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# The Influence of Prices on Within-Year Persistence by Traditional College-Age Students In Four-Year Colleges

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*This paper uses the 1987 National Postsecondary Student Aid Study to examine the influence of prices on within-year persistence by traditional college-age students enrolled in four-year colleges. The findings include: 1) within-year persistence was influenced by the amount of tuition charged; 2) tuition charges were negatively associated with within-year persistence in both public and private colleges; and 3) grant aid was positively associated with persistence in private colleges and negatively associated with persistence in public colleges. The authors conclude that the negative association between grants and persistence by students in public colleges is an artifact, attributable to an insufficient amount of grants available to students in public colleges.*

In recent years there has been substantial progress in national persistence research. Research using the national longitudinal bases has consistently found a positive association between the receipt of student aid and persistence (Carroll, 1987; St. John, 1989, 1990b, 1991b; Terkla, 1985). Only one previous study has examined the influence of prices—amounts of tuition charges and student aid subsidies—on persistence (St. John, 1990b). There have been no prior studies of the influence of prices on persistence by college students in the late 1980s. Given the fact that tuition charges rose faster than inflation throughout the 1980s (Hauptman, 1990a & b), it is important to assess whether prices in the late 1980s had an influence on persistence.

The availability of the National Postsecondary Education Study (NPSAS-87) provides a data source that can be used to examine the influence of prices on within-year persistence during the late 1980s. NPSAS-87 abstracted college records for a sample of all students in the fall of 1986, then followed up with a survey of the student sample in the spring of 1987. This paper uses NPSAS-87 to examine price response in persistence by traditional college-age students (below 23 years of age) in four-year colleges. This analysis of within-year persistence is discussed in five parts: research questions, research approach, findings, analysis, and conclusions.

## Research Questions

Three previously unaddressed research questions are examined in this study.

1. *Are within-year persistence decisions influenced by the amount of tuition charged?* This question is important because excessive increases in tuition can cause students to drop out, if they do not have sufficient resources to complete the academic year. However, until recently, there had been very little research on the relationship between prices and persistence (Leslie and

Brinkman, 1988). The one recent study found that tuition was negatively associated with year-to-year persistence, while student aid was positively associated with this outcome (St. John, 1990b). However, the influence of prices on within-year persistence has not been previously examined.

2. *Were within-year persistence decisions influenced by the amount of student aid they received?* Recent analyses of price response in first-time attendance (St. John, 1990a) and year-to-year persistence (1990b) concluded that the amount of student aid offered had a larger influence than the amount of tuition charged. While no studies have previously examined the influence of prices (i.e., the amount of tuition charged and the amount of aid awarded) on within-year persistence, Carroll (1987) did examine the impact the receipt of grants and loans of different sizes had on within-year persistence. He concluded that large grants had a more substantial influence on within-year persistence than small grants. Thus, the influence of the amount of aid awarded on within-year persistence merits specific consideration.
3. *Do price differentials among private colleges affect persistence more than price differentials among public colleges?* During the 1980s, private colleges allocated more of their discretionary resources to student aid than did public institutions (Hauptman, 1990a & b; St. John, in press). Private colleges also raised their tuition charges by larger amounts than public colleges in the 1980s (Hauptman, 1990a & b). Our analysis considers how the combination of prices in both types of colleges influences persistence.

### **Research Approach**

This study assumes persistence decisions are influenced by social background, high school experience, college experience, aspirations, and prices (or student aid). This logical model is consistent with other recent research on student persistence (Carroll, 1987; St. John, 1989; St. John, Kirshstein, and Noell, 1991). The NPSAS-87 data base, statistical methods, model specifications, and study limitations are described briefly below.

#### *NPSAS-87 Database*

The availability of NPSAS-87 provides an opportunity to examine these and other research questions related to within-year persistence. It sampled all college students in the fall of 1986, then followed up with student surveys in the spring of the same academic year. The total sample for NPSAS-87 included 47,000 undergraduate, 6,500 graduate and 4,280 first professional students (Korb, Schantz, and Zimbley, 1989). The overall response rate was about 72%. The sample for the present study consisted of 16,221 undergraduates enrolled in four-year colleges who responded to NPSAS-87.

