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The Influence of Aid and Income on Persistence at a Small Private College

Charles N. Landreth and
Robert O. Riggs

In the 1990s, many private institutions gave up the practice of making need-blind admission decisions and stopped aiding students to the full extent of their need. A federal change in determination of need — exclusion of home equity in income calculations — reduced the assets used to calculate a family's ability to pay for college. Because home equity is not a liquid asset, this change helped families by not inflating their ability to pay by including an asset that could not be used practically to pay for college. The exclusion of home equity lowered families' contributions, and private colleges, most of which were meeting all of a family's need, saw need amounts go up and aid budgets over-expended (Gose, 2000). In the face of over-budget aid expenditures, institutions modified their financial aid policies to maintain enrollment goals while reducing the cost of aid required to enroll the class. Specific methodology differed from one institution to the next, but generally, instead of making all admission decisions regardless of need, institutions made a majority of admission decisions without consideration of need and admitted the remaining percentage of the class based on the ability to pay most, if not all, of the cost of attending. By recruiting a higher percentage of full-paying students, institutions could rein in financial aid budgets (Gose, 1997).

This article examines the aid practices of one institution during this period of increased effort by private institutions to recruit high income students. The purpose of this study is to examine the influence of income and gift aid on persistence to graduation at a selective, private, coeducational liberal arts college. The importance of this study is to gain insight into the retention implications that may emerge from aid practices.

While Perna (1998) and St. John (2000) provide thorough reviews of the aid and persistence literature, a sample of the representative literature follows. Research on the impact of financial aid on persistence has shown mixed effects. Perna (1998) concluded that previous research "does not conclusively reveal the extent to which the effects of financial aid vary based on the types and combinations of aid received" (p. 25). Studies that found a positive relationship between receipt of student aid and persistence include St. John (1990); St. John, Kirshstein, and Noell (1991); St. John, Andrieu, Oescher, &

Starkey (1994); and St. John (1998). Perna (1998) found little influence from aid on persistence. In her study, the top three influences on graduation were grade point average, on-campus residency, and degree aspirations. St. John and Starkey (1995) found that high tuition and high aid had a significant, negative impact on persistence. St. John, Paulsen, and Starkey (1996) explained 42% of the variance in persistence with the financial variables in a persistence model using national data for public and private schools. In a study at a university, St. John (1998) found that persistence improved in the cohort that received higher loan amounts. It is difficult to conclude, and contrary to the literature, that more loans caused better persistence. The author suggested that factors outside of the model may account for the results. Aid has had a negative association with persistence at public colleges and has had a positive influence on retention at private schools where aid budgets are more robust (St. John, 2000). According to St. John, a negative relationship between aid and persistence does not mean that the presence of aid negatively influences persistence, but rather that the aid is insufficient to promote persistence.

Persistence is explained in different ways in the literature. It has been defined as within-year enrollment in the fall semester and the subsequent spring semester (St. John, 1998; St. John, Andrieu, Oescher, & Starkey, 1994; St. John & Starkey, 1995; Hu & St. John, 2001), year-to-year (Pascarella & Terenzini, 1980; St. John, 1990; St. John, Kirshstein, & Noell, 1991), and undergraduate completion (Perna, 1998).

Income, measured in categories or as a continuous value, is a common independent variable in research on the influence of aid on persistence. In a national study of within-year persistence, high income aid applicants were less likely to persist, raising a question about the effectiveness of providing aid to students who do not need it (St. John, Andrieu, Oescher, & Starkey, 1994). St. John and Starkey (1995) tested three price variables and the extent to which they predicted within-year persistence of undergraduate students and three subgroups based on income. The three price variables were net-price (tuition minus grant), net cost (total cost minus total aid), and price and subsidy (tuition and grant, loan and work). Price and price subsidy best predicted persistence. Of the three income groups (lower, middle and upper), upper income students were least responsive to high tuition charges, although high tuition did have a significant and negative relationship with persistence for all three income groups. In all income groups the combination of high tuition and high aid had a significant and negative impact on persistence.

Financial aid has been defined in a variety of ways. Several studies include multiple measures of student aid to compare the predictive value of different aid measures. St. John (1990) used amount of grant, loan and work study to measure price response in retention decisions. St. John, Kirshstein, and Noell (1991), St. John (1998), and Hu and St. John (2001) measured aid by indicating whether grants, loans, or work, or these in combination were awarded. St. John and Starkey (1995) compared the predictive value of three measures of aid: net-price (tuition minus grant), net cost (total cost minus total aid), and price and subsidy (tuition and grant, loan and work). DeAngelis (1998) used variables to indicate the awarding of any aid and the total amount of each subsidy. Perna (1998) included variables to show whether any aid was received, whether aid of each type was received, the composition of the package (e.g., grant or grant and loan), and whether the weight of grant or loan in the package was greater than 50% of the total package.

