

THE EFFECT OF LOANS ON THE PERSISTENCE AND ATTAINMENT OF COMMUNITY COLLEGE STUDENTS

Alicia C. Dowd*† and Tarek Coury**

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This study informs public policies regarding the use of subsidized loans as financial aid for community college students. Using logistic regression, it analyzes the National Center for Education Statistics' Beginning Postsecondary Students (BPS 90/94) data to predict persistence to the second year of college and associate's degree attainment over five years. During the period under study, loans did not contribute to higher persistence and attainment rates. Loans are observed to have a negative effect on persistence and no effect on degree attainment. Estimates of the interaction effects of borrowing and income status are insignificant but demonstrate the need for further testing. The findings are attributed to a combination of the high uncertainty of degree completion among community college students and the negative affective component of indebtedness.

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KEY WORDS: community college; financial aid; loan; persistence.

In 2003, while Congress debated reauthorization of the Higher Education Act, college lobbyists were 'squabbling' over federal student loan limits (Burd, 2003). The lobbyists disagreed about funding priorities, with some viewing calls for increased student loan funding as a likely drain on federal resources for other programs, particularly the

*Graduate College of Education, University of Massachusetts Boston, Boston, MA, USA.

**University of Oxford, Oxford, UK.

†Address correspondence to: Alicia C. Dowd, Assistant Professor, Graduate College of Education, University of Massachusetts Boston, 100 Morrissey Blvd, Boston, MA 02125. E-mail: Alicia.dowd@umb.edu

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Pell grant for low-income students. The American Association of Community Colleges (AACC) opposed increases in student loan limits, whereas the American Council for Education (ACE), an umbrella group representing all sectors of higher education, called for a substantial increase. The community college lobbying group argued that borrowing presents a financial risk for students who may not succeed academically and will later be forced into loan default. On the other side of the debate, the ACE presented evidence, based on a descriptive statistical analysis of national student outcomes data, that borrowing in combination with reduced work hours constitutes the optimal financing plan for academic success, in large part because it allows full-time study. These findings held for students in both the two- and four-year sectors and for low-income students (King, 2002). The ACE findings suggest that loans enable students to persist and benefit from their investment in higher education.

The AACC's position against loan increases is consistent with the historic public financing of community colleges, which has traditionally placed a minimal burden on students. However, a recent report demonstrates that community colleges are generally affordable today only when students take loans (Kipp III, Price, and Wohlford, 2002). Federal statistics also show that larger percentages of community college students, particularly those who are financially independent of their parents, are borrowing to finance their education (Berkner, 2000; Berkner, Berker, Rooney, and Katharin, 2002). With increases in tuition, a significant shift in the burden of financing a community college education from states to individuals has already occurred (Merisotis and Wolanin, 2000). Therefore, it is important to evaluate the effects of borrowing among community college students on academic outcomes, such as persistence and degree attainment.

Academic research provides relatively minimal information on the effects of loans on persistence in the two-year sector, and the findings have been mixed. This study makes a contribution to the literature by examining the effect of federal loans on persistence to the second year of college and on associate's degree attainment using a national longitudinal sample of community college students. A multivariate design controls for other predictors of successful academic progress and for factors that may be related to a willingness to take loans.

CONCEPTUAL FRAMEWORK

The conceptual framework for the study draws on recent work by Dynarski (2002a, b) and by St. John, Cabrera, Nora, and Asker (2000).

A present value analysis of federal subsidized loans presented by Dynarski (2002b) demonstrates that students who repay loans at the below market rate of the Stafford loan program over ten years following college graduation receive a cost subsidy equal to approximately one-third the value of grant aid. Dynarski conducted an empirical analysis of borrowing among families at the margin of eligibility before and after the exemption of home equity from federal loan eligibility calculations. She concluded that loans do function as a price subsidy, and, therefore, increase college enrollment in four-year private colleges in this relatively affluent group of borrowers. She cautioned that the effects of loans may differ for low-income students, who are expected to be debt averse due to the greater risk of loan default. Elsewhere, she summarized a large body of quasi-experimental studies to show that grants and loans can be expected to have different effects on students of different income groups, but the direction and magnitude of these differences are not yet well understood (Dynarski, 2002a). Researchers have generally found that students in community colleges are more sensitive to college prices than students in the four-year sector (Heller, 1997, 1999; Leslie and Brinkman, 1988; Rouse, 1994). In addition, low-income students, who are disproportionately served by community colleges, show greater sensitivity than upper-income students to changes in prices and aid (Jackson, 1990). These studies support a conceptualization of financial aid effects that differ by family income and student demographic characteristics, an approach that has been advocated by St. John as an alternative to traditional price response theory, which treats student responses to different forms of aid as uniform (1995).

St. John et al. (2000) conceptualize college financial aid as having 'tangible and intangible' effects on persistence in college. Their approach draws on rational choice theory (Becker, 1976, 1993; Elster, 1986), which explains student enrollment decisions as a process of cost-benefit analysis, and recent developments in the persistence literature of the interrelatedness of factors affecting student outcomes. A large number of college student outcome studies evaluate the academic persistence or 'dropout' behaviors of college students within the framework of Tinto's (1975, 1987) sociological model of student attrition. Tinto's model, which focused on a student's academic and social integration into college life and the resulting degree of goal and institutional commitment a student achieves, has been significantly validated by numerous studies of full-time students attending residential four-year colleges. However, extensions of the model to other types of institutions raised questions about the applicability of the 'integration' concept to commuter, part-time, and otherwise 'non-traditional' students.

Building on Tinto's work, Bean and Metzner (1985) developed a conceptual model placing greater emphasis on 'environmental variables.' These include finances, hours of employment, outside encouragement, and family responsibilities, which were considered to play a greater role in the persistence decisions of students who are older, part-time, and/or employed. Bean and Metzner de-emphasized the influence of social integration on campus, arguing that social activities have much less bearing on the persistence of non-residential college students, many of whom have extensive social and family commitments off campus.

The most recent scholarship in this area argues for integrated models of student persistence, which recognize the interrelatedness among financial circumstances, academic experiences, student perceptions of their likelihood of program completion, environmental variables, and social support from significant others in the student's family and community (Beekhoven, De Jong, and Van Hout, 2002; Cabrera, Nora, and Castañeda, 1993; Nora, 2001–2002; St. John et al., 2000). Early college coursework informs students about their areas of comparative advantage, the probability of successful completion of a course of study, and the costs (both direct and indirect) of obtaining a degree (Altonji, 1993). Student commitment to a college and 'fit' in the college environment are understood to be influenced by all these factors and to, in turn, determine persistence.

