argues for a new look at alternative models coupled with statistical testing.

#### **Logistical Model Specifications**

In this model, within-year persistence is viewed as a function of four factors: background, achievement, student financial aid, and college

experiences (Table 1). The factor of background included the following variables: African-American, Hispanic, female, age, independent, low-income aid applicant, middle-income aid applicant, and high-income aid applicant. Three mutually exclusive achievement variables, ACT—low, ACT—high, and National Merit, comprised the achievement factor. Four variables were used as a measure of experiences during the first year of college: grade point average (GPA) (divided into the variables GPA—low and GPA—high), attendance status (full-time or part-time), and persistence program participation.

To compare the impact of aid, several financial aid variables were created. A two-step approach to the analysis was used. First, was a logical test of the model in which the variables representing each factor were sequentially stepped into the regression. The four steps provided information on the effect of each factor. Second, logistic regressions were run which substituted three sets of variables for the factor student financial aid. This substitution allowed for an in-depth assessment of the impact of student aid using the variables described above. In order to compare the impact of aid, variables were created which allowed for the analysis and comparison of aid award strategies, substituting three combinations of aid variables in various versions of the basic model. These three combinations represented the types of approaches to analyzing the impact of student financial aid that have been used in previous studies.

The first analysis examined whether the receipt of any financial aid influenced first-time attendance. The second version analyzed *amount* of aid. This variable represented the total financial aid offered, divided by 1,000 to allow for comparisons to Standardized Price Response Coefficients (SPRCs) (Leslie & Brinkman, 1988), which use \$100 increments. The third version considered the amount of the different types of aid. This included all aid received, including grant dollars, work-study dollars, loan dollars, and scholarship dollars. These numeric variables were divided by 1,000 to allow for conversion to SPRCs. Some research has indicated that specific types of aid were effective in promoting attendance (Fenske, Boyd, & Maxey, 1979; and Manski & Wise, 1983).

## Methods of Analysis

### *Statistical Method*

To describe the relationship between an outcome (dependent) variable and one or more explanatory (independent) variables, statistical regression methods are used. Regression techniques are used to find the “best fit” between the explanatory variables and the outcome variable.

For a model where the outcome variable is dichotomous (such as this study), OLS (Ordinary Least Squared) regressions can seriously misestimate the dependent variable. Instead, a technique known as logistic regression is used. Since a student chooses to attend or not, and later chooses to persist or not, the outcomes are dichotomous: either yes or no (coded as 1 or 0). The resulting graph of the relationship is not a straight line, but a curved line bounded by 0 and 1.

A great deal of statistical work has been done with the linear regression model. The dichotomous model can be made to look exactly

**TABLE 1**  
**Variable Specifications**

**INDEPENDENT VARIABLES**

<b>Factor/Variable</b>	<b>Coding</b>	<b>Comment</b>
<b>Background</b>		
Female	0 = male 1 = female	Compares females to males
African-American	0 = No 1 = Yes	Compares African-Americans to others
Hispanic	0 = No 1 = Yes	Compares Hispanics to others
Age	Numeric	Indicates age
Low-income aid applicant (1-\$15,000)	0 = No 1 = Yes	Compares low-income aid applicants to others
Middle-income aid applicants (\$15,001-30,000)	0 = No 1 = Yes	Compares middle-income aid applicants to others
High-income aid applicant (\$30,001 and greater)	0 = No 1 = Yes	Compares high-income aid applicants to others
<b>Achievement</b>		
ACT—low	0 = No 1 = Yes	Compares ACT scores of 1 - 17 with others
ACT—high	0 = No 1 = Yes	Compares ACT score of 27 - 40 with others
National Merit	0 = No 1 = Yes	Compares National Merit Scholars to others
<b>College Experiences</b>		
Grade point average—low	0 = No 1 = Yes	Compares Fall 1989 GPA -bottom third (0.00—1.937) to others
Grade point average—high	0 = No 1 = Yes	Compares Fall 1989 GPA -top third (2.818+) to others
Full-time	0 = No 1 = Yes	Compares those who attended full-time Fall 1989 with part-time students
Persistence program participation	0 = No 1 = Yes	Compares students enrolled in academic enrichment program with others
<b>Student Financial Aid</b>		
Aid offered	0 = No 1 = Yes	Compares aid and non-aid recipients
Total financial aid amount offered (divided by 1,000)	Numeric	Indicates total amount of aid offered
<b>Types of Aid</b>		
Grant offered (divided by 1,000)	Numeric	Indicates amount of grant offered
Work-study offered (divided by 1,000)	Numeric	Indicates amount of work-study offered
Loan offered (divided by 1,000)	Numeric	Indicates amount of loan offered
Scholarship offered (divided by 1,000)	Numeric	Indicates amount of scholarship offered
<b>Dependent Variables</b>		
	0 = No 1 = Yes	Students enrolled for Spring 1990

