Student Price Response in Higher Education: An Update to Leslie and Brinkman

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An Update to Leslie and Brinkman

In 1987 Larry Leslie and Paul Brinkman published an important review of the literature on the relationship between price and enrollment in higher education. Their article reviewed 25 quantitative analyses of this relationship, which varied in their data sources, methods of analysis, and population studied. In their later book, *The Economic Value of Higher Education*, the authors also reviewed 45 econometric analyses of the relationship between student financial aid and college enrollment.

Leslie and Brinkman described why student demand research was important a decade ago, stating that "expanding and equalizing student access long has been a major public policy goal, and manipulation of price has been seen as the major policy instrument for achieving this goal" (p. 182). These words are no less true today, when both public and private college tuition prices have grown at rates that have far outpaced the ability of students and their families to pay for college. Table 1 presents the annual real increase in tuition and fee charges at public and private institutions, as well as the annual change in median family incomes for four periods over the last two decades. In the latter half of the 1970s, tuition prices at both public and 4-year private institutions fell in real terms, because tuition increases did not keep pace with the double-digit inflation of this period. In the 1980s real tuition rose in all sectors, but at a faster rate in private colleges. While the 1990s have seen a slowing of the rate of growth of private college tuitions, the rate at public colleges has in-

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TABLE 1

Annual Changes in Undergraduate Tuition Prices at Colleges and Universities,
and Changes in Incomes

Period	Public College Tuition		Private College Tuition		Median 4-Person Family Income
	4-Year	2-Year	4-Year	2-Year	
1976–1980	−3.1%	−1.6%	−0.8%	0.7%	−1.2%
1980–1990	4.3%	3.2%	5.0%	4.1%	1.0%
1990–1994	6.1%	6.6%	3.1%	2.3%	0.4%
1976–1994	3.0%	2.8%	3.2%	2.9%	0.2%

SOURCE: Author's calculations from National Center for Education Statistics (1995), Table 306, and U.S. Bureau of the Census (1995).
NOTE: All changes in constant (1994) dollars. Public tuition is for resident students and includes all mandatory fees (excluding room and board).

creased.[1] This has occurred at a time when incomes in the country have stagnated, and the income gap between rich and poor families has widened.[2] The net result is that college is even less affordable today than it was ten or twenty years ago.

Although the Leslie and Brinkman review was comprehensive at the time it was published, the most recent data they analyzed were from the early 1980s, with most studies using samples from the 1970s and earlier. These studies could not capture the effects of the increases in real tuition prices during the 1980s and 1990s. The price of college today receives even more attention than ever, with national newsmagazines trumpeting the "$1,000-a-week price tag at elite institutions" (Morganthau & Nayyar, 1996). Policymakers need to know today even more than ever what the effects of these increasing prices are.

The ensuing years since the publication of Leslie and Brinkman's work have seen the release of many student demand studies that add more information to our understanding of the relationship between price and higher education enrollments. Many of these new studies look at the effects of different forms of financial aid separately from tuition changes. In addition, many focus on the effect of tuition and aid changes on students of different income categories, races, and in different college sectors. In this article I review approximately twenty quantitative student demand studies and examine their new findings in comparison to those of Leslie and Brinkman almost a decade ago. The goal here is not to repeat their meta-analysis with the more recent studies, but rather to extend the Leslie and Brinkman findings to address such question as:

- Do tuition and financial aid changes have the same effects on later cohorts of students as those found by Leslie and Brinkman?

- Do tuition effects differ from those of various forms of financial aid?
- Do these tuition and financial aid effects differ for students of different incomes, races, or in different college sectors?

Knowing the answers to these questions, or at least some possible answers, can help policymakers determine the likely impacts of changes in tuition and financial aid policies at the federal, state, and institutional levels.

1. Findings of Leslie and Brinkman

As described earlier, Leslie and Brinkman (1987) reviewed 25 studies of the relationship between price and college enrollment that were published between 1967 and 1982, including both cross-sectional (5) and time-series (20) analyses. These studies examined different types of institutions, public and private, 2-year and 4-year. Building on a methodology employed in an earlier study by Jackson and Weathersby (1975), they followed a three-step process to standardize each in order to compare results that covered data over a 50-year period. These steps included

> (1) transforming results to a common measure of student response to price change, (2) correcting all values to reflect consistent price levels, and (3) converting data from various age-group populations to a common age base. (p. 184)

These steps resulted in the calculation of a student price response coefficient (SPRC) for each study. The SPRC is defined as the change in the college participation rate of 18–24-year-olds for every $100 increase in tuition prices (in 1982–1983 dollars). Because demand theory indicates that as prices rise, college enrollment rates should fall, *ceteris paribus*, one would expect the SPRC to be negative.

Leslie and Brinkman found that

> the mean price response is about 0.7 percentage points. That is, for every $100 increase in tuition price — given 1982–1983 average weighted higher education prices of $3,420 for tuition and room and board — one would expect an 18–24-year-old participation *rate* drop of about three-quarters of a percentage point. (p. 188)

They went on to note,

> Since the national higher education participation rate was about 0.33 in 1982, U.S. enrollments would decline by about 2.1 percent for each $100 price increase, all other factors equal.[3] (p. 189)

The SPRCs the authors calculated from the 25 studies ranged from −0.2 to −2.4.[4] The modal response was an SPRC of −0.6, which they adopted as their "best estimate for public policy purposes" (p. 189).

In the conclusion of their article Leslie and Brinkman addressed the quandary that college participation rates grew in the United States over the previous two decades, even in the face of increasing college prices. They answered this by noting that college prices, though increasing in nominal terms, had not risen significantly in real terms. They also indicated the ameliorating effects of financial aid, especially for lower income students, who would be most sensitive to tuition changes (a precursor of their findings on aid, which are discussed in more detail in their book). Most importantly, they noted, "Demand is known to be affected not only by price but by the money income of the buyer, by tastes and preferences, and by the value of the good from a consumption or an investment perspective" (1987, p. 200).

Leslie and Brinkman's meta-analysis was an important contribution to the literature. It confirmed the findings of earlier analyses performed by Jackson and Weathersby (1975) and McPherson (1978). Jackson and Weathersby examined seven studies and found SPRCs from −0.05 to −1.46. McPherson examined ten studies and found SPRCs from −0.05 to −1.53. Both of these ranges are similar to that of Leslie and Brinkman when one takes into account that the SPRCs in the two earlier studies were normalized to 1974 dollars[5].

2. Analyses Focusing on the Relationship between Price and College Enrollment

Many student demand studies have been published since Leslie and Brinkman's (1987) review was conducted. Some help fill the methodological gaps left by the earlier studies; many address later cohorts of students. All of them help to shed light on the question of how sensitive higher education enrollment rates are to increases in tuition. Researchers have used different levels of tuition increase as the question variable in their studies, with some replicating Leslie and Brinkman's use of a $100 tuition increase and others choosing differing amounts. Thus, it is important to note the level of increase used in each study when evaluating the resulting enrollment effect. Whereas cross-sectional studies generally used current dollars as a tuition measure, time-series studies generally used constant dollars indexed to a base year.

Kane (1991) used both cross-sectional and time-series methodologies to examine the college enrollment patterns of white and black students from two data sets — the National Longitudinal Survey of Youth

(NLSY) and the Current Population Surveys (CPS). The NLSY surveyed youth who were 14–22 years old in 1979. Kane used this survey and CPS data from 1970 to 1988. In both data sets, and for both white and black populations, he found that higher levels of tuition were associated with lower enrollment rates (controlling for other characteristics), with the tuition sensitivity higher for black students. For example, using the NLSY data, he estimated that a $1,000 increase in tuition (in 1988 dollars) was associated with a 15 percentage point decline in college entry for blacks and a 13 percentage point decline for whites. He found similar but smaller effects using CPS data. Kane (1994) tested these conclusions further by performing a similar analysis on the senior cohort of the High School and Beyond (HSB) survey of 1980, with controls for student background characteristics. He found an SPRC ranging from −0.63 to −1.22 for a $100 tuition increase, depending upon the income group examined.