St. John et al. (2000) emphasize that a student's cost-benefit analysis has cognitive (tangible) and affective (intangible) components. The cognitive component centers on calculations of cost and benefit, as is typical of rational choice models. The affective component includes satisfaction with one's ability to pay for college; it "embodies the student's perceptions regarding her/his financial circumstances" (Cabrera et al., 1990; St. John et al., 2000, p. 37). From this perspective, when students receive financial aid but continue to have unmet financial need, the receipt of aid will have a negative effect on persistence due to dissatisfaction with those financial circumstances.

Both cognitive and affective components impact a student's ability to develop commitments to college participation and become integrated in the academic community. Recognition of an affective component of satisfaction with college costs supports the conceptualization of loans as a form of tuition subsidy that can carry negative effects due to the psychological stress of future loan repayment. Thus risk aversion may be heightened for students in colleges with low degree attainment rates, such as community colleges. This conceptualization implies that, all else equal, community college students who have borrowed will assess the

net benefit of their educational investment more negatively than students who are funded through grants alone or who did not borrow.

While studies of the effects of tuition and aid on enrollment generally find positive effects of loans as well as grants (Dynarski, 2002a; Heller, 1997; St. John, 1990a), studies of the factors influencing student persistence as a choice distinct from the initial enrollment decision have obtained mixed results about the effects of different forms of aid. Stampen and Cabrera (1988) find all forms of aid packages to be effective in enabling low-income students to persist at rates equal to higher income students who had not received any aid. They qualify their findings in regard to loans by noting there were few low-income students among the borrowers in the dataset they examined. Analyzing students in the High School and Beyond database for the class of 1980 who entered different types of colleges, St. John (1990b, p. 393) finds significant positive effects of grants and loans on persistence to the second year of college (delta p of 0.036 and 0.020, respectively, based on a \$100 unit change). However, in later studies analyzing within-year persistence of students in the 1987 National Postsecondary Student Aid Study, St. John and colleagues tested various approaches to modeling aid effects on persistence and often found negative effects of grants and loans, particularly in samples of low-income students (with delta p magnitudes equal to -0.004 to -0.04 , based on a \$1000 unit change) (Paulsen and St. John, 2002, p. 214 ; St. John, Andrieu, Oescher, and Starkey, 1994, p. 468; St. John and Starkey, 1995, pp. 170–172). In studies using single-institution data from four-year institutions, DesJardins, Ahlburg, and McCall (2002) find a negative effect of loans, whereas Singell (2002) finds a positive effect of subsidized loans and an insignificant effect of unsubsidized loans. Both studies find positive effects of merit and need-based grants.

The results of three studies limited to community college samples also offer contradictory evidence of the effects of financial aid on persistence. Using the first of the National Postsecondary Student Aid Studies (NPSAS/86), St. John and his colleagues evaluated the impact of tuition and financial aid on persistence from the fall to spring of the first year of study at a community college among traditional-age students (St. John and Starkey, 1994) and non-traditional-age students (Hippensteel, St. John, and Starkey, 1996). In both samples, the researchers found grants have a negative effect and loans had a small, insignificant effect. They concluded that the level of grant aid was insufficient to offset tuition prices. Working with the 1996 NPSAS data and analyzing a combined sample of traditional and non-traditional age students, Cofer and Somers (1999) reached conclusions opposite to

St. John et al. They found positive effects of both grant and loan aid. The authors concluded that these contradictory findings may be accounted for by the significant shift in federal financial aid policy that occurred during the decade between the two NPSAS surveys (1986–1996). During this period, the availability of grant aid was reduced and subsidized loans became the dominant type of financial aid (McPherson and Schapiro, 1998). However, it is not clear why this shift from grants to loans would create positive effects where prior studies found negative effects, presumably due to unmet need, which would still exist or perhaps become a larger problem as students hesitated to accept loans.

Several critics of cross-sectional analyses of the type described above offer a methodological explanation for these inconsistent results. Dynarski (2002a), who favors quasi-experimental designs for the study of aid effects, argues that unobservable student characteristics are correlated with student choice of institution and financial aid package. Therefore, cross-sectional estimates of the effects of aid on persistence and other schooling choices are likely to suffer endogeneity bias and be unstable. In addition, other researchers (Alon, 2005; Bettinger, 2002; Singell, 2002) have recently gauged the effects of student self-selection into program types and aid packages by estimating models in two forms, with and without controls for self-selection and endogeneity bias.¹ Between the two types of models, they find substantive differences in the estimated effects of aid on student outcomes, including changes in the sign of the estimate. Bettinger (2002) finds that a model that does not control for self-selection bias underestimates the positive effects of Pell grant aid on persistence. To explain empirically observed negative effects of grants and loans and sometimes contradictory results, educational researchers have developed theoretical models incorporating affective components of financial aid receipt. In contrast, the methodological concerns that have been raised by economists focus attention on statistical biases as a potential explanation for negative results, which are unexpected from a traditional rational choice perspective where all types of aid are treated as cost reductions that should raise the optimal level of schooling.²

This study builds directly on the work of Hippensteel, St. John, and Starkey (1996), St. John and Starkey (1994), and Cofer and Somers (1999) by examining the influence of tuition prices and financial aid in the form of grants, loans, and work-study on the persistence of community college students, using a national longitudinal dataset previously unexamined for this purpose. In doing so, it also extends the work of these researchers, who studied within-year persistence, by examining persistence between the first and second years and degree attainment

over a five-year period. As in these prior studies, the effect of aid is modeled as a single-stage logistic regression.

To inform the current debate regarding the role of loans among the financing strategies available to community college students, the analytical focus is on the effects of loans on student outcomes. The study first examines the hypothesis that grants, loans, and work-study aid have a positive effect on persistence and degree attainment by reducing college costs. It controls for income; academic performance, enrollment intensity, and program characteristics in the first college year; environmental variables representing family and work pressures; and demographic characteristics. The study then tests the hypotheses that the effect of loans on persistence and associate's degree attainment differs by income and dependency status. Discussion of the results is informed by consideration of the cognitive and affective components of student experiences with financial aid and college costs. The discussion also considers the implication of endogeneity and self-selection bias in the estimates.