like the linear model. This allows the values of  $\beta_i$  for the dichotomous model to be calculated using the same well-documented techniques as the standard linear model.

#### *Delta P*

One of the most important questions posed by model users is: Will a change in the independent variable have a positive or negative impact on the outcome? This question is answered by computing a statistic called "delta P," which measures the effect on the dependent variable given a change of one unit in a selected independent variable. Petersen's (1984) delta P formula is used; this calculation can be done easily with a computer spreadsheet that contains exponential functions, and a delta P value for each independent variable in the model can be calculated. The delta P can be used as a student price response coefficient (Leslie & Brinkman, 1988).

[A commonly used calculation for delta P is:

$$\text{Delta P} = \beta_i P(1-P)$$

where P = the sample mean of the dependent variable, and  $\beta_i$  = the coefficient of the *i*-th independent variable. In a discussion of the use of this measure for logit and probit models, however, Petersen (1984) points out that the result of this calculation may well be greater than 1 in absolute value, leading to estimated changes in the dependent variable outside the zero-one range. He proposes this alternate calculation:

$$\text{Delta P} = \frac{\exp(L_1)}{1 + \exp(L_1)} - \frac{\exp(L_0)}{1 + \exp(L_0)}$$

where  $L_0$  is the logit score before the change in the *i*-th variable, and  $L_1 = L_0 + \beta_i$  is the logit score after the unit change in  $X_i$ . This calculation can be done easily with a computer spreadsheet program that contains exponential functions, and a delta P value for each independent variable in the model can be calculated.]

Delta P statistics are used in two ways in this study. First, for dichotomous variables, the delta P provides a measure of the extent to which the outcome is likely to change if a student has that characteristic. For example, a delta P of 0.061 for African-Americans can be interpreted as increasing the probability of persistence or attendance by 6.1 percentage points for this group.

The second use for the delta P statistic in this study is for continuous variables. In these cases, the delta P can be interpreted as meaning that a change in a unit measure will change the probability of the outcome by a certain percentage. For example, a delta P statistic of 0.061 per \$1,000 of grant aid indicates that the probability of attendance or persistence increases by 6.1 percentage points per \$1,000 in grant aid awarded. In this study, the figures are converted to \$100 units for comparison purposes.

There are two ways to use price-response coefficients in planning models (St. John, 1991b). The first is as an estimation of participation rates in projection models. Second, the SPRC can be converted to

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*"The research literature on college student persistence is ambiguous on the question of how financial aid affects student persistence."*

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*“Those students scoring in the bottom third of the ACT were 13.6% less likely to persist, while those scoring in the top third were 6.9% more likely to persist.”*

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a price elasticity, which is then used to estimate enrollments after participation rates are calculated. Since about one-third of the eligible population attends institutions of higher education, this figure is multiplied by three to obtain a price elasticity (Leslie & Brinkman, 1988).

Three versions of each logical model are utilized, substituting the following three sets of variables for the factor of student financial aid:

1. Aid only (receipt of any aid).
2. Total aid (dollar amount).
3. Types of aid (by dollar amount).

By analyzing student financial aid in these three ways, a much richer picture of the complexities of the impact of aid are possible. Moreover, it is possible to assess how the aid variables influence the matriculation decisions of students from varying backgrounds. In addition, this complex analysis makes it possible to study the differing impact of aid at various points in the matriculation process.

#### *Student Profile*

The population consisted of the 1,473 students who persisted to the spring of 1990 after enrolling as first-time students in the fall of 1989. The institution studied was an urban, public institution of approximately 15,000 students.