In a later publication, the same author (Kane, 1995) examined changes in tuition and aggregate enrollments in public colleges and universities in each of the fifty states during the period 1980 to 1992, using enrollment data from the Integrated Postsecondary Education Data System (IPEDS) surveys conducted by the National Center for Education Statistics. Controlling for unemployment rates and need-based grant spending in each state, he analyzed the effect of a $1,000 tuition increase (in 1991 dollars) at community colleges and 4-year colleges.[6] By itself, the community college increase resulted in a drop in total public enrollments of 3.5 percentage points. Similarly, an increase at the 4-year colleges resulted in a total enrollment decrease of only 1.4 percentage points. These findings indicate that students are more sensitive to tuition increases in community colleges, which is not surprising, given that these colleges are often the entry point into higher education for the poorest students.

St. John (1990) used cross-sectional analysis to update Leslie and Brinkman's (1987) SPRC findings. He analyzed the sophomore cohort of the HSB survey to test tuition sensitivity, controlling for students' background characteristics and financial aid awards. Combining students in all types of institutions (4-year and 2-year, public and private), he found that a $1,000 increase in tuition decreased enrollment rates by 2.8 percentage points. This is lower than Leslie and Brinkman's range of −0.50 to −0.80 for a $100 increase. St. John commented on this difference:

> The lower price-response measures reported here may be attributable to (1) change in SPRCs over time, (2) methodological differences between this study and other studies, or (3) a combination of the two. (p. 171)

Noting that other studies using similar methodologies to compare SPRCs in the 1970s and 1980s found few differences,[7] St. John con-

cluded that methodological variations in his model specification most likely accounted for the lower SPRCs he found. The most important methodological difference was that his study included financial aid in the models. Less than a quarter of the studies in Leslie and Brinkman's (1987) article included financial aid (or net tuition) as a question variable. As described later in this article, because financial aid does affect enrollment, its inclusion in a model likely serves to dampen the effects of tuition on enrollment. St. John's findings in this study with respect to the effects of financial aid are described in the next section.

Savoca (1990) analyzed data from the National Longitudinal Survey of 1972 (NLS72) but used a different methodology than those of most other researchers who used this data set and similar longitudinal series. She argued that most other studies underestimate the tuition sensitivity of the college enrollment decision because they treat the decision to apply to college as exogenous:

> By treating the application decision as exogenous, they are likely to understate the true price effects, for they ignore the possibility that a change in tuition may affect enrollments through its effect on the decision to apply to college. (p. 123)

Savoca is stating that the level of tuition may be a determining factor in whether a student decides to apply to college, an effect that would be missed in studies that examine only the tuition responsiveness of students who do apply and are admitted to a college.

Treating the application decision as endogenous, Savoca analyzed the same subset of the NLS72 data that was used by Fuller, Manski, and Wise (1982) in an earlier landmark study.[8] Those authors found a general SPRC (for a $100 tuition increase) of −0.23 for those students who applied and were admitted to a college. Savoca found that the tuition sensitivity of the decision to *apply* to college was −0.26. As she concluded,

> If we assume that a school's tuition charge and admission policy are set independently, i.e., that admission standards are unaffected by changes in price, then the price elasticity of the probability of enrollment is the sum of these two elasticities, −0.49. Hence, the true elasticity of demand may be more than double the estimates reported in the literature. (p. 128)

Thus, Savoca argues, many other researchers who used similar methodologies to Fuller, Manski, and Wise may also have understated the true tuition sensitivity of the enrollment decision by as much as one half. One potential flaw with Savoca's analysis is that her models assume independence of the tuition-setting behavior of the institution and the setting of admissions policies. If in fact rising tuition prices force institutions to loosen admissions standards in order to meet enrollment targets,

Savoca's analysis may be overstating the impact of the application elasticity of demand.[9]

McPherson and Schapiro (1991b) analyzed eleven years of aggregate CPS data (through 1989) to examine the enrollment behavior of white students in three income categories. They found an SPRC (for a $100 tuition increase) for lower-income students in all types of institutions of −0.68. Although this figure cannot be directly compared to Leslie and Brinkman's because it is based on 1978–1979 tuition rates and is for lower-income students only, the authors conclude that their results "seem broadly consistent with typical cross-section findings" (p.221).

Shires (1995) used California enrollment and tuition data to calculate tuition elasticities of demand for the three public higher education sectors (community colleges, California State University, and University of California). He calculated elasticities of −0.15, −0.20, and −0.05, respectively. Though these tuition elasticities are not mathematically equivalent to SPRCs, the author compared them with elasticities in Leslie and Brinkman (1987) and found them to be consistent with other student demand studies.[10]

A study by Heller (1996) combined state cross-sectional and time-series data to estimate fixed-effects models of public college enrollment rates. Using data from the IPEDS surveys and controlling for state unemployment levels and grant awards, he analyzed the relationship between tuition and enrollment rates and found an SPRC of −0.36 for a $100 tuition increase (1993 dollars) at community colleges. This estimate is below that of Leslie and Brinkman (even taking into account inflation between 1983 and 1993), for as he noted, "One would expect a lower measure here, however, as this study analyzed the enrollment response of *all* students, not just first-time enrollees" (p. 19), who are the focus of the Leslie and Brinkman meta-analysis.

Rouse (1994) analyzed data from the NLSY to examine college enrollments at two-year versus four-year institutions. As a measure of price, she used the tuition price at public comprehensive colleges and community colleges in each student's state. Controlling for a wide range of background characteristics, she found tuition effects "similar to those estimated by others" (p. 74), with an SPRC of −1.0 when both two-year and four-year tuition prices are increased simultaneously.[11] She noted that more than two-thirds of the enrollment drop was predicted to occur at community colleges. Rouse also calculated cross-sector SPRCs to examine the effect on enrollments in each sector relative to a price change in the other. As community colleges can be considered a substitute for four-year comprehensive institutions (and vice-versa), one would expect a price increase in one sector to have a positive im-

pact on enrollments in the other. She found such an effect, as detailed in Table 2.

All the studies described here are consistent in one respect: each found an inverse relationship between tuition and enrollment rates. The exact size of the effect may differ depending upon the methodology used, the data set analyzed, and the type of students or institutions examined. But the magnitude of the effect is remarkably similar across most of these studies. The evidence indicates that a tuition increase of $100 is consistent with a drop in enrollment of somewhere in the range of 0.50 to 1.00 percentage points, a range consistent with Leslie and Brinkman's (1987) estimates.

Again, it is important to note that these changes assume that all other variables affecting enrollment demand are held constant. Even given this caveat, however, the inverse relationship between tuition and enrollment has been confirmed. Appendix A summarizes the findings from the studies reviewed in this section.

3. Analyses Focusing on the Relationship Between Student Financial Aid and College Enrollment

Analyzing the relationship between financial aid and enrollment in public higher education is a more complex undertaking than looking just at tuition. If one assumes that financial aid is nothing more than a discount to the posted tuition price, then students should react similarly to the same-sized increase in financial aid or cut in tuition, because both would result in the same net cost to the student.[12] Unfortunately for policymakers, this does not appear to be the case.

One issue is that "financial aid" is not a singular entity, but is a term that incorporates many different forms of student financial assistance. This includes grants, subsidized loans, unsubsidized (market rate) loans,

TABLE 2

Cross-Sector Student Price Response Coefficients, NLSY

8% Tuition Increase in:	Predicted Change in Probability of Enrollment (Percentage Points)		
	Community Colleges	Comprehensive Colleges	Both Sectors
Community Colleges	−0.9	0.2	−0.7
Comprehensive Colleges	0.4	−0.6	−0.2
Both Sectors	−0.7	−0.3	−1.0

SOURCE: Rouse (1994).

tuition remission, and work study wages. The net cost paid by the recipient of a $1,000 grant is different than that of a student receiving a $1,000 subsidized loan. Economists would argue that these two could be compared simply by calculating the subsidy value of the loan and comparing this to the grant. Yet in practice it appears that students are not always rational economic actors, and they react differently to various forms of financial aid and tuition changes, even if the economic value of each is the same.