METHODS

Data and Sample

The data analyzed are the result of two surveys conducted by the National Center for Education Statistics (NCES). These are the National Postsecondary Student Aid Study (NPSAS) conducted 1989–90, and the Beginning Postsecondary Students, Second Follow-up (BPS 90/94), conducted in 1994 as a longitudinal component of the NPSAS/90 survey. BPS 90/94 provides extensive information about persistence and degree attainment among a nationally representative sample of students who entered college for the first time in the fall of 1989. More recent BPS data are available spanning three academic years (BPS 96/98), but the earlier survey results are preferable for this study because they cover five years, allowing more time for students to complete their degree.³

NPSAS and BPS are multistage, probability weighted samples with stratification by higher education sector and clustering of cases by region (*BPS 90/94 Technical report*, 1996; Berkner, Cuccaro-Alamin, and McCormick, 1996; Cuccaro-Alamin and Choy, 1998). As recommended by Thomas and Heck (2001), this study presents a 'design-based' rather than a 'model-based' analysis, which means parameters are estimated using the NCES longitudinal probability weight (BPS 94AWT) and the reported standard errors are based on a robust estimate of variance that takes into account the stratified, clustered

sampling design. In addition the reported model goodness-of-fit tests do not rely on the likelihood ratio, which is not based on a true likelihood function under complex sampling designs (Hosmer and Lemeshow, 2000; Skinner, Holt, and Smith, 1989). ‘Design-based’ analyses are employed when they are available, but other estimation strategies supplement the analysis when they are not.⁴

The sample was selected by first limiting the analysis to students who began their studies in public two-year institutions⁵ in their first semester ($n=899$). Given the interest in associate’s degree attainment, students who were enrolled in four-year institutions at the start of the second year were excluded, as were cases with a zero or missing probability weight or missing data on variables in the analysis.⁶ The analytic sample was $n=694$, representing a population of 1,010,543 students, based on the probability weights. In this sample, 41% of students persisted to enroll in the fall of the second year and 20% earned an associate’s degree within five years.

An examination of cases with missing and non-missing data indicated that the characteristics of the two groups are not significantly different in the predictor variables, with the exception that independent students are overrepresented in the missing cases. Also, the group with missing data was less likely to persist (16%) or attain associate’s degrees (6%). This implies that the sample is not representative of the community college population because independent students and those who are least likely to persist are underrepresented. Students enrolled in California community colleges make up a relatively large percentage of the sample (21%). While this percentage is appropriate to the California presence in the U.S. population of community college students, it is important to note the potentially heavy influence of the California experience on this national study.

Analysis

The analytical focus is on the effect of financial aid, primarily federal loans⁷, on persistence and associate’s degree attainment within the five-year period of the survey. Higher tuition rates are hypothesized to have a negative effect on persistence and attainment, while tuition subsidies in the form of grants and work-study awards are hypothesized to have a positive effect by reducing the costs of college. The positive effect of both subsidized and unsubsidized loans is hypothesized to be less than that of grants, because students must repay loans and bear the risk of not being able to do so comfortably. This risk is exacerbated by non-completion of a degree, because students may not realize a return on

their educational investment if they do not bring credentials to the labor market. Based on the literature review, low income students are hypothesized to be more risk averse than higher income students, because they have less of a financial cushion and lower probabilities of degree completion.

The affective component of borrowing and satisfaction with financial aid are not included because BPS 90/94 lacks strong measures of these psychological factors. Beekhoven et al. (2002) found that a model integrating rational choice and student integration perspectives performed well even when they omitted psychological factors. This study adopts their perspective, in which psychological factors are recognized but not explicitly measured. The assumption is that negative affective factors enter into the cost estimates of the utility-maximizing rational actor. Prior research has found both positive and negative effects of loans on persistence, so a two-tailed test at $\alpha = 0.05$ is used to evaluate significant differences.

Persistence is defined as re-enrollment in the fall of the second year (fall 1990) and attainment is defined as receiving an associate's degree prior to the conclusion of the survey in the spring of 1994. Descriptive and correlation statistics summarize the variables of interest and the relationships between them. A design-based chi-square analysis tests for differences in the characteristics of students who take loans. Logistic regression analyses examine the effects of the predictor variables on the dichotomous outcomes with multivariate controls.

Two logistic regression models of the following form are estimated:

$$\log\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta X_i + \delta Y_i + \gamma Z_i + \varepsilon_i \quad (1) \text{ and } (2)$$

where p_i is the probability of persistence in (1) and of associate's degree attainment in (2); X_i is a vector of personal characteristics and environmental variables, including income and financial dependency; Y_i is a vector representing academic experiences in the first college year, including enrollment intensity, grade point average, and program type; and Z_i is a vector of financial variables including tuition and aid. The estimated parameters are represented by α , β , δ , and γ , while ε_i is a logistically distributed random error term.

Both of these models are estimated in three alternative versions. The first version enters the receipt of different forms of financial aid as dichotomous variables (1A and 2A); the second enters each type of financial aid as a ratio variable in dollars (1B and 2B); and the third version enters all forms of aid in dollars as an aggregated subsidy (1C and 2C). (The rationale for testing these alternative measures of aid is

discussed below.) Finally, both the persistence and associate's degree attainment models are estimated with the effect of borrowing allowed to vary by income and financial dependency status by interacting these dichotomous variables with the continuous form of the federal loan variable. This final model with interaction terms takes the form:

$$\log\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta X'_i + \delta Y_i + \gamma Z'_i + \lambda_1 x_{1i} \times y_{1i} + \lambda_2 x_{2i} \times y_{1i} + \varepsilon_i \quad (3) \text{ and } (4)$$

where x_{1i} is a binary variable representing income status above or below the median sample value; x_{2i} is a binary variable representing financial dependence or independence; and y_{1i} represents federal loans. The estimated parameters for the effect on the probability of persistence (3) and associate's degree attainment (4) of the interaction of income and dependency status with loans are represented by λ_1 and λ_2 , respectively. The vectors X'_i and Z'_i are identical to X_i and Z_i in (1) and (2) above, with the exception that the variables in the interaction terms are now removed from these vectors.

The magnitude of the effect of the predictor variables is reported as odds ratios, with standard errors estimated as robust z-statistics to adjust for the weighting and clustering of the complex sample design (*Stata*, 2001a, p. 232). Significant odds ratios are then reported as 'delta p ' statistics for the primary model. The delta p statistic, which represents the change in probability of the positive predicted outcome holding other variables in the model at median and modal values, simplifies interpretation of the effects of non-linear models (Long, 1997; Long and Freese, 2001a, b; Peng, So, Stage, and St. John, 2002). However, the delta p only represents the magnitude of effects on students with typical characteristics. As recommended by Peng et al. (2002), to obtain results for non-modal subgroups of particular interest to the study, predicted probabilities of persistence and degree attainment are estimated separately based on the logit results and discussed in the text. For ease of interpretation, the effects of the interaction terms are presented graphically.