#### *Step 1: Background Factors*

In the first step (Table 2), the effect of the factor background on within-year persistence was studied. Eight variables were included in the factor background: female, African-American, Hispanic, independent, low-income aid applicant, middle-income aid applicant, high-income aid applicant, and age.

Half of the background variables were significant. Hispanic students were 12.1 percentage points more likely to persist than others. Two of the income variables had a significant, positive association with persistence. Middle-income aid recipients were 10.5 percentage points and high-income aid applicants were 11.3 percentage points more likely to persist than others. The correlation coefficient between low-income aid applicant and independent was 0.60, indicating some interaction between the two variables. Age had a significant, slightly negative association with persistence. The probability of persistence decreased by 0.58 percentage points for each year of age.

The logit score for Step 1 was 1.266. The pseudo  $r^2$  was 0.0353.

#### *Step 2: Achievement*

In the second step of the model, the factor achievement was added to that of background. Achievement consisted of three variables, National Merit Scholar, ACT—low, and ACT -high. Of the 11 variables in this iteration, six had a significant association with persistence.

Once again, the variable Hispanic had a significant and positive association with persistence. Hispanic students were 13.2 percentage points more likely to persist than others.

Two income variables were again significantly associated with persistence. Middle-income aid applicants were 11.1 percentage points

**TABLE 2**  
**Sequential Analysis of Factors—Within-Year Persistence Model**

<b>Factor/ Independent Variable</b>	<b>Step 1 Delta P</b>	<b>Step 2 Delta P</b>	<b>Step 3 Delta P</b>	<b>Step 4 Delta P</b>
<b>Background</b>				
Female	-0.0366	0.0167	-0.0170	-0.0470**
African-American	-0.0092	0.0280	0.0228	0.0710*
Hispanic	0.1211*	0.1324*	0.1316*	0.1316*
Independent	0.0568	0.0696**	0.0704**	0.0714**
Low-income aid applicant	-0.0088	0.0180	0.0170	0.0236
Middle-income aid applicant	*	*	*	**
High-income aid applicant	0.1048	0.1106	0.1088	0.1019
Age	**	**	**	
	0.1126	0.1014	0.0984	0.0927
	-0.0058*	-0.0023	0.0000	0.0001
<b>Achievement</b>				
Merit Scholar		0.2200	0.2200	0.2200
ACT—low		-0.1360*	-0.0799*	-0.0799**
ACT—high		0.0691*	0.0282	0.0283
<b>College Experiences</b>				
Persistence program			0.0751	0.0751
Full-time			0.1804*	0.1805*
GPA—high			0.0910*	0.0911*
GPA—low			0.0413*	0.0414
<b>Financial Aid</b>				
Any aid?				-0.0017

\*Significance level = 0.01 \*\*Significance level = 0.05

**MODEL STATISTICS**

	<b>Step 1</b>	<b>Step 2</b>	<b>Step 3</b>	<b>Step 4</b>
Logit score	1.266	1.266	1.266	1.266
Pseudo r <sup>2</sup>	0.0353	0.0777	0.1693	0.1693
Log likelihood function	-975.8923	-930.5560	-816.7578	-816.7572
Chi square	69.55317 (Sig = 0.0000)	160.2258 (Sig = 0.0000)	387.8221	387.8235
Degrees of freedom	8	11	15	16

more likely to persist and high-income aid applicants were 10.1 percentage points more likely to persist. Moreover, dependency status was also significant, with a 7.0 percentage point association between independence and within-year persistence. Independence had not been significant in Step 1.

Two of the achievement variables were associated with persistence. Those students scoring in the bottom third of the ACT were 13.6 percentage points less likely to persist, while those scoring in the top third were 6.9 percentage points more likely to persist. One variable



was significant in Step 1, but not in Step 2. Age had a small negative delta P, but was not significant.

The logit score for Step 2 was 1.266 and the pseudo  $r^2$  was 0.0777. This increase in the pseudo  $r^2$  indicated that achievement was a distinct factor in the within-year persistence logistical model.

#### *Step 3: College Experiences*

Step 3 of the model added the factor college experiences to background and achievement. College experiences consisted of the variables persistence program participation, full-time, GPA—low, and GPA—high.