There is also evidence that students react to the "sticker price" of the college, either because they are not aware of the existence of financial aid or do not believe they would qualify for it.[13] In a recent book, Mumper (1996) summarizes the dilemma facing policymakers who seek to use financial aid to lower the cost of higher education for needy students:

> A plan which may look good in an economics class may prove counterproductive in the real world of college finance. In this view, lower-income students are likely to become discouraged by rapid increases in the "sticker price" of higher education. This occurs because information about tuition levels is much more widely known and available than is information about financial aid programs. (p. 45)

The evidence for this view can be seen in most of the studies described in this section. Those studies that analyze the relationship between enrollments and tuition changes compared to financial aid awards generally find varying effects for each. Similarly, those studies that include different types of aid as explanatory variables (i.e., grants versus loans) find different effects for each type. St. John and Starkey (1995), building on the earlier work of Dresch (1975), emphasize the importance of these effects for student demand research. They argue that the traditional use of only a single student price (whether the "sticker" tuition price or the net price paid after subtracting financial aid) in many student demand studies overlooks potential policy levers that can be used at the federal, state, or institutional level to affect the rates at which students enroll in college and where they attend. Although the exact impact of pulling these levers cannot be known for certain in advance, there is a large body of evidence that can help policymakers use financial aid — loans, grants, and work study — singularly and in tandem as tools for increasing access and choice in higher education. Because most aid is awarded based on financial need, much of the research looks at the relationship between aid and enrollments of lower-income students only.

With the implementation of Basic Educational Opportunity Grants (BEOG) in the 1972 reauthorization of the Higher Education Act (renamed Pell Grants in 1980), the federal government for the first time

began to issue need-based financial aid on a large scale.[14] This provided an opportunity for researchers to examine the question of whether widespread availability of financial aid affected enrollment rates.

As with tuition rates, an excellent starting point for assessing the relationship between financial aid and access to higher education is the work of Larry Leslie and Paul Brinkman. In their 1988 book these authors examined three types of studies: multivariate analyses of student behavior, calculations of aggregate enrollment (what they term "participation") rates, and student opinion surveys. Because of the wide variety of methodologies used, even within each of the three types of studies, Leslie and Brinkman did not conduct a formal meta-analysis of the impact of aid on enrollment, as they did with the student demand studies. However, they did conclude,

> Student aid, at least in the form of grants, does increase the enrollment of low-income individuals. The results of the participation rate studies do not lend themselves to unambiguous interpretation, but most studies indicate that a greater proportion of eligible low-income individuals were participating in higher education in the early 1980s than prior to the advent of the major federal grant program (BEOG/Pell). (p. 154)

From their analysis of the econometric studies they estimated that in 1982, 20% to 40% of the enrollment of lower-income students was due to the existence of grants, and 13% of middle-income student enrollments were due to grants. Adding these two figures together and adjusting for the relative enrollment rate of each income group, the authors concluded that 16% of all full-time students enrolled in college because of the existence of need-based grants.

One of the most influential articles included in Leslie and Brinkman's review was Lee Hansen's (1983) analysis of the effect of the BEOG program. He used data from the Current Population Surveys (CPS) to compare overall enrollment rates in 1971/1972 and 1978/1979, periods before and after implementation of the BEOG program. Looking at students from below and above the median income line, he found little improvement in the relative enrollment rates of poorer students in the later period as compared to before the implementation of BEOGs:

> These data force one to conclude that the greater availability of student financial aid, targeted largely toward students from below-median-income families, did little, if anything, to increase access. The results certainly do not accord with expectations that access would increase for lower-income dependents relative to higher-income dependents. (p. 93)

The author confirmed this finding by examining the college enrollment expectations of graduating high-school seniors in NLS72 and the senior

cohort of the High School and Beyond (HSB) survey in 1980. He found no significant differences in the expectation of lower-income seniors in 1980 as compared to lower-income seniors in the earlier cohort, thus confirming the lack of impact of BEOGs.

Hansen provided four possible explanations for these counterintuitive findings: (1) financial aid may not have been targeted enough toward lower-income students; (2) the volume of aid available and size of the grants were not large enough to change the aggregate behavior of these students; (3) the enrollment rates of lower-income students might have been even *lower* if aid had not been available; (4) the findings may be the result of data and methodology problems.

Hansen's article provoked great controversy, especially for those policymakers and researchers who were invested in the notion that financial aid served to improve access for targeted populations. Many academics conducted studies to confirm or refute Hansen's findings or, at the least, to determine which of his explanations was correct. Most of these studies have been published subsequent to Leslie and Brinkman's book.

Kane (1994) tested Hansen's conclusions regarding the impact of the BEOG program on enrollments. He also analyzed CPS data from two time periods — 1970 to 1972 (before BEOGs) and 1973 to 1977. Like Hansen, he found that the enrollment rates of lower-income students relative to higher-income students did not increase in the later period. Kane proposed an additional explanation for these results to add to those put forth by Hansen:

> Only the otherwise college-bound may have the time and incentive to solve the mystery of eligibility. To the extent that students are unaware of financial aid rules and programs, they [BEOGs] may simply subsidize the otherwise college-bound and such programs may be a pure transfer. (p. 8)

As described earlier, St. John and Starkey (1995) indicated that researchers should examine the relationship between enrollment and different types of financial aid separately and in combination. This method of analysis may elicit effects on access that would be missed by studies such as Hansen's and Kane's described here.

McPherson and Schapiro (1991a) pointed out three limitations of Hansen's analysis, limitations that also apply to Kane's (1994) work:

> Year-to-year fluctuations may obscure underlying trends, so that increasing the number of years in the comparison is helpful. . . . Controlling for variation in other factors that affect the demand for enrollment is not possible with this method. . . . This kind of comparison is not responsive to changes over time in the targeting of student aid. (p. 311)

Their concern with the last point was that the targeting of student aid changed drastically in the late 1970s, as middle- and upper-income students became beneficiaries of the federal aid programs for the first time. These explanations equate most directly with Hansen's fourth explanation of his findings.

To test their hypothesis, McPherson and Schapiro (1991b) in another study analyzed data from the CPS for the 11-year period from 1974 to 1984, looking only at white students. They measured the effect on the enrollment rate of lower-income white students of a $100 increase in tuition, financial aid, and net cost (tuition less aid). They found that a $100 increase in any one of these measures led to a change in enrollments of 0.70 percentage points in the expected direction — increases in tuition and net cost decreased enrollments, and increases in financial aid increased enrollments.[15]

Some researchers analyzed separately the enrollment effects of different types of financial aid awards. Moore, Studenmund, and Slobko (1991) examined applicants to Occidental College, in their words a "selective college," in 1989. They found that for those students who applied for financial aid, a $1,000 increase in grants would increase the probability a student would enroll by 7.8 percentage points. They found a similar-sized effect for a decrease in the net cost (tuition minus grants). In comparison with grant awards, they found that changes in the size of loan or work study offers had no effect on enrollments. The authors concluded that "tuition and scholarships affect the probability of enrollment of financial aid applicants, but that loans and work-study have no significant effect" (p. 311).

St. John (1990) used the HSB sophomore cohort to answer some of the same questions regarding the effect of tuition and financial aid on enrollment.[16] Controlling for background characteristics, such as ability and socioeconomic status, he modeled the change in the probability of enrollment given changes in tuition, grants, loans, and work study awards. He found that all four of these variables affected the probability of enrollment as shown in Table 3.

Like Moore et al. (1991), St. John found similarly sized effects of tuition and financial aid. But unlike Moore et al., he found that enrollments were sensitive to changes in loans and work study as well as grants. Although St. John did not state if he tested whether the sizes of the effects were significantly different from one another, he did conclude that "on a dollar-for dollar basis, all forms of aid are at least as effective as tuition decreases in promoting enrollment" (p. 168).