Forty-eight percent of students in the analytic sample are independent. They differ from dependent students in substantively and statistically significant ways. Independent students are more likely to be married and have children (consistent with the definition of independent financial status); are older and have lower incomes (their own rather than parental), and work more hours. Similarly, the sample includes both academic and vocational students (self-defined) who have statistically significant differences, and students who did not report a program

type. Students who define themselves as enrolled in vocational programs have characteristics similar to those of independent students (although the two groups do not entirely overlap).

If an OLS regression were being estimated, the differences between independent/dependent and vocational/academic students described above would suggest the need to analyze these subgroups of students separately. However, homoskedasticity of error terms is not a requirement of logistic regression (Menard, 1995; Peng et al., 2002), the estimation method employed in this analysis.

As recommended by Menard (1995), the logistic regressions are supplemented by diagnostic model-building tests using ordinary least squares regression. These models are estimated to test for multicollinearity using the variance inflation factor (VIF) statistic and for outliers and influential points using the Cook's D and leverage statistics, respectively. The model significance and goodness of fit are indicated by a design-adjusted Wald chi-squared test.

Three additional goodness-of-fit measures that are not design-based are presented: McFadden's Pseudo R^2 statistic (a likelihood ratio index), the Hosmer–Lemeshow chi-squared statistic and the percentage of cases correctly predicted, all of which must be calculated without probability weights. Several measures are presented because Long (1997, p.102) expresses reservations about the widespread use of Pseudo R^2 in logistic regression. He observes that, unlike measures of fit for linear regression, there is “no clear choice” of measure and none “has a clear interpretation in terms of explained variation.” He concludes that such measures are best treated as a rough index of a model's adequacy to compare models or studies within a research area. Similarly, Hosmer and Lemeshow (2000, pp. 156–160) caution against the use of classification tables as indicators of goodness-of-fit unless classification is the primary purpose of the analysis. With these reservations in mind, this array of measures is presented to facilitate comparison with prior studies.

The data analysis was conducted using the complex survey design estimation (*Stata*, 2001b, p. 321), cluster, and other features in *Stata*, version 7.

Variables

All predictor variables were measured in the NPSAS base year, the student's first year of college. The predictors are conceptualized as components of the first-year experience. Student's financial status, financial aid package, parental status, work hours, and other characteristics may often change in subsequent years and also affect degree attainment.

First-year cost and aid information is not necessarily a good indicator of subsequent costs and financing, particularly for students who transfer. Ideally, data indicating the tuition price a student faced and the financing sources used in each enrolled year would be included across the five years of the study. However, BPS 90/94 only includes detailed financial information for the base year. Therefore, first-year financial information is included in both the persistence and attainment models as a proxy for the costs students would encounter at other community colleges within their state.

The financial aid variables are the main predictors of interest. A student's eligibility for aid increases as their costs, including tuition and fees, increase. Although researchers have tested various approaches to controlling for the relationship between tuition and aid (St. John and Starkey, 1995), recent work models the effects of aid measured in dollars, controlling for tuition (DesJardins et al., 2002; Paulsen and St. John, 2002). In keeping with these developments in the literature, the financial aid variables are entered into the model in three forms. As noted above, in Model A receipt of each type of financial aid is entered as binary variables, controlling for tuition in dollars. This model tests the direction of effects of different aid types, but is not sensitive to outliers or the magnitude of aid. The receipt of aid indicates a student's financial need relative to the unsubsidized direct and indirect costs of attending a community college. Model B enters combined annual tuition and fees and different types of aid (federal loans, state and federal grants, and work-study aid) in \$500 dollar units. This model tests both the magnitude and direction of effects of different types of aid. Model C is estimated with grant, loan, and work-study aid aggregated and entered as a total subsidy, again controlling for tuition. This model, which is discussed below but not reported in the tables, reduces the effects of aid outliers⁸ and treats each type of aid as an equal subsidy.

Consistent with prior research, demographic and status variables are included in the analyses. These include gender, age, race/ethnicity (Hispanic and African-American, with Caucasian the omitted group), marital and parental status, household income, and financial dependency status. It is important to note that in the BPS data income is defined as the parental income if the student is financially dependent and as the student's own income if she or he is financially independent. The same income level likely signifies a qualitatively lower standard of living for a parent with college-age children in comparison to a financially independent college student. Work hours and enrollment intensity, factors known to affect persistence (Bradburn, 2002), are included. Enrollment intensity is measured as a series of indicator variables

comparing full-time full-year enrollment (the omitted group) with full-time part-year, part-time full-year, and part-time part-year enrollment, based on student records from the first year. First-year grade point average (GPA) and an indicator of remedial coursework measure the college academic experience. Unfortunately, BPS 90/94 lacks good measures of high school achievement, such as grades, class rank, or number of core academic courses completed⁹. SAT and ACT scores are available in the data, but these variables have few valid cases in this community college sub-sample. Missing values for income and GPA were imputed using the mean value for the analysis sample.

LIMITATIONS

The statistical modeling does not adjust for three factors that may affect the coefficients obtained. First, the sample is time censored (some students are still working towards their degrees). Second, a student's decision to seek and obtain financial aid is not strictly exogenous to the persistence and degree outcomes modeled as the dependent variables. Therefore, a two-stage regression model adjusting for self-selection and endogeneity bias may be more appropriate (Alon, 2005; Heckman, 1979; Singell, 2002). Finally, other than through the geographically clustered sampling design, the study does not control for variation by state in higher education policies and general economic conditions, including unemployment cycles, which are known to affect community college enrollment rates. Fixed effects models are often used to adjust for state-level variation (see, for example, Rouse, 1994, 1998), but the small sample size for this study prohibits such an approach. The sample comprises a large proportion of students enrolled in California colleges. While this is appropriate to the population under study, factors unique to the state and community college system of California may generate results that are atypical of the rest of the country.

RESULTS

As reported in Table 1, on average students in the sample were 22 years old and working 31 hours a week. The majority of cases were White, 11% were Hispanic and 8% were African-American. Four percent were categorized as Asian and this small proportion was incorporated into the omitted group, which was predominantly White. Fifty-six percent engaged in full-time study the entire first year, while 18% were enrolled full time part of the year.