#### *Statistical Methods*

Logistic regression is an appropriate statistical method for analysis of qualitative dichotomous outcomes, such as persistence. Logistic regres-

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*“Full-time attendance actually decreased the probability of persistence.”*

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sions estimate how various factors will influence the probability of a particular outcome. In this analysis, changes in probability measures (delta-p statistics) were estimated for each variable in the statistical model using a method recommended by Petersen (1984). For dichotomous variables, the delta-p statistic provides a measure of the extent to which the outcome is likely to change if the individual possesses the characteristic being measured. For example, if the beta for a dichotomous variable in a logistic analysis of persistence, such as full-time attendance, is significant and has a delta-p of 0.054, then it can be interpreted that having this particular characteristic—attending full-time—increases the probability of persisting by 5.4 percentage points.

When continuous variables are used in a logistic regression analysis, the delta-p statistic can be interpreted to mean that a change in a unit measure of that variable changes the probability of the outcome measure by a specific percentage. For example, if the delta-p statistic for tuition, coded in \$1,000 increments (by dividing actual tuition by 1,000), is significant and has a value of -0.045, it can be interpreted as meaning: 1) a \$1,000 increase in tuition will decrease the probability of persistence by 4.5 percentage points; or 2) a \$100 increase will decrease the probability by .45 percentage points. In our discussion, we consider \$100 increments because this amount is used in most of the literature on price response (Leslie and Brinkman, 1988).

#### *Model Specification*

This study defined *persistence* as reenrollment during the spring semester after being enrolled in the fall semester. If seniors said they had met their educational goals, then they were also counted as persisters.

Several *background* variables were considered: ethnicity, family income, mother's education, age, whether the student was working, and marital status. Ethnicity, family income, and mother's education were recoded into sets of dichotomous variables.

The receipt of a high school degree was the only available measure related to *high school experience*. Other related variables typically used in this type of analysis (i.e. high school grades and track) were not available. However, it should be noted that the percentage of the sample without high school degrees was extremely small (1.8%).

*Aspirations* were treated as a separate factor. NPSAS-87 contained an aspirations question. Responses to this question were transformed into three dichotomous variables: some college, master's degree, and advanced degree (all of which are compared to aspiring to attain a bachelor's degree).

Three variables related to *college experience* were examined: whether students attended full time, their grades, and whether they attended a private college. Grades were converted as a set of dichotomous variables; less than C average, C average, and A average (all were compared to B average).

Four *price* variables were examined: tuition, grants, loans and work. The actual dollar amounts were divided by 1,000, a conversion that results in easily interpreted price-response measures.

### *Limitations*

This paper extends and adapts a model originally developed for analysis of NCES' longitudinal studies to a new data base, NPSAS-87. The development of a viable persistence model for this particular data set is an important step because one of the original purposes of NPSAS-87 was to provide a data resource for analyses of policy issues related to the impact of federal student aid programs. However, there are a few limitations inherent in using this data base for research on persistence.

First, NPSAS-87 did not include all the types of information that would be needed for an "ideal" persistence study. In particular, prior analyses of NCES' national longitudinal studies used test scores and additional variables related to high school experiences (e.g., high school grades, test scores, and academic track). These data are entirely missing from NPSAS-87. In a previous study, the influence of these variables diminishes as students persist through college, which suggests that those variables do have an influence on attrition (St. John, Kirschstein, and Noell, 1991). The absence of these variables is not considered a serious problem for this analysis because: 1) we focus on within-year persistence rather than on year-to-year persistence; and 2) we control for the year in college.

Second, there are missing values for each of the variables included in the model. It is assumed that these missing values are randomly distributed. Fortunately, the number of missing values in NPSAS-87 is consistently small.

Third, NPSAS-87 was a fall sample, which is not representative of all college students. This is a less serious problem for four-year colleges, where most students enroll in the fall semester, than for other types of colleges. It is more problematic for two-year colleges and proprietary institutions, which have students enrolling each enrollment period year-round. Therefore, this initial analysis was limited to students enrolled in four-year colleges.