Jackson (1988) performed a cross-sectional analysis on data sets from two points in time — NLS72 and the HSB senior cohort — to examine

TABLE 3

Relationship Between Tuition, Financial Aid, and the Probability of Enrollment in
Higher Education, 1982

$1,000 Increase in:	Predicted Change in Probability of Enrollment (Percentage Points)
Tuition	−2.8
Grants	4.3
Loans	3.8
Work Study	4.6

SOURCE: St. John (1990)
NOTE: All variables significant at a level $p \leq 0.05$.

whether the determinants of the demand for college changed during the
1970s. His analysis examined many variables besides whether the stu-
dent received any type of financial aid, including race, gender, region of
the country, academic ability, and family income and socioeconomic
status. Controlling for other factors, he found that financial aid recipi-
ents were 6.5 percentage points more likely to enter college in 1972, and
7.8 percentage points more likely in 1980. Jackson concluded,

> High-school seniors, as a group, decided whether to enter college in 1980
> much as they had in 1972. . . . Many federal programs of the time were
> supposed to increase college participation among groups traditionally under-
> represented: the poor, particularly, and disadvantaged minorities. Whether
> these programs had the desired effect — the evidence is somewhat contro-
> versial at this point, although the consensus is that they did — they produced
> neither an overall change in enrollment rates nor a substantial change in
> overall choice patterns. (p. 25)

St. John and Noell (1989) extended Jackson's analysis by examining
students from NLS72, the HSB senior cohort, and the HSB sophomore
cohort, thus giving them a comparison for three points in time — 1972,
1980, and 1982. These authors looked at the effects of each type of fi-
nancial aid (grants, loans, and work study) separately, along with any
combination of two or more types of aid. The question variable was
whether the student received *any* aid of that type, not the *size* of the aid
award. A summary of their findings is shown in Table 4. The authors
concluded that

> in all three years, financial aid offers with work only and packages with two
> or more types of aid had a slightly stronger impact than offers with scholar-
> ships or loans as the only source of aid. However, these differences are
> slight. Therefore, we conclude that all forms of aid were effective in promot-
> ing access in all three time periods. (p. 574)

Unlike Jackson, however, these authors reached the conclusion that the implementation of the BEOG program *did* improve access. Because aided students were more likely to attend college, and because more students overall received aid in 1980 and 1982 as compared to 1972 (shown in the last row of Table 4) they concluded that the BEOG program helped increase access to college.

The evidence regarding the relationship between financial aid and access to higher education is more complex than the findings on tuition described in section 2. Though difficult to generalize, those researchers who conducted cross-sectional analyses of the major longitudinal data sets (NLS72, NLSY, and HSB) found that students were sensitive to aid awards when they made the decision to enroll in college. The level of that sensitivity varied from study to study, depending upon the type of aid (grants, loans, or work study) and dollar value of the aid. The effect that aid has on enrollments is difficult to compare with that of tuition; whereas some of these studies found similar effects between the two (i.e., a $100 increase in aid would have roughly the same effect on enrollments as a $100 decrease in tuition), others found students to be less sensitive to aid than they were to tuition.

The evidence from the time-series studies is more mixed, however. Hansen's 1983 article, which compared enrollments before and after the creation of the BEOG program, concluded that the grants had no significant effect on access. His findings were echoed by Kane, at least in his 1994 article. Others, including McPherson and Schapiro (1991a), came to different conclusions, based on different interpretations of the data. These contrasting findings indicate that more time-series research is needed to determine whether the effects of financial aid are consistent over longer periods of time, and are not just an artifact of the periods

TABLE 4

Relationship Between Financial Aid and the Probability of Enrollment in Higher Education in 1972, 1980, and 1982

Type of Aid	Predicted Change in Probability of Enrollment (Percentage Points)		
	1972	1980	1982
Grants	6.2	10.1	6.2
Loans	10.8	9.5	7.8
Work Study	14.9	11.0	9.7
Combination	14.7	8.2	9.5
Percentage Receiving Any Aid	26.8%	30.7%	35.2%

SOURCE: St. John and Noell (1989)
NOTE: All variables significant at a level $p \leq 0.05$.

studied in the cross-sectional analyses described in this section. Appendix B summarizes the findings from the studies reviewed here.

There is strong evidence from the cross-sectional studies that financial aid awards do affect enrollments, and some of the post-Hansen researchers have provided compelling explanations for his inability to find such an effect. The topic deserves further study to uncover the complexity of the relationship between financial aid and enrollment.

4. Analyses Focusing on the Relationship Between Student Financial Aid and College Enrollment for Students of Different Incomes, Races, and in Different College Sectors

Although the evidence is clear that both tuition prices and financial aid awards affect access to public higher education, it is important to understand if students with varying characteristics react differently to changes in tuition and financial aid. For example, do students from wealthier families have the same sensitivity to tuition increases as do those from poorer families? Do white students react to financial aid awards in a fashion similar to black students?

These questions are important because of the targeting effects of financial aid versus the broader effects of tuition. Though all students at a given institution are affected by tuition increases, financial aid can be narrowly targeted through the design of eligibility requirements. Thus, it is important to understand how different types of students react to changes in both tuition and financial aid.

A related question is whether tuition and financial aid changes have the same effect on access to different kinds of institutions, i.e., community colleges as compared to 4-year institutions. For example, does the awarding of a $500 grant to a student at a community college have the same effect on that student's probability of enrollment as does a similar award made by a baccalaureate institution?

Many of the post-Leslie and Brinkman studies described in the previous two sections addressed one or more of these questions. Researchers have recognized the importance of group differences in these issues, and they have attempted to distinguish what effect those differences have on students' enrollment decisions.

Effects of Tuition and Financial Aid on Students of Different Incomes

All other things being equal, a student with more financial resources (of her own or from her family) should be less sensitive to tuition increases than would a student who had to make significant financial and

other sacrifices to afford a college education. Similarly, the marginal utility of a scholarship should be greater for this latter student than for the former, because of the discounting effect of the scholarship. Because poorer students have access to fewer funds to pay for college, the probability that they would enroll in college would likely decline more for every unit increase in net cost compared to wealthier students. In economic terms, the poorer student would be described as having a more elastic demand for higher education. The difference between two such students can be seen in Figure 1.

D_P represents the demand curve of a poor student, and D_w the demand curve of a wealthy student.[17] At a very low tuition level, such as T_1, both students have a probability of enrollment, P_1, that is very close to one. At this level, tuition alone is not a barrier to entry for either student. As the price rises, to T_2, the wealthier student would see a small drop in her probability of enrollment to P_2. The probability of enrollment of the poorer student, who has fewer resources to pay for college and is therefore more sensitive to tuition increases, would drop closer to zero, to P_3.

Most research on this topic has confirmed that these assumptions from economic theory do hold in practice. Students from lower-income families do tend to be more sensitive to tuition and aid when making un-
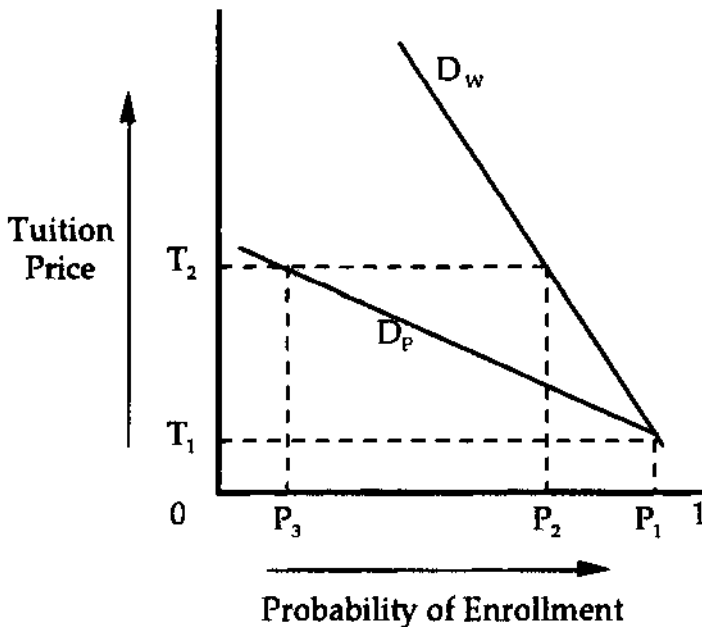

FIG. 1. Higher Education Demand of Poor and Wealthy Students

dergraduate enrollment decisions than do those from upper-income families. Leslie and Brinkman (1987) briefly discussed their findings concerning income levels. Some of the 25 student demand studies they reviewed looked at students of different income levels. They found that these studies were consistent in their finding of a higher level of price sensitivity for lower-income students, with price sensitivity generally lessening as income rises. Though they theorized that the increasing availability of financial aid should help to lessen these differences among income groups, they concluded that the evidence was only just becoming available (at the time of their review) to confirm this effect.