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Various statistical methods have been used in studies of student aid and persistence. Logistic regression (e.g., Hu & St. John, 2001; St. John, 1998; DeAngelis, 1998), ordinary least squares regression and path analysis (Bean, 1980; Perna, 1998), and structural equation modeling (Cabrera, Castenada, Nora, & Hengstler, 1992) have also been employed. Dey and Astin (1993) compared the results of three different methods applied to one data set in a study of college student retention. As long as the variables were moderately distributed (at least a 75%/25% split), there was little practical difference among logit, probit, and linear regression in explaining variance and fit.

Method

Data for this study came from three cohorts (1995, 1996, and 1997) of first-time, first-year students at a private, coeducational, liberal arts college. The sample was 55% female, 71% graduated, and 57% demonstrated no need. Because 90% were white, race was not included as a variable in this study. A student was counted as graduated based on the enrollment status as of the summer of 2002. Although this may seem to give a more favorable graduation rate to the earliest cohort, in fact, very few students graduate from the institution after the fifth year. Students who did not finish the first semester of the first year were not included in this study inasmuch as college performance is an independent variable, and these students would have had a grade point average (GPA) of zero, falsely representing poor performance instead of the fact that they left the institution prior to earning any credit. The variables are defined in Table 1.

The number of financial variables in this study is small compared to other aid studies. The initial design included aid variables to represent the existence of different types of aid and continuous variables for actual income and aid amounts. However, this design resulted in extensive multicollinearity — high correlation between independent variables. Given the patterns of aid packaging at the institution, this is not surprising. To solve the multicollinearity problem, two financial variables were chosen as independent variables. The two variables are dichotomous, indicating: (a) whether or not a student had a need amount; and (b) whether a student received gift aid. This design also solved the problem of missing income amounts for students who did not apply for aid.

The measure of pre-college ability was an institutional-based measure utilizing the ratings made in the review of admissions files. These ratings are based upon high school GPA, standardized test scores on the SAT and ACT, and other factors in a student's application such as the strength of the high school academic program, the depth of extra-curricular involvement, and the quality of an admissions essay. While this approach to the pre-college ability measure makes it difficult to compare these results to other studies, this study is institutional in scope, and use of a pre-college ability measure based on admissions review practices provides a test of the admissions ratings in light of other variables in the study.

Results

Ordinary least squares multiple regression was used to determine the influence of the independent variables on the dependent variable — persistence to graduation (see Table 2). The alpha level for significance was set at .05. A block entry approach was used in the estimation of the regression equation. First, graduation was regressed on the background variables: gender, pre-college ability, and full pay. Together the background variables explained 3.7% of the variance in

Table 1
Variable Names and Variable Definitions

Name	Definitions
<i>Gender</i>	A dichotomous variable where female = 1 and male = 0
<i>Full pay</i>	Students who applied for aid or who applied but demonstrated no need (Full pay = 1) and students who demonstrated need (Full pay = 0)
<i>Pre-college ability</i>	A three-level dichotomous variable with the two highest levels compared to the lowest level. The ability score was based on the admissions office rating scheme of high school GPA, standardized test scores, and review of other student credentials. Ability1 = 1, the highest rated new students; Ability2 = 1, the second highest rated students
<i>Gift aid</i>	A dichotomous variable indicating the award of a grant (Gift aid = 1) or no grant awarded (Gift aid = 0)
<i>College Performance</i>	A five-level dichotomous variable indicating range of college GPA computed at the end of the first year. GPA1 = 1, 3.5 to 4.0, otherwise 0 GPA2 = 1, 3.0 to 3.5, otherwise 0 GPA3 = 1, 2.5 to 3.0, otherwise 0 GPA4 = 1, 2.0 to 2.5, otherwise 0
<i>Graduation</i>	A dichotomous variable where graduated = 1 and not graduated = 0

the dependent variable graduation ($F(4,1154) = 10.998, p < .001$) with only pre-college ability having a statistically significant effect. Both high ability and middle ability students, as rated by the admissions office, were more likely to persist than the students rated in the low category. Further, the standardized regression coefficients show that students rated in the highest category ($\beta = .206, p < .001$) of ability were nearly three times more likely to persist than students in the middle category of ability ($\beta = .072, p < .05$).

Adding gift aid to the model produced an increase in R^2 of .038 ($F_{change}(1,1153) = 47.067, p < .001$) indicating that the gift aid variable explained an additional 3.8% of variance in persistence to graduation beyond the background variables. With gift aid in the model, pre-college ability became non-significant. The full pay variable, non-significant in the first regression, had a statistically significant, positive influence on graduation in the presence of gift aid.