TABLE 1. Variable Definitions and Descriptive Statistics

	Mean	Std. Error	Minimum	Maximum
<i>Dependent variables</i>				
Persistence enrolled fall year2	0.4068	0.0227	0	1
Associate's degree attained in 5 years	0.1992	0.0163	0	1
<i>Status variables</i>				
Male	0.4638	0.0211	0	1
Age (years) ^a	22.42	0.4127	16	68
African-American (White/Asian omitted)	0.0762	0.0138	0	1
Hispanic (White/Asian omitted)	0.1082	0.0163	0	1
Income ^a	28729	993.5	0	178,000
Dependent financially	0.4817	0.0221	0	1
Married	0.1958	0.0186	0	1
Has children	0.1762	0.0155	0	1
Single parent	0.0621	0.0096	0	1
Work hours ^{a,b}	31.23	0.5291	4	70
<i>Academic variables</i>				
Full time full year	0.5513	0.0307	0	1
Full time part year	0.1863	0.0191	0	1
Part time full year	0.1444	0.0164	0	1
Part time part year	0.1178	0.0164	0	1
Remedial coursework	0.1669	0.0168	0	1
College GPA ^a	2.450	0.0498	0	4.0
Academic program	0.5784	0.0225	0	1
Vocational program	0.2624	0.0201	0	1
Unknown program type	0.1590	0.0154	0	1
<i>Financial variables^b</i>				
Tuition and fees (annual) ^a	990.7	46.56	50	5025
Federal loans ^a	2497	99.39	333	6625
Grants ^a	2091	102.3	192	7475
Work-study ^a	885.1	70.1	117	2499

^aIndicates a continuous variable.

^bWork hour and financial aid means are contingent on values > 0.

Variable names indicate the positive value of binary variables.

Data: NCES BPS 90/94, Subpopulation: public 2-year (OFCON1 = 2) Weight: BPS 94AWT.
N = 694; Population size: 1,010,542.

Approximately half the sample was financially dependent on their parents or others. The mean income was \$29,000, though this differed significantly for financially dependent and independent students. The parental income for the dependent student sample averaged \$40,000,

while the mean for independent students was \$18,000. Twenty-two percent took federal loans¹⁰, and 45% received state or federal grants. The phi correlation coefficient between receipt of loans and grants was 0.58, showing a moderate relationship between these two forms of aid. The relationship between loan-taking and work-study aid was somewhat weaker, with a phi correlation of 0.40.

African-American students and those taking remedial courses were less likely to take loans, in the latter case potentially due to ineligibility, but on other status variables borrowers and non-borrowers had similar characteristics. The average loan amount among those taking loans was \$2500, which compares with average tuition and fee charges around \$1000. The typical loan amount suggests that students took loans to cover both direct and indirect (opportunity) costs. The chi-squared analysis indicates a significant association between taking loans and persistence, but not between loans and associate's degree attainment. Among borrowers 27% persisted, in comparison to 45% of non-borrowers.

The negative association of loans with persistence rates observed in the cross-tabulation is also found in the multivariate analysis. The logistic regression results (Table 2) show that loans have a negative association with persistence, all else equal. This result is statistically significant whether loans are measured as a binary variable indicating receipt of aid (Model 1A) or in dollars (Model 1B). Loans received in the first year do not have a significant effect on associate's degree attainment. The effects of grants and work-study awards are not significant in any model. When grants and work-study aid are aggregated with loans in the supplementary analysis to estimate the combined effect of total government subsidies, the effect is negative and significant in the persistence model and insignificant in the degree attainment model, a finding that suggests the loan effect is dominating the estimate. No form of financial aid has a significant effect on associate's degree attainment in either model.

Dependent financial status and better academic performance as measured by the GPA are strong positive predictors of both persistence and degree attainment. Women persist at higher rates than men and older students are less likely to attain degrees. Students for whom the academic or vocational nature of the educational program was not well defined (or who had missing data on this variable) were less likely to persist or attain. Students who defined their program as vocational and single parents were less likely to attain an associate's degree.

The delta *p* statistics for Model 1A indicate that for a 'typical' student, as defined by the median and modal values of the predictors, taking a loan reduces the probability of persistence by -0.15 from the estimated persistence probability of 0.52. The delta *p* statistics for

TABLE 2. Second-Year Persistence and Associate's Degree Attainment

	(1A) Persist	(1A) Delta <i>p</i>	(1B) Persist	(1B) Delta <i>p</i>	(2A) Attain AA	(2A) Delta <i>p</i>	(2B) Attain AA
Male	0.663 (2.12)*	-0.102	0.664 (2.13)*		0.734 (1.40)		0.734 (1.40)
Age	0.976 (1.38)		0.977 (1.35)		0.930 (2.52)*	-0.014	0.931 (2.44)*
African-American	0.670 (1.07)		0.647 (1.17)		0.811 (0.47)		0.801 (0.49)
Hispanic	0.864 (0.45)		0.866 (0.44)		1.066 (0.17)		1.053 (0.13)
Income	1.003 (0.47)		1.003 (0.48)		0.999 (0.16)		1.000 (0.09)
Dependent	2.137 (2.86)**	0.177	2.139 (2.90)**		1.876 (2.35)*	0.143	1.866 (2.36)*
Married	0.499 (1.56)		0.490 (1.58)		0.688 (0.61)		0.659 (0.68)
Has kids	1.913 (1.67)		1.873 (1.62)		1.945 (1.13)		1.952 (1.15)
Single parent	0.387 (1.65)		0.398 (1.60)		0.159 (2.18)*	-0.227	0.158 (2.18)*
Work hours	0.995 (0.98)		0.995 (0.86)		0.995 (0.63)		0.996 (0.52)
Full-time partyr	1.437 (1.39)		1.464 (1.47)		0.817 (0.67)		0.832 (0.62)
Part-time allyr	0.921 (0.28)		0.928 (0.25)		0.812 (0.71)		0.829 (0.64)
Part-time partyr	0.709 (1.15)		0.713 (1.14)		1.147 (0.42)		1.138 (0.40)
Remedial	0.916 (0.33)		0.921 (0.31)		0.912 (0.31)		0.889 (0.40)
GPA	1.262 (1.98)*	0.058	1.274 (2.04)*		1.447 (2.46)*	0.075	1.447 (2.47)*
Vocational	0.794 (1.07)		0.790 (1.08)		0.557 (2.19)*	-0.103	0.558 (2.14)*
Unknown program	0.156 (5.87)**	-0.379	0.157 (5.85)**		0.130 (3.38)**	-0.238	0.130 (3.41)**
Tuition + fees	1.163 (1.79)		1.159 (1.74)		1.081 (0.99)		1.082 (1.00)
Loan (yes/no)	0.535 (2.22)*	-0.153			0.973 (0.08)		
Grant (yes/no)	0.888 (0.58)				0.829 (0.71)		
Work study (yes/no)	0.889 (0.28)				0.672 (0.83)		

Loans \$500 units						0.898 (2.45)*	-0.026		0.976 (0.44)
Grants \$500 units						0.981 (0.47)			1.001 (0.01)
Work study \$500						0.855 (0.75)			0.936 (0.29)
<i>Model statistics</i>									
Wald Chi-square (21)	109.02					102.69		99.30	100.78
Prob > Chi-square	< 0.001					< 0.001		< 0.001	< 0.001
McFadden's R^2 ^a	0.149					0.147		0.136	0.134
LR Chi-square (df) ^d	158.27					155.99		106.12	105.2
Prob > LR Chi-square	< 0.001					< 0.001		< 0.001	< 0.001
Hosmer-Lemeshow	1.58					3.04		NR	NR
Chi-square (6) ^d									
Prob > HL Chi-square	0.9539					0.8041		NR	NR
Percentage correctly classified	68.88%					69.16%		69.16%	69.88%
Baseline prob	0.4068					0.4068		0.1992	0.1992

Observations 694.