Fourth, for this initial test of a new within-year persistence model, the sample was intentionally limited to traditional college-age students. This improves comparability with other national studies of student persistence (Carroll, 1987; St. John, 1989, 1990b).

The total sample examined in the study includes 16,221 college students enrolled in four-year colleges during the fall of 1986 (Table 1). About half of this group was enrolled in private colleges (8,083) and half in public colleges (8,138). There are a few important differences between students in public and private four-year colleges. A slightly large percentage of students in private four-year colleges are from upper-income families and aspire for advanced degrees. They also face higher average tuition charges and receive larger average grant and loan awards. Otherwise, the two sets of students are similar.

### **Findings**

The analysis of within-year persistence is discussed in three parts. First, persistence by the entire subpopulation is examined, which is followed by separate discussions of students in private, then public institutions. Table 2 presents the delta-p statistics and significances for the three analyses. Three levels of significances are presented (.01, .05, and .1).

**TABLE 1**  
**Descriptive Analysis of Within-Year Persistence**  
**By Traditional College-Age Students in Four-Year Colleges**

	All Mean	Private Mean	Public Mean
Ethnicity			
Black	7.2%	6.7%	7.8%
Hispanic	3.6	3.7	3.6
Male	47.4	47.7	47.2
Mother's Education			
Less than High School	7.0	6.1	8.0
Some College	24.1	23.0	25.3
College Degree	21.4	22.5	20.3
Master's	10.1	11.9	8.4
Advanced	5.9	7.7	4.0
Age	19.8 yrs.	19.7 yrs.	19.9 yrs.
Working	51.0%	50.6%	51.4%
High School Degree	98.2	98.4	98.0
Married	2.8	2.3	3.3
Independent	4.5	3.7	5.3
Income			
Below \$11,000	12.7	11.0	14.3
\$30,000-\$60,000	41.8	40.6	43.1
Above \$60,000	20.1	23.9	16.2
Full-Time Attendance	92.9	95.4	90.4
Private College	49.8	NA	NA
College Grades			
Less than C	7.0	4.7	9.3
C Average	36.3	33.0	39.5
A Average	1.7	2.0	13.8
Year in College			
Freshman	30.1	31.1	29.1
Sophomore	25.9	25.9	26.0
Senior	18.4	19.3	17.6
Aspirations			
Some College	2.3	2.1	2.6
Master's Degree	38.1	40.6	35.6
Advanced Degree	17.6	21.8	13.3
Prices <sup>1</sup>			
Tuition \$	\$3,916	\$6,364	\$1,484
Grant \$	\$1,622	\$2,506	\$ 743
Loan \$	\$ 962	\$1,326	\$ 600
Work \$	\$ 149	\$ 212	\$ 86
N	16,221	8,083	8,138

<sup>1</sup>Divided by 1,000 in logistic regression analysis.

Only significant relationships are discussed. Since the .1 significance level is not routinely used in research papers, this significance level is noted parenthetically in the text.

#### *Within-Year Persistence*

Most traditional-age, four-year college students who enroll during the fall semester re-enroll during the spring semester. The baseline probability that the average student will reenroll is 94.8%. A few social background variables had a significant association with within-year persistence: gender, age, and marital status. Males were more likely to persist, as were married students (.1 significance).