Besides confirming these relative relationships, researchers seek to determine more precisely what the respective tuition (and aid) elasticities of demand are for students of different income levels. Calculating these elasticities can allow policy makers to predict with some degree of certainty what the impact of proposed tuition and aid changes will be on students from different income categories.[18]

The effect of financial aid can be seen by reexamining the demand curves of poor and wealthy students shown earlier. Figure 2 shows the same two curves, D_P and D_W. A new curve, D_{p*}, represents the demand curve of poor students after the effects of financial aid are taken into account. While the slope of the curve stays the same (D_{p*} is parallel to D_P), the curve shifts to the right so that at any given tuition level, the probability of enrollment is greater. For example, at a tuition price of T_1, the poor student without financial aid would have a probability of enrollment of P_1, while that same student with financial aid would have an enrollment probability of P_2, similar to that of the wealthier student.

One of the questions researchers in this arena seek to address is, How much does financial aid serve to shift the demand curve of recipients? Because the majority of aid is awarded based on financial need, does it actually eliminate all barriers to entry for poorer students, or does it eliminate only part or even none of the gap?

McPherson and Schapiro (1989) analyzed Current Population Survey (CPS) data from 1974 to 1984 to examine if tuition and aid sensitivities differ by income level.[19] For a sample that included students in both public and private institutions, they found that those in the lowest income group were sensitive to tuition increases, with a $100 increase resulting in a decrease in enrollment of 0.68 percentage points. These same students had no statistically significant reaction to a similarly sized decrease in financial aid. For middle- and upper-income students, McPherson and Schapiro found no effect of aid on their enrollment rates, and as they labeled it, the "perverse" (p. 41) result of a *positive* relationship between tuition increases and enrollment. They offered no explanation for this latter finding but did conclude, "Our most important
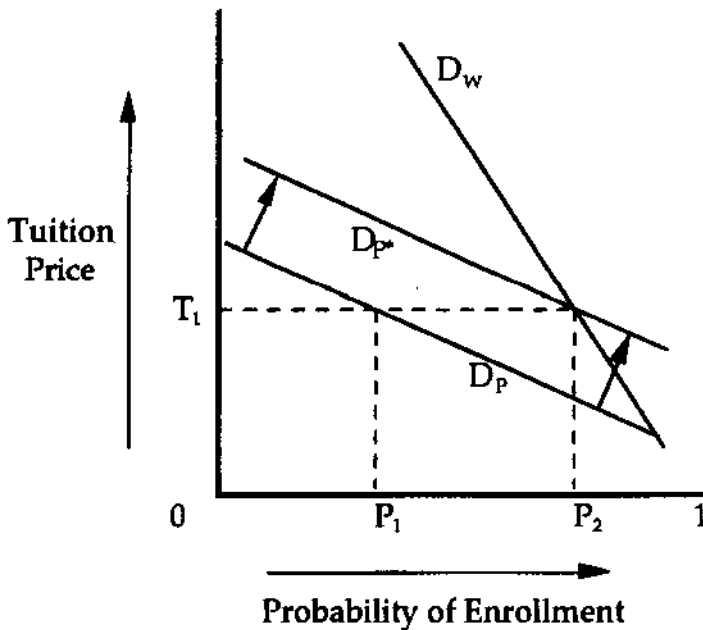
Fig. 2. Higher Education Demand of Poor and Wealthy Students, Showing Effect of Financial Aid.

and reliable finding is that increases in the net cost of attendance have a negative and statistically significant effect on enrollment for white students from low income families" (p. 42).

St. John (1990), in his analysis of the HSB sophomore cohort, divided students into four income categories and analyzed the effect of tuition and aid changes, controlling for student background characteristics. He modeled the effects on the probability of enrollment of a $100 decrease in tuition and a $100 increase in grants or loans. The results are shown in Table 5.

St. John found similar levels of tuition sensitivity for all but the wealthiest students, who were much less sensitive to tuition changes than were the other three groups. The poorest students responded more strongly to grant increases, probably because they were the group most likely to receive aid. Loans were an incentive to enroll only for students in the two middle-income groups. An interesting finding was that the poorest students reacted much more strongly to grant increases than to tuition decreases. This may have been because any tuition changes would be at least partially offset by a change in the size of the grant awarded to the student and may be an indication that students who received grants were responding more to the net cost, rather than the sticker price.

TABLE 5

Percentage Point Change in the Probability of Enrollment in Higher Education for
Students of Different Income Levels, 1982

Income Group[a]	$100 tuition decrease	$100 grant increase	$100 Loan increase
Less than $15,0000	0.34	0.88	NS
$15,000–$24,999	0.39	0.35	0.53
$25,000–$39,999	0.31	0.33	0.63
Above $40,000	0.14	NS	NS

SOURCE: St. John (1990)
NS = not significant. All other variables significant at a level $p \leq 0.05$.
[a]Median income of 4-person families in 1982 was $27,619 (U.S. Bureau of the Census, 1995).

McPherson and Schapiro (1994) used the American Freshman Survey
(conducted annually by UCLA) to examine changes in the enrollment of
students of different income levels between 1980 and 1993. They found
that lower-income students were becoming more clustered in commu-
nity colleges:

> One of our most interesting findings is the increasing representation of low
> income students at public two-year colleges, and the declining representa-
> tion of middle and upper income students there; . . . these data do seem
> worrisome. They suggest that the combined effects of tuition increases and
> limitations on federal student aid may be impairing the ability of low income
> students to gain access to institutions other than community colleges. (p. 14)

Though they did not conduct a traditional multivariate analysis to reach
this conclusion, the authors ascribe this shift of poorer students into
community colleges to greater tuition and aid sensitivity.

These researchers concluded that there is a relationship between in-
come and sensitivity to tuition and financial aid. Although the sizes of
the effects differ across studies, they find that poorer students are more
sensitive to increases in net cost, whether those increases take the effect
of tuition increases or financial aid decreases. These findings confirm
the theoretical examples provided in Figures 1 and 2. Tuition increases
that are not offset by concomitant increases in financial aid appear to
have the effect of reducing access to higher education for our country's
poorest students.

Effects of Tuition and Financial Aid on Students
of Different Races

The previous section described how students of different income lev-
els react to changes in tuition and financial aid. Another question ad-

dressed by many researchers is, How do tuition and aid changes affect students of different races? There are at least three explanations for why students of different races may have varying sensitivities to tuition and financial aid changes. The first is that race may be a proxy for income. If students of one race tend to be at one end or the other of the national income distribution as a group, they would have higher education demand curves that are similar to those of a given income group as a whole. There is some evidence for this, at least based on national statistics. Table 6 presents data from the U.S. Bureau of the Census on median family income nationally by race for selected years since 1972.

The data in Table 6 show that white families since 1980 and Asian families since 1990 have incomes that are at least 150% that of blacks and Hispanics. In addition, since 1990 incomes of whites and Asians have continued to grow, whereas those of blacks and Hispanics have stagnated. Other measures of socioeconomic status besides income, such as mother's and father's educational levels, tend to show similar patterns and likely work to reinforce the effect of income on the demand for higher education.

It is important to note that these are national, median figures. The distribution of incomes within each race may differ, as may the distribution in particular states or regions of the country. Distribution within racial groups may also differ — third generation Chinese Americans may have different income profiles than first generation immigrants from Southeast Asia. Nevertheless, the data show that there are significant differences in average incomes among the races; these differences may be driving variations in higher education entry and outcomes among the racial groups. An analysis of college dropout rates by the General Accounting Office (1995) noted, "Minorities are overrepresented among low-income families, so their rates serve as a reasonable proxy for low-income students' graduation rates" (p. 6).

TABLE 6

Median Family Income by Race since 1972, Current Dollars

Year	White[a]	Black	Hispanic	Asian
1972	$11,694	$6,864	$8,183	NA
1980	$22,336	$12,674	$14,716	NA
1990	$38,239	$21,423	$23,431	$42,246
1993	$41,110	$21,542	$23,654	$44,456

Source: U.S. Bureau of the Census (1996).
NA = Not available
[a]The category "White" includes white, non-Hispanic origin families.

The second reason why students of different races might react differently to changes in tuition and aid in the aggregate is that they may be perceived to have different ability levels. Many of the student demand studies that analyzed cross-sectional data sets have found that higher ability students tend to have higher college enrollment rates, even after controlling for family income.[20] The whole issue of race and ability is fraught with political landmines and is not a central question in this analysis. However, aggregate SAT scores, which are used as measures of ability by most 4-year colleges and universities, show large differences between races. Table 7 summarizes these differences.