Robust z-statistics in parentheses.

*significant at 5%; **significant at 1%.

Data: NCES BPS 90/94. Weight: BPS 94AWT. Subpop: public 2-year OFCON1 = 2.

^aLR and Hosmer-Lemeshow Chi-square and percentage correctly classified calculated using models without p weights.

NR not reported due to cell frequencies less than 5.

Model 1B indicate that for the typical student a change in the loan amount of \$500 lowers the probability of persistence -0.03 . A unit change of \$1000 has a -0.05 effect¹¹. The magnitude of these effects on persistence was also estimated separately based on the Model 1 results for independent and dependent students with otherwise typical characteristics who take loans. Dependent students who take loans still have a greater probability of persistence (0.56) than the base value, but that probability is reduced from 0.70 for dependent students without loans. Independent students who take loans are estimated to have a low probability of 0.37 of persistence.

The test of interaction terms for low-income and dependency status in Models 3 and 4 were not significant. However, these terms approached conventional levels of significance in the persistence model and provide support for further testing of interaction effects of loan-taking by students belonging to different income groups. The logit coefficients and significance tests for the interaction models are shown in Table 3. Figure 1 graphs the probability of persistence as loan amounts increase by income group and by dependency status. Figure 2 provides the same information regarding associate's degree attainment. As shown in Figure 1, the effects of increasing loan burden on persistence are negative for all groups except independent students whose income is above the median. Figure 2 illustrates a negative effect of loans on associate's degree attainment among low-income students. Figure 2 also highlights the greater probability of degree attainment among dependent students, which was noted above.

All the models are statistically significant, as shown by the model chi-square test. The Pseudo R^2 values of 0.15 predicting persistence and 0.13 predicting attainment are low, but fall in the middle of a range of values reported in previous studies on this topic. Hippensteel et al. (1996) report values from 0.045 to 0.11., while Paulsen and St. John report final models in the range of 0.20–0.30. The Hosmer–Lemeshow statistic for the persistence models, based on eight groups, indicate a reasonably good fit. While this statistic could not be obtained for a model with probability weights, the unweighted model provides results consistent with those based on the weighted model. The effect of loans is still found to be negative at similar magnitude. The Hosmer–Lemeshow statistic is not reported for the degree attainment models because expected frequencies in some cells were less than 5, even when the groups were set as low as 6. At less than 6 groups the statistic gives an artificially high indication of fit (Hosmer and Lemeshow, 2000). A test for leverage values using OLS models did not reveal the presence of cases exerting undue influence on the estimates. In addition, VIF tests

TABLE 3. Predictors of Persistence and Degree Attainment with Interaction Terms

	(3) Persist	(4) Attain AA
Male	0.676 (2.03)*	0.727 (1.43)
Age	0.972 (1.58)	0.930 (2.39)*
African-American	0.689 (1.00)	0.816 (0.46)
Hispanic	0.914 (0.27)	1.068 (0.17)
Married	0.415 (1.92)	0.622 (0.78)
Has kids	1.916 (1.62)	1.984 (1.15)
Single parent	0.375 (1.70)	0.154 (2.18)*
Hrs 8990	0.994 (1.06)	0.996 (0.51)
Full-time partyr	1.448 (1.45)	0.826 (0.65)
Part-time allyr	0.889 (0.40)	0.822 (0.68)
Part-time partyr	0.721 (1.07)	1.140 (0.40)
Remedial	0.903 (0.38)	0.883 (0.42)
GPA	1.250 (1.86)	1.441 (2.45)*
Vocational	0.784 (1.12)	0.567 (2.08)*
Unknown program	0.159 (5.82)**	0.132 (3.39)**
Tuition + fees	1.160 (1.75)	1.080 (0.96)
Grants \$500 units	0.988 (0.29)	1.000 (0.01)
Work study \$500s	0.864 (0.67)	0.935 (0.30)
Low income	0.776 (0.85)	0.987 (0.04)
Federal loan \$500s	1.052 (0.56)	1.011 (0.10)
Low income*fedloan	0.818 (1.84)	0.928 (0.76)
Dependent	1.829 (1.95)	1.739 (1.68)
Dependent*fedloan	0.858 (1.52)	0.992 (0.07)
<i>Model statistics</i>		
Wald Chi-square (23)	103.64	101.80
Prob > Chi-square	< 0.001	< 0.001
McFadden's R^{2a}	0.1549	0.1348
Hosmer-Lemeshow Chi-square (6) ^a	7.23	NR
Prob > HL Chi-square	0.3005	NR
Percentage correctly classified	70.03	68.73
Baseline prob	0.4068	0.1992

Observations 694.

Robust z -statistics in parentheses.

*significant at 5%; **significant at 1%.

Data: NCES BPS 90/94.

Weight: BPS 94AWT.

Subpop: public 2-year OFCON1 = 2.

^aLR and Hosmer-Lemeshow Chi-square and percentage correctly classified calculated using models without p weights.

NR not reported due to cell frequencies less than 5.

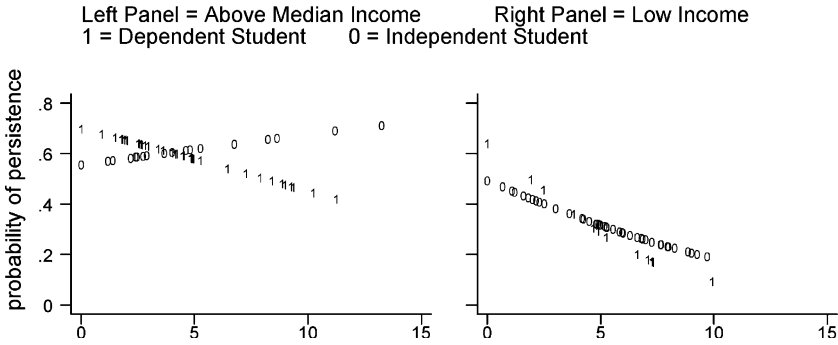


FIG. 1. Effect of loans on persistence by income and dependency. Federal loans in \$500 units.