**TABLE 2**  
**Analysis of Within-Year Persistence**  
**By Traditional College-Age Students**

	All		Private		Public	
	Delta P	Sig.	Delta P	Sig.	Delta P	Sig.
Ethnicity						
Black	0.0085		0.0123	*	0.0064	
Hispanic	0.0114		0.0168		0.0054	
Male	0.0119	***	-0.0131	***	0.0105	**
Mother's Education						
Less than High School	-0.0045		-0.0020	*	-0.0094	
Some College	-0.0075		-0.0109		-0.0075	
College Degree	-0.0072		0.0088		-0.0079	
Master's	0.0003		0.0043		-0.0092	
Advanced	0.0041		0.0077		-0.0054	
Age	0.0053	***	0.0031		0.0064	**
Working	0.0051		-0.0011		0.0084	
High School Degree	0.0141		0.0032		0.0268	
Married	0.0132	*	0.0091		0.0163	
Independent	-0.0101		-0.0230	**	0.0117	
Income						
Below \$11,000	0.0019		0.0010		0.0077	
\$30,000-\$60,000	-0.0029		0.0034		-0.0143	**
Above \$60,000	-0.0034		0.0092		-0.0221	***
Full-Time Attendance	-0.0145	***	0.0093		-0.0220	***
Private College	0.0446					
College Grades						
Less than C	0.0276	***	0.0238	***	0.0288	**
C Average	-0.0100	***	-0.0127	***	-0.0103	*
A Average	-0.0342		-0.0392	**	-0.0190	
Year in College						
Freshman	0.0123		-0.0106		0.0283	***
Sophomore	0.0102		0.0025		0.0172	**
Senior	-0.0290	***	-0.0298	**	-0.0255	***
Aspirations						
Some College	0.0331	***	-0.0263	***	0.0434	***
Master's Degree	-0.0166	***	-0.0128	***	-0.0192	***
Advanced Degree	-0.0147	***	-0.0053	***	-0.0241	***
Prices <sup>1</sup>						
Tuition \$	-0.0260	***	-0.0210	***	-0.0494	***
Grant \$	-0.0010		0.0022	*	-0.0152	***
Loan \$	-0.0037	**	-0.0013		-0.0060	*
Work \$	-0.0190	***	-0.0195	***	-0.0073	
Baseline P	94.6%		95.6%		94.0%	
N	16,221		8,083		8,138	

\* Significant at 0.1 level

\*\* Significant at 0.05 level

\*\*\*Significant at 0.01 level

<sup>1</sup>Divided by 1,000 in logistic regression analysis.

College experiences also had a strong influence on whether students persist. Full-time attendance actually decreased the probability of persistence, a marked contrast to the consistent findings of year-to-year persistence studies that full-time attendance had a positive influence (St. John, 1989). College grades also made a difference, although the relationship between grades and persistence was not linear. Students with B averages were more likely to persist than students with C aver-

ages. However, students with less than C averages were more likely to persist than other students, a situation that is probably attributable to institutional policies that make it difficult for students with low grades to re-enroll if they do not complete the academic year.

Aspirations are associated with persistence, but a positive relationship between higher aspirations and persistence was not evident. Students who aspired to attain some college were more likely to persist than students who aspired to complete four years of college, perhaps because they were pursuing goals that could be attained in shorter time periods. In contrast, students with aspirations for an advanced degree were less likely to persist through the year, possibly because those who have higher aspirations have confidence that if they take a leave of absence for one semester, they will eventually re-enroll.

Prices had an influence on within-year persistence. Each additional \$100 of tuition charged by an institution decreased the probability that the average student would persist by .26 percentage points. These students were slightly more responsive to the amount of tuition charged than were students in the prior study of price response in year-to-year persistence, which found that tuition price was not significant in three of the four transitions examined (St. John, 1990b). Each \$100 of loans awarded decreased the probability that the average student would persist by .04 percentage points. The small negative impact of loans is consistent with Carroll's (1987) study of within-year persistence, which found a slight negative association between loans and persistence. However, it is inconsistent with the prior study of price response in year-to-year persistence (St. John, 1990b), which found a positive association. Work dollars were also negatively associated with within-year persistence, which is a surprising finding, given the fact that prior research has consistently found a positive association between work-study and persistence (e.g., Astin, 1975; Leslie and Brinkman, 1988; St. John, 1989).

It is interesting to note that in this analysis, grants were not significantly associated with within-year persistence. Prior studies have consistently found a positive association between grants and persistence (Astin, 1975; Carroll, 1987; Leslie and Brinkman, 1988; St. John, 1989, 1990b).

#### *Private Four-Year Colleges*

Private college students had a slightly higher probability of returning the second semester, with a baseline persistence probability of 95.7%. Several background variables also influence persistence by students in private colleges. In fact, racial orientation for black students was positively associated with persistence in private colleges (.1 significance). Private college students who aspired to complete college were more likely to persist than students with higher or lower aspirations. The significance of this level of aspiration in private colleges may be attributable to the fact that many offer only four-year degrees. Additionally, students with B averages were more likely to persist than students who had C or A averages, and less likely to persist than students with less than C averages.