The model consisted of 15 variables, and 8 of them had a significant association with persistence. Three of the new variables were significantly associated with within-year persistence and one achievement variable was no longer significant in this step. Hispanic, independent, middle-income aid applicant, high-income aid applicant, and ACT—low were again significant and negatively or positively associated with persistence. At this step of the analysis, both scoring in the top third on the ACT and age were not significant in explaining persistence, a change from the previous steps.

Three of the four new variables added in this step were significant. Full-time attendance during the first semester increased the probability of persistence by 18.0 percentage points. Both GPA variables were significantly and positively associated with persistence. Those students in the top third were 9.1 percentage points more likely and those in the bottom third were 4.1 percentage points more likely to persist. The implications of these figures will be discussed in the analysis section.

The model statistics showed a stronger model with the inclusion of college experiences. The logit score was 1.266 and the pseudo  $r^2$  was 0.1693. The pseudo  $r^2$  doubled between Steps 2 and 3. This showed that college experience was a distinct factor. More of the variance in the dependent variable, within-year persistence, was explained when the factor college experience was added to the factors of background and achievement.

#### *Step 4: Financial Aid*

Step 4 again consisted of the factors of background, achievement, college experiences, and appended the student financial aid variable (represented by receipt of any aid). Of the 16 variables in this iteration, eight were significant. Unchanged from the previous models were the significant, positive delta Ps for the variables Hispanic, independent, middle-income aid applicant, full-time 1, and GPA 1—high. Also unchanged was the significant negative delta P for ACT—low. Of the income variables, only middle-income aid applicant was significant when aid was added to the model, with middle-income aid applicants 10.2 percentage points more likely to persist. Two sets of variables had correlation coefficients above 0.05. For the independent, low-income aid applicant, the correlation coefficient was 0.60. The coefficient for independent and any aid was 0.52. This indicates some interaction between these variables.

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*"The consistent positive association between being Hispanic and persistence was unexpected, since previous research indicated that Hispanic students were less likely to persist."*

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In this step of the model, two background variables were significant. Gender was negatively associated with persistence, with women 4.7 percentage points less likely to persist. African-American students were 7.1 percentage points more likely to persist. These were important changes that indicated that the mere receipt of aid was negatively associated with aid for women, but positively associated with aid for African-Americans.

The model statistics for Step 4 were identical to Step 3. The logit score was 1.266 and the pseudo  $r^2$  was 0.1693. This meant that the addition of the factor student financial aid (any aid) did not explain any more of the variance in the dependent variable, but as shown below, the financial aid factor did have an effect on persistence.

### *Analysis*

In the first three steps, being a middle-income or upper-income aid applicant was positively associated with persistence; however, when the receipt of aid was controlled for, there were shifts in significance. For high-income aid applicants, the significant association at the 0.05 level did not continue when receipt of any aid was added to the model. For middle-income aid applicants, the significance level shifted from 0.01 to 0.05. These data suggest that the mere receipt of any aid does not add to the explanatory power of the model. The other three versions discussed in the next section may add more to the analysis.

The receipt of aid was significantly associated with persistence for two groups. Women were less likely to persist when receipt of aid was considered; however, African-American students were more likely to persist.

The consistent positive association between Hispanic and persistence was unexpected, since previous research indicated that Hispanic students were less likely to persist. In part, this may be explained by socioeconomic status, since the community in which this institution was located has a large number of political refugees from Central America.

Full-time attendance was positively associated with within-year persistence (18.0 percentage points more likely to persist for Steps 3 and 4). Because the institution studied was an urban public institution with a large part-time student population, this statistic was troubling. It suggested that the institution should examine steps that could improve the persistence of this important segment of the population.

Three variables had significant associations with persistence in the directions that were expected based on both the research literature and common sense. Scoring in the bottom third on the ACT was consistently negatively associated with persistence. Since admissions tests were designed to predict first-year academic performance, this was anticipated. Achieving a first-semester GPA in the top third was positively associated with persistence.