The third step in the model was the addition of dummy-coded variables for college performance in the first year. Adding GPA variables to the model produced an increase in R^2 of .074 ($F_{change}(4,1149) = 25.04, p < .001$) indicating college performance explained an additional 7.4% of the variance in persistence to graduation beyond the variance explained in the first two steps. Full pay and gift aid each had a statistically significant, positive influence on graduation. Compared to the lowest GPA category (below 2.0), all other GPA categories had a statistically significant, positive influence on persistence to graduation, with the

3.0 to 3.5 range showing the strongest influence, followed by the 3.5 to 4.0 range, the 2.5 to 3.0 range, and the 2.0 to 2.5 range. The full model explained 14.9% of the variance in persistence to graduation.

Because of the interest in the effects of income and gift aid in this study, interaction terms were computed for the full pay and gift aid variables. Gift aid interacted with the other independent variables to explain an additional 2.8% of variance ($F_{change}(8,1141) = 4.898, p < .001$). Although GPA ranges were statistically significant for both recipients and non-recipients of gift aid, t-tests indicated there was not a statistically significant difference in the effect of GPA for the two groups. The interaction effect of full pay explained an additional 2.4% of the variance in persistence to graduation ($F_{change}(8,1141) = 4.156, p < .001$). Although the GPA variables were statistically significant for full-paying and needy students, t-tests indicated that there was not a statistically significant difference in the effect of GPA for the two groups.

For those students receiving gift aid ($n = 780$), the GPA variables and the full pay variable had statistically significant effects on persistence to graduation. Grades of 3.0 to 3.5 had the greatest effect on persistence to graduation ($\beta = .436, p < .001$), followed by the 3.5 to 4.0 range ($\beta = .414, p < .001$), the 2.5 to 3.0 range ($\beta = .290, p < .001$), the 2.0 to 2.5 range ($\beta = .143, p < .05$) and full pay ($\beta = .071, p < .05$). For those students who did not receive gift aid ($n = 379$), the GPA variables showed statistically significant effects. Grades of 2.5 to 3.0 had the strongest effect ($\beta = .437, p < .001$), followed by the 3.0 to 3.5 range ($\beta = .337, p < .001$), the 2.0 to 2.5 range ($\beta = .296, p < .001$) and the 3.5 to 4.0 range ($\beta = .181, p < .001$). The small effect of the 3.5 to 4.0 GPA range is difficult to interpret because of small cell size; only 17 students without gift aid had a college GPA greater than 3.5. For those students without gift aid, the highest pre-college ability rating was also statistically significant, with a negative effect on persistence to graduation ($\beta = -.208, p < .001$), indicating that the lowest rated unaided students in the admissions process were more likely to persist than the highest rated unaided students.

For the group that demonstrated no need ($n = 663$), gift aid and the GPA variables had a statistically significant positive effect on retention. The 3.0 to 3.5 grade range had the strongest effect ($\beta = .392, p < .001$), followed by the 2.5 to 3.0 range ($\beta = .386, p < .001$), the 3.5 to 4.0 range ($\beta = .381, p < .001$), gift aid ($\beta = .377, p < .001$), and the 2.0 to 2.5 grade range ($\beta = .253, p < .001$). The variable indicating highest pre-college ability had a statistically significant negative effect for those students with no demonstrated need ($\beta = -.211, p < .001$), indicating that the full-paying students rated lowest by the admissions office were more likely to persist to graduation than those rated highest by the admissions office. For those students with demonstrated need ($n = 496$), the only statistically significant effects were from the positive influence of the GPA variables on persistence to graduation. Grades of 3.0 to 3.5 had the strongest effect ($\beta = .437, p < .001$), followed by the 3.5 to 4.0 range ($\beta = .415, p < .001$), the 2.5 to 3.0 range ($\beta = .347, p < .001$), and the 2.0 to 2.5 range ($\beta = .176, p < .001$).

Discussion

The ability to pay the full price for this college and receiving gift aid had statistically significant positive effects on graduation. This finding is similar to results from previous studies (St. John 1990b; St. John, Kirshstein, & Noell, 1991; St. John, Andrieu, Oescher, & Starkey,

Table 2
Summary of Hierarchical Regression Analysis for Variables Predicting Persistence to Graduation (N=1159)