As with incomes, the profile of Asian students looks similar to that of whites, and black students' scores are closer to those of Hispanics. Measures of ability from other types of standardized tests show similar patterns. Regardless of one's view on the validity of these tests, the reality in the educational marketplace is that (1) colleges use these scores to assess students' academic abilities and make admissions decisions, and (2) these scores send signals to students about their own ability and preparedness for college. Higher ability students may see themselves more as "college material" and be more likely to make the financial sacrifices necessary to attend college if they perceive a better chance for success through graduation and subsequent entry into labor markets. Thus, if race is acting as a proxy for ability (perceived or actual), then students from particular racial groups may have different price elasticities because of differences in ability. Students who perceive themselves as having higher ability may be more likely to incur increasing college costs.

The last major explanation for differences in demand curves between racial groups is because of different "tastes" for higher education among these groups. It is these "tastes" for any good or service that help to shape the demand curve for that product. Irrespective of any differences in income or ability, people with different racial and cultural backgrounds

TABLE 7

Combined Verbal and Math SAT Scores by Race since 1975

Year	White	Black	Hispanic[a]	Asian
1975–1976	944	686	773	932
1980–1981	925	694	770	910
1984–1985	939	722	793	922
1990–1991	930	736	786	941
1993–1994	938	740	777	951

SOURCE: National Center for Education Statistics (1996).
[a]Average of Mexican-American and Puerto Rican scores.

may place different values on attending college. These values can determine how much a family is willing to invest in a college education. Karen (1991), for example, describes how the "political mobilization" of blacks from 1960 to 1976 may have helped to increase their college participation rates during this period. This action could have helped to change the "taste" for higher education among this group. Again, the sociological question of how much different groups value higher education is not central to this article, but it is important to note that such differences between races can affect their relative sensitivity to changes in tuition and financial aid.

One way to test whether tuition and aid differences between the races are due to income or academic ability levels is by including controls for these two measures in multivariate models. If family income, socioeconomic status, and ability are included in the model, and differences between the races still exist, then one can conclude that the differences are due to varying "tastes" for higher education or some other unobserved factor (such as discrimination).

Many researchers have examined differences in the sensitivity to tuition and aid changes among racial groups.[21] Behrman, Kletzer, McPherson, and Schapiro (1992) analyzed the NLS72 survey, comparing the tuition sensitivity of white students with that of a sample of black and Hispanic students together. Controlling for student background characteristics (including parents' education, family income, and ability) and labor market conditions, they estimated the probabilities that a student would not enroll in higher education, enroll in a 2-year college, or enroll in a 4-year school. As a measure of college cost, they used the average in-state tuition at a 4-year college in the student's state of residence. They found that the enrollment of black and Hispanic students in 2-year colleges reacted *positively* to tuition increases at the 4-year schools, but their enrollment in 4-year schools was not related to tuition. This may indicate that higher tuition at baccalaureate institutions was pushing black and Hispanic students, who otherwise would enroll at 4-year institutions, into community colleges.

The authors found that white enrollments in 2-year institutions did not respond to changes in tuition, but interestingly enough, white enrollments in 4-year colleges reacted *positively* to tuition increases there. They concluded that for these students, "price is capturing a quality effect here for which we are unable to control" (p. 14). In other words, they theorized that higher-priced institutions were sending a signal of higher quality to students, thus providing more incentive for them to enroll there. This incentive had to have been large enough to offset any negative effect caused by students' inability or unwillingness to pay the higher tuition.

St. John and Noell (1989) examined white, black, and Hispanic students from the HSB sophomore and senior cohorts to measure the effect of financial aid on enrollment.[22] They also included controls for socioeconomic status, family income, and ability. They found that black students were the most responsive to financial aid offers, followed by Hispanic students and then whites. Their findings are summarized in Table 8.

White students in 1980 who received only a grant (of any size) had a probability of enrollment 8.9 percentage points greater than that of white students receiving no aid. Black students in 1980 received almost twice the incentive from grants, with their probability of enrollment increasing 17.7 percentage points over unaided black students. The authors concluded, "Student aid appears to have a stronger impact on college attendance by blacks and Hispanics than whites" (p. 578). However, they did not explain the drop in the effect of grants among all three groups from 1980 to 1982.

Jackson (1989) also analyzed the HSB senior cohort to ascertain similar differences among white, black, and Hispanic students. Controlling for similar background characteristics as St. John and Noell (1989), he found that black enrollments responded more to financial aid offers than did those of other races. Blacks who received grants had a probability of enrollment 11.2 percentage points greater than unaided black applicants. In comparison, a white student who received a grant was 6.3 percentage points more likely to enter college than an unaided white. Hispanic students who received grants were no more likely to enter college than their counterparts who did not receive grants.

A possible explanation for the difference in these findings from those of St. John and Noell is that Jackson included in his model a construct of "college tendency," which was a composite of student background char-

TABLE 8

Change in the Enrollment Probability of White, Black, and Hispanic Students
when Offered Financial Aid, 1980 and 1982

| | Predicted Change in Probability of Enrollment (Percentage Points) | | | | | |
| | 1980 | | | 1982 | | |
Type of Aid	White	Black	Hispanic	White	Black	Hispanic
Grant	8.9*	17.7*	14.1*	4.2*	15.0*	3.8*
Loan	8.8*	14.5*	12.3	7.2*	11.2*	13.1*
Combination[a]	7.1*	11.9	16.9	8.1*	18.6*	15.0

SOURCE: St. John and Noell (1989).
[a] Including work study.
* = $p \leq 0.05$.

acteristics he used to predict whether the student would apply to college or not. It was the inclusion of this construct that likely caused the finding that aid had no effect on Hispanic college entry. When Jackson dropped this variable from his models, he found that the reaction of Hispanic students to grant offers was between that of whites and blacks. As the author concluded:

> Black students remain the most responsive to scholarship awards, the effect being about twice as large as it is for White students, but the response of Hispanic students cannot be distinguished from the effect of their family and academic backgrounds. (p. 24)

Jackson found that the existence of a loan provided no statistically significant incentive to enroll for any of the three groups.

Kane (1991), in his analysis of Current Population Survey data from 1970 to 1988, compared the responses of white and black students to tuition, Pell Grants, and the net cost of college. His models included controls for socioeconomic status and family income, but not ability. With all three measures of college costs, he found that the enrollment of blacks was more sensitive than that of whites. The difference in the respective sensitivities was greatest for tuition, indicating that sticker price is much more of a barrier to enrollment for blacks than for whites.

Heller (1994) conducted a state cross-sectional analysis comparing the change in public college enrollment rates from 1984 to 1991 of white and minority (black and Hispanic) students. The models included as dependent variables the change in public college tuition, state need-based grants per capita, and unemployment rates. In every model, minority students were more sensitive to tuition increases than were white students, with the gap largest when grants and unemployment were used as controls. Table 9 summarizes these findings.

The evidence from the studies described in this section is that black students are more sensitive to college costs than white students, even

TABLE 9

White and Minority Student Responses to Tuition Increases Between 1984 and 1991

Model	Percentage Point Change in Enrollment Rate Per $100 Increase in Tuition		
	Minority	White	Gap
Tuition only	−0.63*	−0.58*	0.05
Tuition and Grants	−0.64*	−0.57*	0.07
Tuition, Grants, and Unemployment	−0.46*	−0.35	0.11

SOURCE: Heller (1994).
* = $p \leq 0.05$.

controlling for income, socioeconomic status, and ability. For Hispanic students, the evidence is more mixed. Whereas some authors found that Hispanic students tended to react to tuition and aid changes in a fashion similar to that of black students, others found a different response. These differences warrant further investigation.

Effects of Tuition and Financial Aid on Enrollment in Different Sectors of Higher Education

Higher education in the United States is a very heterogeneous market. In 1992 over 12 million undergraduates attended college in this country (National Center for Education Statistics, 1994). Approximately ten million, or 83%, attended public institutions, with 46% of these in 4-year colleges and universities, and 54% in community colleges. Given the quite different missions of community colleges and baccalaureate institutions as well as the differences in how their graduates fare in labor markets, an important question for researchers and policymakers is whether students in each of these sectors react differently to changes in tuition and financial aid.