### **Assessing the Influence of Aid on Within-Year Persistence**

The second analysis of within-year persistence used three approaches to assess the influence of student financial aid. For this analysis, logistic regression was performed on the four-step model introduced in the previous section; however, a different set of variables was substituted

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*“Full-time attendance was significantly associated with persistence, increasing the probability of persistence by 17.8%.”*

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for the factor student financial aid. This substitution permitted the assessment of how different combinations of student financial aid might influence within-year persistence.

The first version of the model examined whether the receipt of any financial aid influenced within-year persistence. This model was also included in the previous discussion as Step 4, and is not discussed again here, but is included in the analysis section. The second version of the model considered the total amount of aid received. The third version of the model contained four aid variables representing the type and amount of aid.

The first analysis, receipt of any aid, was presented in the previous discussion as Step 4. The findings are not repeated here, but will be compared with the other analyses below.

The model for the second aid version combined background, achievement, college experiences, and the variable amount of total aid. This model was the first to consider dollar amounts for the student aid variable. Of the 16 variables in this version of the model, eight had a significant association with persistence (eight were significant in the any aid version).

Hispanics were 12.6 percentage points more likely to persist than others. The variable age was significantly and negatively associated with the dependent variable, with older students 0.07 percentage points less likely to persist, a small shift from the previous step. The probability of persistence for students scoring in the bottom third of the applicant pool for this institution on the ACT was decreased by 7.7 percentage points.

With the total amount of aid controlled for, two college experience variables were significant. Full-time attendance was significantly associated with persistence, increasing the probability of persistence by 17.8 percentage points. Further, having a GPA in the top third of the class at the end of the fall semester increased the likelihood of persistence by 9.3 percentage points. Being a low-income aid applicant was significantly and negatively associated with persistence. When the total amount of aid was controlled for, low-income aid applicants were 18.2 percentage points less likely to persist. The correlation coefficient between independent and low-income aid applicant was 0.60. The dollar amount of aid was significantly and positively associated with persistence. The price response coefficient was 5.0 percentage points for each \$1,000 of aid.

The most important change from Version 1 to Version 2 was for the variable African-American. In the “any aid” analysis, African-American was significant and this group was 7.1 percentage points more likely to persist with the receipt of aid. In Step 2, with the actual dollar amounts included, this figure shifted to 4.8 percentage points less likely to persist; however, the figure was not significant at the 0.01 or 0.05 level. The data suggested that aid amounts for African-Americans were not high enough to promote within-year persistence.

The amount of aid received provides a better picture of the influence of aid on persistence; the negative association between being a low-income aid applicant and persistence reflects the unmet need or

**TABLE 3**  
**Comparison of Aid Analysis—Within-Year Persistence Model**

Factor/Independent Variable	Version 1	Version 2	Version 3
	Any Aid	Aid Amount	Types of Aid
	Delta P	Delta P	Delta P
<b>Background</b>			
Female	-0.0470**	-0.0461	-0.0414
African-American	0.0710*	-0.0481	0.0506
Hispanic	0.1316*	0.1260*	0.1723*
Independent	0.0714**	0.0590	0.0702
Low-income aid applicant	0.0236	-0.1818*	-0.1170*
Middle-income aid applicant	0.1019**	-0.0133	-0.0261
High-income aid applicant	0.0927	-0.0098	-0.0152
Age	0.0001	-0.0007**	-0.0008
<b>Achievement</b>			
Merit Scholar	0.2200	0.2200	***
ACT—low	-0.0799**	-0.0773*	-0.0811*
ACT—high	0.0283	0.0235	0.0212
<b>College Experiences</b>			
Persistence program	0.0751	0.0833	0.0848
Full-time	0.1805*	0.1782*	0.1785*
GPA—high	0.0911*	0.0928*	0.0924*
GPA—low	0.0414	0.0400	0.0389
<b>Financial Aid</b>			
Any aid?	-0.0017		
Total aid		0.0495*	
<b>Types and Amounts of Aid</b>			
Grant amount			0.0624*
Loan amount			0.0516*
Work/study amount			0.0116
Scholarship amount			0.0537**

\*Significance level = 0.01 \*\*Significance level = 0.05

**MODEL STATISTICS**

	Version 1	Version 2	Version 3
Logit score	1.266	1.266	1.266
Pseudo r <sup>2</sup>	0.1693	0.1791	0.1785
Log likelihood function	-816.757115	-803.081546	-803.919621
Chi square	387.8235	415.1746	413.4985
Degrees of freedom	16	16	18

“gap” inherent in most aid packages. Moreover, since low-income aid applicants at this institution may rely primarily on federal financial aid, which was reduced during the 1980s, the problem of unmet need has increased.