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*"Each \$100 of tuition charges decreased the probability that an average student would persist."*

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Prices had an influence on persistence in private four-year colleges. Tuition charges decrease the probability that students will persist—each \$100 of tuition charges decreased the probability that an average student would persist by .21 percentage point. Grant dollars had a slight positive association with persistence by private college students (.1 significance)—each \$100 in grants awarded increased the probability of persistence by .02 percentage point. This finding is consistent with the prior study of the influence of prices on persistence (St. John, 1991c). Work continued to have a negative association with persistence.

#### *Public Four-Year Colleges*

Traditional college-age students at public four-year institutions have a slightly lower persistence rate. The baseline probability of persistence was 94.0%.

A slightly different set of background variables influenced within-year persistence by students in public colleges. Male gender and age were positively associated with persistence in public four-year colleges, but not in private four-year colleges. Income was also significant: students from upper-middle and upper-income families had a lower probability of persisting than students in the lower-middle or low-income groups, a pattern that was not evident in the analysis of students in private four-year colleges. Students with family incomes between \$30,000 and \$60,000 were less likely to persist than students from families with incomes between \$10,000 and \$30,000. While students with more than \$60,000 in family income were also less likely to persist. This development raises the prospect that persistence by middle- and upper-income students could have been influenced by the financial conditions of the late 1980s.

The prices facing students also had an influence on persistence by students in public colleges. Tuition, grants, and loans were all negatively associated with persistence. Each \$100 of tuition charged decreased the probability of persistence by .49 percentage point, while each \$100 in grants awarded decreased this probability by .15 percentage point and each \$100 in loans awarded decreased this probability by .06 percentage point (.1 significance). The impact of loans is slight and not necessarily surprising given prior research on within-year persistence (Carroll, 1987).

#### **Analysis**

These findings help answer our initial research questions.

- *Were within-year persistence decisions influenced by the amount of tuition charged?* These analyses clearly demonstrate that within-year persistence is influenced by tuition charges. Other recent price-response studies concluded that tuition dollars had less influence on enrollment and year-to-year persistence than student aid dollars (St. John, 1990a & b), a situation that is reversed here. There are at least two possible explanations for this reversal: 1) within-year persistence could differ from year-to-year persistence in ways that make it possible for students to be more vulnerable to high tuition charges (e.g. some students may only have enough discretionary money to attend

one semester a year); and/or 2) there could have been changes in higher education finance during the late 1980s, including the rise in real tuition charges, that influenced the change during the decade in the way students responded to different types of prices. We suspect that both of these are viable possibilities and merit further exploration. Our focus in the analysis below is on the second of these possibilities. Indeed, we suspect that several successive years of real price increases have started to take their toll, especially in public colleges.

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*“Tuition dollars had less influence on enrollment and year-to-year persistence than student aid dollars.”*

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- *Were within-year persistence decisions influenced by the amount of aid students received?* In this analysis, student aid had a lesser influence on within-year persistence than did tuition and, in most instances, the influence was negative. The slight negative association between loan dollars and within-year persistence is not entirely surprising. It is consistent with some prior studies (Astin, 1975; Carroll, 1987). However, in recent studies, St. John found that: 1) loans had a positive influence on persistence in the early 1980s, after having had a negative association with persistence in the early 1970s (St. John, 1989); and 2) students' year-to-year persistence was positively associated with loans received in the early 1980s (St. John, 1991c). The slight negative response to loan dollars found in this study raises the prospect that the increased emphasis on loans during the past decade could now be problematic.

The finding that students were, in some instances, negatively influenced by the amount of work-study awarded was surprising. The reasons for this association merit more serious scrutiny.

The findings that grant dollars had a positive influence on persistence by students in private colleges and a negative influence on students in public colleges are troubling. In public colleges, the amount of grants awarded could be correlated with the level of unmet need, since grant amounts are usually awarded based on need and grant aid did not increase as fast as tuition charges in the 1980s, an issue explored more below.