All other things being equal, one would expect students at community colleges to be more sensitive to tuition and aid than students at 4-year colleges. This is because lower-income students are overrepresented in community colleges, and as discussed earlier in this section, lower-income students are more sensitive to price increases.[23] Minority students also are overrepresented in community colleges.[24]

In contrast to the other questions reviewed in this analysis, there has been little research that has compared the tuition and aid sensitivities of community college students with those in 4-year colleges. Some studies, however, have attempted to address this issue.

In their review of student demand studies, Leslie and Brinkman (1987 and 1988) examined a handful of studies that analyzed enrollments separately at public 4-year and community colleges. While they estimated the overall student price response coefficient (SPRC) to be −0.7, they estimated the 4-year public SPRC to be −0.6 to −0.7, and the community college SPRC to be −0.9. They concluded that community college students were more responsive to tuition increases than students at 4-year colleges.

As described in section 2, Shires (1995) calculated tuition elasticities of demand for California community colleges, California State University, and the University of California. He calculated elasticities of −0.15, −0.20, and −0.05, respectively, finding that community college students were more price responsive than students at the University of California, but slightly less responsive than students at California State University.

Kane's (1995) analysis of aggregate public enrollments by state looked at the effect on enrollments of increases in tuition at community

colleges and 4-year colleges. He modeled the effect of a $1,000 tuition increase in each sector, using a similar methodology as that of Rouse (1994), described in section 2, to test cross-sector price responsiveness. His results are summarized in Table 10.

When tuition is increased $1,000 at community colleges, all public enrollments drop 3.5 percentage points, with enrollments at community colleges dropping 4.7 points. Public 4-year enrollments actually increase, as tuition there becomes more cost competitive with community colleges. When tuition is increased $1,000 at the 4-year colleges, total enrollments drop only 1.4 percentage points, with 4-year enrollments dropping 1.2 points. It appears from these findings that community college students are more likely to drop out of college entirely when their tuition is increased, compared with students at 4-year colleges.

Though not as extensive as some of the other questions addressed in this article, the literature on tuition and aid sensitivity by sector does show that community college students are more sensitive to price than are students in 4-year institutions. This is likely because of the overrepresentation of both lower-income and minority students in community colleges. Appendix C summarizes the findings from this section.

5. *Conclusions*

The studies reviewed in this article used a wide variety of methodological approaches and data sets to address a fundamental question: How sensitive are students to increases in college costs, and do the effects differ for students of different characteristics? Whether examining tuition, financial aid, or the net cost of attendance, the evidence is very consistent and can be summarized in one sentence:

As the price of college goes up, the probability of enrollment tends to go down.

TABLE 10

The Effect of Tuition Increases on Enrollments in Public 4-Year and Community Colleges, 1980 to 1992

	Percentage Point Change in Enrollment at		
$1,000 Tuition Increase At	Community Colleges	Public 4-Year	All Public Colleges
Community Colleges	−4.7*	1.8*	−3.5*
4-Year	0.5	−1.2*	−1.4*

Source: Kane (1995, Table 2).
* = $p \leq 0.05$

The magnitude of this effect varies, depending upon which population is examined, which component of cost is changed, and which statistical technique is used. It is also important to note that this is an aggregate effect, and may differ for individual institutions or groups of students. But as a whole, this fundamental relationship — the existence of a downward-sloping demand curve for higher education found by Leslie and Brinkman and other earlier researchers — has been confirmed.

The specific findings of this review include these key observations:

Tuition Sensitivity	Increases in tuition lead to declines in enrollment. The consensus among the studies reviewed is that every \$100 increase in tuition results in a drop in enrollments of 0.5 to 1.0 percentage points across all types of institutions, a finding consistent with that of Leslie and Brinkman (1987). It should be noted that this range is based on data, including tuition prices, from the 1970s and early 1980s, so that under today's higher tuition levels, the effect may be greater.
Aid Sensitivity	Decreases in financial aid also lead to declines in enrollment, with the effect differing depending upon the type of aid awarded. In general, enrollments are more sensitive to grant awards than to loans or work study.
Differences among income groups	Lower-income students are more sensitive to changes in tuition and aid than are students from middle- and upper-income families.
Differences among races	Black students are more sensitive to changes in tuition and aid than are white students. For Hispanic students, the evidence is more mixed.
Differences between sectors	Students in community colleges are more sensitive to tuition and aid changes than are students in 4-year public colleges and universities.

As noted above, an important issue to be considered when formulating policy is that the majority of these studies analyzed data from the mid-1980s or earlier. All of these data sets were from an era when college tuition, especially at public institutions, was far lower than it is today. If the demand for higher education is curvilinear rather than linear, with higher sensitivity to increases at higher tuition levels, than the student price response coefficients found in the studies reviewed here will be lower than those in effect today. Students today would be more

sensitive to tuition increases or aid cuts than the students who attended college 15 to 25 years ago.

The studies reviewed here also demonstrate the importance of broadening the traditional conception of the "cost of college." Whereas Leslie and Brinkman's review focused on tuition price as the key measure of college costs, many of the studies here extend their analysis by examining how students respond not just to tuition changes or to the net price they pay, but to how that net price is arrived at. Financial aid can have varying effects on college access and choice, and policymakers need to understand how these effects differ for students of different races, incomes, or in different college sectors.

The studies reviewed here demonstrate that college enrollments are more sensitive to increases in grants than in loans. As federal financial aid policy continues its shift from grants to loans, many in the higher education community are increasingly concerned about the impact on college access. In addition, as states move away from their historical commitment to low public tuition levels and toward increasing the responsibility of students for the financing of their postsecondary education, those least able to afford to attend college are likely to be disproportionately impacted by the combined effects of changes in federal and state policy.

The issues addressed in this article deserve further study using enrollment, tuition, and financial aid data from more recent cohorts of college students. Even though many of these studies used samples of students from years later than those reviewed by Leslie and Brinkman, there still is a lack of research on the impact of the most recent rounds of tuition increases and financial aid policy changes since the late 1980s. Such updated studies can help to answer the question of whether recent tuition increases and financial aid cuts have served to restrict access to postsecondary education, especially for those students who have traditionally been underrepresented in colleges and universities. Or more accurately stated, How *greatly* have these changes helped to restrict access? Only by knowing the answers to these questions can policymakers begin to formulate strategies to assure equal opportunity in higher education for all groups.

APPENDIX A

Summary of the Relationship Between Tuition and Enrollment

Authors	Data set	Question Variable	Key Findings
Leslie & Brinkman (1987)	Meta-analysis	$100 tuition increase, 1983	Mean SPRC for first-time freshmen of −0.7 percentage points
Jackson & Weathersby (1975)	Meta-analysis	$100 tuition increase, 1974	SPRC of −0.05 to −1.46 points
McPherson (1978)	Meta-analysis	$100 tuition increase, 1974	SPRC of −0.05 to −1.53 points
Kane (1991)	NLSY	$1,000 tuition increase, 1988	SPRC of −13 to −15 points
Kane (1994)	HSB	$100 tuition increase, 1980	SPRC of −0.63 to −1.22 points
Kane (1995)	IPEDS 1980–1992	$1,000 tuition increase at community colleges, 1991	SPRC of −3.5 points for total public enrollment
	IPEDS 1980–1992	$1,000 tuition increase at 4-year colleges, 1991	SPRC of −1.4 points for total public enrollment
St. John (1990)	HSB	$1,000 tuition increase, 1982	SPRC of −2.8 points
Savoca (1990)	NLS72	$100 tuition increase, 1972	SPRC of −0.49 points
McPherson & Schapiro (1991b)	CPS 1979–1989	$100 tuition increase, 1979	SPRC of −0.68 points for lower income students
Shires (1995)	California enrollments		Price elasticity of demand of −0.15 at CCC, −0.20 at CSU, and −0.05 at UC
Heller (1996)	IPEDS 1978 to 1993	$100 tuition increase, 1993	SPRC of −0.36
Rouse (1994)	NLSY	8% tuition increase, 1982	SPRC of −0.60 to −1.00, depending upon sector

NOTE: See section 2 for more information on each study.