The model statistics again indicated a slightly stronger model over the previous steps. The logit score was 1.266 and the pseudo r<sup>2</sup> was 0.1791. This represented an increase in the pseudo r<sup>2</sup> over the “any

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*“Low-income aid applicants didn’t persist as well as others when the type and amount of aid were considered.”*

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aid” version of the model which demonstrated that the “aid amount” version explained more of the variance in the dependent variable.

The third analysis utilized the model which added to the factors of background, achievement, and college experiences, the variables for types and amounts of financial aid (grant amount, work-study amount, scholarship amount, and loan amount). Of the 19 variables in the model, seven significantly influenced persistence.

As in the previous model, the following variables were significantly associated with persistence: Hispanic, low-income aid applicant, ACT—low, full-time, and GPA—high. Low-income aid applicants were 21.7 percentage points less likely to persist when the types and amounts of aid were considered. This was consistent with the findings in the previous step about the total amount of aid, and suggested that more need-based aid was necessary to promote within-year persistence. Hispanic students were 12.7 percentage points more likely to persist.

The amounts of two of the four types of aid were significantly associated with persistence. Students receiving grants were 6.2 percentage points more likely to persist. There was an interaction between low-income aid applicant and grant amount, with a correlation coefficient of 0.73. Receiving loans increased the probability of persistence by 5.2 percentage points. This produced a price response coefficient of 6.3 percentage points per \$1,000 in grants awarded and 5.2 percentage points per \$1,000 in loans. There was a correlation coefficient between grants and loans of 0.55.

The model statistics demonstrated a slight improvement over the previous step. The logit score was 1.266 and the pseudo  $r^2$  was 0.1785. This model explained more of the variance in the dependent variable, within-year persistence, than any previous version.

#### *Analysis*

The three versions of the within-year persistence logistical model which used student aid variables offer insights into how aid affects persistence. Throughout the three analyses, the variables Hispanic, full-time, and GPA—high were significantly associated with persistence. The variable ACT—low was also consistently negatively associated with persistence between the first and second semesters.

In two of the three analyses, there were significant associations between within-year persistence and student financial aid. Both of these analyses considered actual dollar amounts rather than mere receipt of aid. When the amount of aid was considered (Version 2), a student price response coefficient of 5.0 percentage points per \$1,000 in aid was found. When the types and amounts of aid were examined (Version 3), student price response coefficients of 6.2 percentage points per \$1,000 in grants and 5.2 percentage points per \$1,000 in loans were discovered.

Based on the comparisons between the three versions of the model, five conclusions emerged from these data. First, low-income aid applicants didn’t persist as well as others when the type and amount of aid were considered. This reflects the “gap,” or unmet financial need of low-income aid applicants; their financial aid packages were

inadequate. This group of "high-risk" students was very price responsive and additional need-based grants could be effective in promoting their persistence. Second, the total amount of aid offered was significant in promoting within-year persistence for all students. Third, the amount of both grants and loans (which low-income aid applicants receive) were significantly associated with persistence. Fourth, women students were less likely to persist when the amount of aid was considered, suggesting that this group may have special needs that could also be met through additional need-based grants. Fifth, African-American students were responsive to both the receipt of aid and the amount of aid. Additional aid, both need-based and merit, could increase the persistence of African-American students.

## Summary

In this paper, the results from the within-year persistence logistical model were presented. The factors of background, achievement, college experiences, and student financial aid were added sequentially to a logistic regression to test the logic of the model. A second series of logistic regressions used three approaches to study the impact of aid. Both the total amount of aid, and the amounts of grants and loans, were significant in promoting within-year persistence.

This research demonstrates that an econometric model can be developed which uses extant institutional data to develop price response figures for within-year persistence. Further research that examines and compares figures across institutions in an effort to "benchmark" price response is currently underway (Somers, 1993).

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