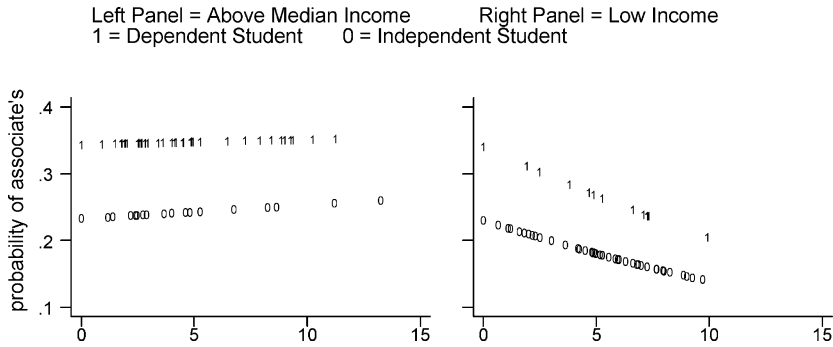


FIG. 2. Effect of loans on degree attainment by income and dependency. Federal loans in \$500 units.

showed no value greater than 3.15 and mean values less than 1.5, which indicates collinearity is not a problem.

DISCUSSION

Earlier studies of the effects of loans on the persistence of community college students present mixed results, with St. John and his colleagues (Hippensteel et al., 1996; St. John and Starkey, 1994) finding negative effects and Cofer and Somers (1999) finding positive effects. This study finds negative effects of loans on persistence and no effect of loans taken in the first year on subsequent degree attainment. It finds no significant effects of grants. These results support the theoretical proposition that, all else equal, students who take loans will arrive at a more negative

assessment of the net benefits of a community college education than their peers. As students assess their aptitude for college work and the prospects for a financial return to their educational investment, those who have loans will more quickly become dissatisfied with their college investment decision and withdraw.

Only 20% of the sample earned an associate's degree within five years. Given that the majority of students do not earn a degree, the prospect of a burdensome level of indebtedness from student loans is real. The completion of some college coursework in the absence of a degree is associated with higher earnings in some occupational fields, but these returns are not as high as those associated with degree attainment (Grubb, 1997). The decision to withdraw is affected by both a cognitive assessment of financial costs and potential future benefits, as well as an affective dissatisfaction with the risks of loan default.

The risks of loan default are greater among low-income students, who have less of a financial cushion to absorb loan repayments, particularly in the absence of higher earnings associated with degree completion. With a mean income of \$29,000 (1990 dollars), these community college students are a relatively low income college-going population. The interaction terms for income and financial dependency with loans, though not statistically significant, indicate that independent students with higher incomes are the only group that experience a positive effect of increases in loan amounts. The lack of significance in the interaction term for low and higher income groups may be due to the qualitatively different meanings of the income measure for dependent and independent students, or due to the relatively low range of incomes in this population.

The insignificant effect of grants is unexpected under rational choice theory. Unlike loan aid with its risks of repayment costs and default, grant aid is a direct cost reduction and, as hypothesized, the effects on persistence and degree attainment should be positive. The analysis did not disaggregate the effect of grant aid eligibility from the effects of the cost reductions associated with receiving grants. The former are negative, as eligibility indicates lower income status and the characteristics correlated with low income that affect academic success, which may not be adequately controlled in the model. These negative effects are likely masking the positive effects of cost reduction (Alon, 2005). The effect of loans is more complex and can be disaggregated into four components:

1. the economic and academic characteristics associated with *eligibility*, which is positive relative to those who receive full grant aid and negative relative to those who pay tuition without receiving any aid;

2. the *risk* of loan repayments or default in the absence of a positive return to the educational investment through degree attainment and higher earnings;
3. *self-selection* into loan-taking, as opposed to increased work hours, for example, which is positive in that it indicates higher confidence in one's own academic ability;
4. *cost subsidies*, which are positive as they reduce tuition and fee payments.

In that the analysis did not model these component effects of loan taking separately, the findings of negative effects of loans on community college student persistence are not conclusive. They indicate the need to determine whether the negative affective components of risk outweigh the positive effects of cost reduction using approaches that control for self-selection and the probability of degree (or certificate) completion. Hilmer (1998) has shown that student enrollment decisions regarding community college or university attendance are conditioned on their expected probability of completion. In addition, Kaufman (1999) has argued using examples from the labor economics literature that rational choice theory would be strengthened by incorporating psychological constructs such as motivation and emotion. These studies, as well as the results of the rich student retention literature (Cabrera, Nora, and Castañeda, 1992; St. John et al., 2000; Tinto, 1987) regarding the importance of psychological constructs such as student motivation, family support, financial attitudes, and 'fit' in the campus and community environments indicate that a net negative effect of loans on community college students cannot be ruled out.

The contradictory results among studies in this area can be due to several factors, including differences in statistical modeling, sample selection criteria, and the time frames under study. Earlier studies analyzed within-year community college persistence, while the current study analyzes persistence to the second year. The survey years of the BPS data analyzed in this study, 1989–1994, fall between the 1986 NPSAS survey analyzed by St. John et al. and the 1996 NPSAS data analyzed by Cofer and Somers. As loans become a more typical component of the community college student's financial aid package, greater numbers of financially needy students will be expected to borrow and the negative effects of borrowing may emerge more strongly. In a review of the literature analyzing access to postsecondary education, Baker and Velez (1996) cite studies by Mortenson and the College Entrance Examination Board to emphasize that low-income students are risk-averse when it comes to taking loans: "Financial aid has increasingly come in the form

of repayable loans that low-income students are less willing to assume because of their sense that their lifetime earnings from a college education may not repay the costs incurred from loan indebtedness” (p. 87).

While the sampling strategy for the BPS survey is designed to yield a nationally representative sample, minority groups were not oversampled. The results of this study may not accurately reflect the experiences of Hispanic and African-American students, as effects may have been found insignificant due to small sample size. The effects of loans on the persistence of African-American and Hispanic community college students in particular—who are disproportionately enrolled in the public two-year sector (Horn, Peter, and Rooney, 2002)—are not well understood. Analyzing student responses to aid packaging at a private four-year university, Linsenmeier, Rosen, and Rouse (2001) found support for the hypothesis that there are “differing perceptions between minorities and non-minorities about the cost of financing college through loans,” which are the source of greater risk aversion (p. 22). In contrast, Kim and Gomez have reported a greater willingness of Asian-American students to borrow to attend their first-choice institution (Monaghan, 2001).