Variable	B	SE B	—
Step 1			
Gender	.005	.027	.006
Full pay	-.044	.027	-.048
Ability1	.118	.032	.206***
Ability2	.074	.035	.072*
Step 2			
Gender	-.003	.026	-.003
Full pay	.093	.033	.102**
Ability1	.057	.036	.062
Ability2	.019	.036	.018
Gift aid	.273	.040	.284***
Step 3			
Gender	-.038	.025	-.042
Full pay	.073	.032	.080*
Ability1	-.037	.038	-.041
Ability2	-.035	.035	-.034
Gift aid	.220	.039	.228***
GPA1	.454	.053	.419***
GPA2	.445	.048	.440***
GPA3	.405	.047	.381***
GPA4	.281	.050	.228***

* $p < .05$

** $p < .01$

*** $p < .001$

1994; and St. John, 1998). Being able to pay the full price, by itself, did not have a statistically significant influence on graduation. However, in the presence of gift aid, being able to pay the full price became a positive influence on graduation. This effect suggests that the concern about the ineffectiveness of providing aid to high income students (St. John, Andrieu, Oescher, & Starkey, 1994) is not pertinent in this case. Although aid and ability to pay had a positive effect on graduation, it is important to point out the influence of aid and income relative to the impact of GPA on graduation. In the full model, having a GPA of 3.0 or higher had five times greater influence than income and twice the influence of gift aid.

Separating the aided from the unaided students provided further insight into the research question. Although ability to pay had a statistically significant influence on aided students' graduation, the influence was not as great as strong academic performance in college. Having a 3.0 GPA or higher had six times greater influence on persistence to graduation than the ability to pay. For those students who were not aided (of whom 98% were full-paying), two issues emerged. First, while all of the GPA ranges had a greater influence on persistence than the lowest range (below 2.0), the beta-weights show an interesting pattern of influence. Having a GPA in the range of 2.5 to 3.0 had two-and-a-half times greater influence on persistence than having a GPA in the 3.5 to 4.0 range. This GPA pattern, alone, is not especially reliable because of the small cell size mentioned previously. However, the second point adds some weight to the concern about

high ability students without aid: the students without gift aid rated lowest in the admissions process were more likely to persist than those rated highest.

Taking a separate look at the full-paying students (some receiving gift aid and some not), the findings reveal that for students with no need, the presence of gift aid has a positive effect on persistence to graduation, an effect about the same in weight as the three highest GPA categories. Contrary to concerns in the literature, this suggests that gift aid is effective when given to those without need. Further, the concern about ability evident in the group of students who were not aided arises again with the full-paying group. Of this group of no-need students, those rated lowest in the admissions process were more likely to persist than students rated highest in the admissions process, whether or not they received aid.

These results point to several larger issues. First, the issue of student mobility is pertinent. Students who have the ability to pay, who are rated high in the admissions process, and have strong college performance are in a favorable position to transfer. Institutional response to this group of students leads to a counter-intuitive action: providing support for students who are doing well academically and who have relatively little financial pressures. While it is unlikely the institution has the potion to address attrition in one dose, it is reasonable that a set of responses that would support these students would be good for all students. For example, finding ways for all students to find attachment in the college and civic community could prevent attrition for the group of students who would leave because it is easy to leave, and for the students who leave out of desperation to solve a particular problem with their college experience.

The pattern of attrition for full-paying, high ability students also raises questions about the impact of enrolling these students. Although recruiting full-paying students is a necessity for institutions where tuition is the primary source of revenue, attrition of these students may generate more pressure on admissions than attrition of other students. For example, consider the importance of a low acceptance rate as an institutional quality measure. If the institution admits four students to yield one, each student who has to be replaced, because of attrition or graduation, represents four more admitted students. While balancing the need for revenue, the institution should more closely study the effect of full-paying students' attrition patterns on recruitment.

The idea that persistence could be improved by aiding more full-paying students deserves comment. The positive effect of gift aid for full-paying students suggests that even high income families are sensitive to cost, a finding consistent with St. John and Starkey (1995). Although aiding full-paying students may be the logical response to the results of this study, these results should be considered within the context of the institution's mission. Because of the patterns of wealth in the recruitment pool of the institution, gift aid for full-paying students may produce results contrary to the goals of building a diverse educational environment with a variety of socioeconomic classes and ethnicities. The more significant conclusion to draw from the positive effect of aid on the persistence of full-pay students is the undesirable effect of tuition increases. Full-paying students receiving gift aid are receiving discounts on tuition. Full-paying students not receiving the discount are paying higher tuition. The results suggest that increases in tuition may create retention problems for the students who contribute most to the net tuition revenue of the college.

This study shows the importance of understanding income and aid patterns in persistence to graduation and the influence from student ability and performance. Recruitment of high income, high ability students, although fiscally desirable, can have a negative impact on an institution's retention and recruitment goals. The practice of aiding students without need is necessary for tuition-driven institutional budgets, but the success of this practice may point to the negative impact of tuition increases, especially when considering the attrition patterns of full-paying students who receive no aid.

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