- *Do price differentials among private colleges affect persistence more than price differentials in public colleges?* There were two distinct differences in the price responsiveness of students in public and private colleges. First, higher tuition levels had a greater impact on persistence in public colleges than in private institutions. Public colleges did not increase their grant dollars as was the case in private institutions during the 1980s (St. John, 1991c, in press). In contrast, tuition charges increased in both sectors. These developments could explain the difference in the effects of grants at public and private colleges, since they would contribute to the growth in the gap between need and the level of aid awarded.

Second, grants had a slight positive influence on persistence in private colleges and a negative influence on students in public colleges. Differences in financing strategies at public and private colleges during the 1980s may explain this situation. Private colleges allocated more discretionary resources to grants than did public institutions in the 1980s (St. John, 1991c). The amount of grant aid awarded in

private colleges continued to be positively associated with persistence in 1987, as was the case earlier in the decade (St. John, 1990a & b).

In contrast, public colleges increased their tuition charges without allocating new institutional resources to student aid during the 1980s (St. John, 1991c, in press). Consequently, grant increases in public institutions did not keep pace with tuition increases, due to modest increases in Pell grants (Hauptman, 1990a & b; St. John, 1991c). Thus the failure of public colleges and universities to raise institutional grants when they raised tuition charges could explain the negative association between the amount of grant awards and persistence. In other words, the amounts of unmet need could explain the negative association between grant dollars and within-year persistence in public colleges. Thus we conclude that the negative coefficient for grant dollars identified for public college students in this analysis of NPSAS-87 is an artifact, possibly attributable to higher levels of unmet need in public four-year colleges compared to private four-year colleges.

### **Conclusions and Implications**

There are two overall conclusions from this analysis. First, students' within-year persistence decisions are negatively influenced by tuition charges, especially in public colleges. This finding is consistent with past research on student demand (Jackson and Weathersby, 1975; Leslie and Brinkman, 1988).

Second, grants had differential effects in public and private institutions. They were positively associated with within-year persistence in private four-year colleges and negatively associated with within-year persistence in public colleges. This is a surprising finding. We suspect this is attributable to changes over time in both federal financial aid policy and institutional pricing. Dresch (1975) has observed that finance strategies in different historical periods could influence the ways students respond to different types of prices during different historical periods. He argued that students could respond differently to tuition charges in the 1970s than they did in the 1960s, because of growth in federal student aid. In our opinion, the negative association between grants and persistence in public institutions discovered in this study can be at least partially explained by changes in financing strategies in the 1980s.

Private colleges adjusted their financial strategies to compensate for losses in federal grants: they increased their allocations to student grants in addition to increasing tuition (Hauptman, 1990a & b; St. John, in press), which helped them mitigate the impact of price increases on enrollments (St. John, 1991c). Additionally, private colleges attract a larger percentage of high-income students, as discussed in the descriptive analyses presented here. We suspect that, as a result of these conditions, unmet need was not as significant for students in private colleges. Under these conditions, grants were positively associated with persistence, probably because the amount of grants awarded varied with the amount of unmet need. Unfortunately, public colleges did not make adjustments for changes in federal grant policies.

In public institutions, grant aid did not increase in the early 1980s, as it did in private colleges (St. John, 1991c), but tuition did increase faster than inflation. Therefore, the amount of unmet need probably increased. Thus we suspect that the relatively higher level of unmet need in public institutions could explain the negative association between grants and persistence observed in this study. This issue certainly merits further investigation.

In our opinion, these findings, in combination with the results of other national research, provide insight into the long-term consequences of the Reagan and Bush administrations' budget strategies in higher education. Making minor adjustments to who gets aid, while the total amount of federal aid available is decreasing, is like rearranging deck furniture on a sinking ship. The erosion in federal student aid apparently influenced private colleges to increase tuition, in part because these colleges increased their allocations to grants to compensate for losses of federal grant dollars, a strategy that had a positive influence on the ability of students to persist. However, public colleges raised their tuition charges to compensate for expenditure increases and slow growth in state subsidies, but did not increase their allocations to grants (St. John, 1991c, in press), a strategy that apparently increased the level of unmet need and had a negative influence on within-year persistence. Thus it appears that the implicit assumption in many federal budgets, that cuts in federal aid do not influence educational attainment or institutional financial strategy, should be altered. ♦

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