In a study analyzing data from 1979, Olivas (1985) found that Hispanic students had an “extraordinary reliance on grants to the virtual exclusion of other forms of aid” (p. 465) and that institutions serving Hispanic students, particularly community colleges, were not actively engaged in financial aid packaging (providing multiple forms of aid). This may have changed with the growing prevalence of loans as a staple of the financial aid package, but Nora and Horvath (1989) have observed that many studies of the effects of financial aid on enrollment and persistence are limited to samples with a small number of minority students and have inconclusive results for underrepresented groups. In addition, only recently have theoretical models emerged that focus centrally on modeling the retention of minority students (Rendón, Jalomo, and Nora, 2000). To address these shortcomings, national surveys of postsecondary participation should be designed to oversample minority students in community colleges in order to support analysis of student experiences by ethnic background.

It is important to note, too, that the negative effects of the growing policy reliance on loans rather than grants may have the greatest impact on the enrollment decision, rather than on the re-enrollment decision modeled in this study. Low-income and first-generation students may face significant barriers to accessing the information needed to make an informed decision about borrowing and may have greater difficulties than other students in completing required documentation (Kane, 1999;

Nora and Horvath, 1989; Olivas, 1986). A recent analysis of NPSAS data indicates that many aid-eligible students fail to complete the federal financial aid form, with community college students least likely to take this first step (Gidjunis, 2004). Current methodological and theoretical work in the area of student retention also places greater emphasis on modeling the sequential nature of the college choice, persistence, and degree attainment outcomes and understanding how these related decisions affect the estimates obtained in persistence studies (Beekhoven et al., 2002; DesJardins et al., 2002; Dynarski, 2002a; Singell, 2002; St. John et al., 2000). Student departure or degree attainment is influenced by changes in family status, financial aid, and self-knowledge about academic skills and interests that occur during the first year. Specifically modeling these changes will provide a better estimate of the effects of loans on long-term persistence and degree attainment.

Such methodological innovations are especially important to inform policy proposals based on expectations about the ways student responses to borrowing change over the course of their college careers. The proposal to 'front-load' grants to the first two years of college and require students to take loans in later years assumes that students become less averse to loans as they gain confidence in their degree prospects (Davis, 2000; Kane, 1999). Similarly, the proposal to make loan repayment 'income-contingent' assumes that students will become less risk-averse when they are held harmless for lower-than-expected economic returns to their degrees (Kane, 1999). These are theoretically sound proposals that deserve empirical testing in community college student populations and greater elaboration based on an understanding of differences by program type and student characteristics.

CONCLUSION

Numerous reports have been issued by policy institutes and higher education organizations to influence the upcoming Reauthorization of the Higher Education Act (*AACC HEA Position Statement*, n.d. 2003; *Challenging Times*, 2003; King, 2002; *Policy of Choice*, 2002). These reports articulate principles and policy frameworks for determining the priorities of federal student financial aid. The tension between the responsibilities of government to finance higher education as a public good and the responsibilities of individuals to themselves finance what is often a sound investment is well recognized. Most analysts today accept student loans as a likely and reasonable part of the financial aid package for most students. While the public two-year sector grew dramatically in the 1960s and '70s as states financed no- and low-cost tuition,

many states are now reducing expenditures on higher education. Community college students are expected to assume a greater share of the burden. Yet, relatively little is known about the effect of borrowing on community college student outcomes, such as persistence and degree attainment, particularly when we consider theoretically plausible differences in behavior based on program and student characteristics. The empirical literature does not present consistent results, and more work is clearly needed in this area.

This study provides a review of the literature and presents results indicating that loans taken in the first year had a negative effect on persistence to the second year and no effect on subsequent degree attainment among community college students who borrowed in academic year 1989–90 and pursued their studies through 1994. Since 1989, borrowing has become more common among community college students, particularly those who are enrolled full time or are financially independent (Berkner, 2000). If, as indicated by the results presented here, borrowing does not reduce student costs sufficiently to enable persistence and timely degree attainment, then students may be at risk of loan default. Given the high rates of attrition in community colleges, students who take loans may later find repayment to be a financial burden, as the AACC has argued in taking a position against increases in loan limits. Arguments favoring loans as an efficient way to stimulate private investments in higher education are theoretically sound, but deserve much greater empirical testing. The impact of requiring more community college students to take loans should be better understood before student borrowing is accepted as a dominant financial aid policy for the public two-year sector of higher education.

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ENDNOTES

1. Endogeneity and self-selection bias are related but distinct concepts, both of which may affect cross-sectional analyses. See Millimet (2001) for a concise, readily available review of these issues.

2. See Alon (2005) and Dowd (2004) for a fuller discussion of how these statistical biases may affect estimates of the effects of financial aid on student outcomes.
3. The BPS 96/01 restricted dataset was not available at the time this study was conducted.
4. Hosmer and Lemeshow (2000, p. 219) recommend using design-based approaches to estimate parameters and model-based approaches to perform other functions as needed, due to a lack of design-based statistics.
5. This sampling stratum also includes institutions offering three-year programs.
6. Three extreme cases were identified as reporting invalid tuition data for their college and were excluded.
7. The federal loan variable used in this analysis included Stafford and Perkins loans and Supplemental Loans for Students (SLS). Stafford is the dominant subsidized loan program, while Perkins funds are available to high need students. In 1989, SLS loans, which are unsubsidized, were generally available only to independent students, who presumably would access higher rate loans only after borrowing at the maximum subsidized level for which they were eligible (Berkner, 2000).
8. The skewness statistic for aggregated aid is 1.96, while for grants it equals 2.35, loans 2.00 and work study aid 4.72.
9. BPS 96/01 does include measures of high school academic success.
10. The estimated proportion taking loans and the mean value exceeds values for this population published by NCES, based on the NPSAS:90 data. See Berkner (2000, p. 70) where the proportion of students borrowing in the public two-year sector is reported in the range of 2–11%, depending on dependency and income status, and an average of \$2086. The estimate in this study is based on the BPS 90:94 variable 'tfedln,' omitting cases with zero and missing weights and missing data for the selected analytic sample. Cases with missing data in BPS may have borrowed at a lower rate, inflating the estimated proportion of borrowers.
11. The effect of a \$1000 unit change was estimated separately for comparison with prior research reporting financial aid effects in \$1000 units. With a non-linear model the effect is not uniform across the range of values of the predictors, though in this case the effects are of very similar magnitude.

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