APPENDIX B

Summary of the Relationship Between Financial Aid and Enrollment

Authors	Data set	Question Variable	Key Findings
Leslie & Brinkman (1988)	Review		20% to 40% of lower-income and 13% of middle-income enrollments result of BEOGs
Hansen (1983)	CPS 1971 and 1978		Enrollment rate of poorer students relative to richer no greater in 1978 than in 1971
Kane (1994)	CPS 1970 to 1972 & 1973 to 1977		Enrollment rate of poorer students relative to richer no greater in 1973–1977 than in 1970–1972

APPENDIX B *(Continued)*

Summary of the Relationship Between Financial Aid and Enrollment

Authors	Data set	Question Variable	Key Findings
Manski & Wise (1983)	NLS72		BEOGs increased enrollments of lower-income students by 59%, middle income by 12%, and upper-income by 3%
McPherson & Schapiro 3%(1991b)	CPS 1974 to 1984	$100 aid increase, 1978	SPRC of 0.70 points for lower-income students
Moore, Studenmund, & Slobko (1991)	Occidental College, 1989	$1,000 increase in grants, 1989	SPRC of 7.8 points
Moore, Studenmund, & Slobko (1991)	Occidental College, 1989	$1,000 increase in loans or work study, 1989	No effect
St. John (1990)	HSB	$1,000 increase in grants, 1982	SPRC of 4.3 points
	HSB	$1,000 increase in loans, 1982	SPRC of 3.8 points
	HSB	$1,000 increase in work study, 1982	SPRC of 4.6 points
Jackson (1988)	NLS72		Financial aid recipients were 6.5 percentage points more likely to enroll than non-recipients
Jackson (1988)	HSB		Financial aid recipients were 7.8 percentage points more likely to enroll than non-recipients
St. John & Noell (1989)	NLS72		Probability of enrollment increased for recipients of: Grants — 6.2 points Loans — 10.8 points Work study — 14.9 points Combination — 14.7 points
St. John & Noell (1989)	HSB Seniors		Probability of enrollment increased for recipients of: Grants — 10.1 points Loans — 9.5 points Work study — 11.0 points Combination — 8.2 points
St. John & Noell (1989)	HSB Sophomores		Probability of enrollment increased for recipients of: Grants — 6.2 points Loans — 7.8 points Work study — 9.7 points Combination — 9.5 points

NOTE: See section 3 for more information on each study.

APPENDIX C

Summary of Income, Race, and Sector Effects

Authors	Data set	Question Variable	Key Findings
Leslie & Brinkman (1987)	Review		Tuition sensitivity lessens as income increases

APPENDIX C *(Continued)*

Summary of Income, Race, and Sector Effects

Authors	Data set	Question Variable	Key Findings
McPherson & Schapiro (1989)	CPS 1974 to 1984	$100 tuition increase, 1978	SPRC of –0.68 points for lower-income whites; increase in enrollments for middle- and upper-income students
McPherson & Schapiro (1989)	CPS 1974 to 1984	$100 aid decrease, 1978	No effect on white students of any income level
St. John (1990)	HSB	$100 tuition decrease, 1982	SPRCs by income quartile: Bottom — 0.34 points 2nd — 0.39 points 3rd — 0.31 points Top — 0.14 points
St. John (1990)	HSB	$100 grant increase, 1982	SPRCs by income quartile: Bottom — 0.88 points 2nd — 0.35 points 3rd — 0.33 points Top — Not significant
St. John (1990)	HSB	$100 loan increase, 1982	SPRCs by income quartile: Bottom — Not significant 2nd — 0.53 points 3rd — 0.63 points Top — Not significant
McPherson & Schapiro (1994)	American Freshman Survey		Lower-income students more clustered in community colleges due to tuition increases and aid cuts
Behrman, Kletzer, McPherson, & Schapiro (1992)	NLS72	Tuition increase at in-state 4-year publics	Hispanic and black enrollments in community colleges *increase*, but no effect on enrollments in 4-year colleges. No effect on white enrollments in community colleges, but enrollments in 4-year colleges *increase*
St. John & Noell (1989)	HSB Seniors	Effect of receipt of grant	Probability of enrollment increased for: Whites — 8.9 points Blacks — 17.7 points Hispanics — 14.1 points
St. John & Noell (1989)	HSB Seniors	Effect of receipt of loan	Probability of enrollment increased for: Whites — 8.8 points Blacks — 14.5 points Hispanics — Not significant
St. John & Noell (1989)	HSB Seniors	Effect of receipt of combination, including work study	Probability of enrollment increased for: Whites — 7.1 points Blacks — Not significant Hispanics — Not significant
St. John & Noell (1989)	HSB Sophomores	Effect of receipt of grant	Probability of enrollment increased for: Whites — 4.2 points Blacks — 15.0 points Hispanics — 3.8 points
St. John & Noell (1989)	HSB Sophomores	Effect of receipt of loan	Probability of enrollment increased for: Whites — 7.2 points Blacks — 11.2 points Hispanics — 13.1

APPENDIX C *(Continued)*

Summary of Income, Race, and Sector Effects

Authors	Data set	Question Variable	Key Findings
St. John & Noell (1989)	HSB Sophomores	Effect of receipt of combination, including work study	Probability of enrollment increased for: Whites — 8.1 points Blacks — 18.6 points Hispanics — Not significant
Jackson (1989)	HSB Seniors	Effect of receipt of grant	Probability of enrollment increased for: Whites — 6.3 points Blacks — 11.2 points Hispanics — Not significant
Kane (1991)	CPS 1970 to 1988	Effect of changes in tuition, Pells, and net cost	Blacks more responsive than whites, with gap the largest for tuition sensitivity
Heller (1994)	IPEDS 1984 and 1991	$100 tuition increase, 1991	SPRC range of −0.35 to −0.58 points for whites and −0.46 to −0.63 points for blacks
Leslie & Brinkman (1988)	Meta-analysis	$100 tuition increase, 1983	4-year SPRC of −0.6 to −0.7 points; community college SPRC of −0.9 points
Shires (1995)	California enrollments		Price elasticity of demand of −0.15 at CCC, −0.20 at CSU, and −0.05 at UC
Kane (1995)	IPEDS 1980–1992	$1,000 tuition increase at community colleges, 1991	SPRCs: All publics — −3.5 points Comm. Colleges — −4.7 points 4-year publics — 1.8 points
	IPEDS 1980–1992	$1,000 tuition increase at 4-year colleges, 1991	SPRCs: All publics − −1.4 points Comm. Colleges − Not signif. 4-year publics − −1.2 points
Rouse (1994)	NLSY	8% tuition increase at community colleges, 1982	SPRC of −0.9 at community colleges, 0.2 at comprehensives, −0.7 overall
	NLSY	8% tuition increase at comprehensive colleges, 1982	SPRC of -0.4 at community colleges, −0.6 at comprehensives, −0.2 overall
	NLSY	8% tuition increase in both sectors, 1982	SPRC of −0.7 at community colleges, −0.3 at comprehensives, −1.0 overall

NOTE: See section 4 for more information on each study.

Notes

[1]See Kane (1994) and Hearn, Griswold, and Marine (1996) for some explanations of the reasons for the large public college tuition increases in the 1990s. The consensus opinion is that the increase has been driven by the slowdown in state funding for public higher education.

[2]Many authors have written about the rise in income inequality in the country during the 1980s and the possible explanations. See, for example, Levy (1988), Levy and Murnane (1992), and Bradbury (1996) for econometric analyses, and Cassidy (1995) and Phillips (1990) for more general descriptive analyses.

[3]The authors noted that this effect is probably overstated, because most of the 25 studies examined the enrollment only of first-time freshman students. One would expect upper-division students to be less price responsive, because they already have invested in a portion of their postsecondary education and have fewer semesters of tuition left to pay to gain the benefits of attaining a college diploma or other credential.

[4]Two studies had positive SPRCs. Both restricted their analysis to community college students in only a single state (Wisconsin and New York, respectively).

[5]See Leslie and Brinkman (1987, p. 185) for a discussion of some of the problems with the Jackson and Weathersby analysis and its applicability to their own work.

[6]Because attending college can be a substitute for entering the work force, many researchers have hypothesized that unemployment may be positively associated with college enrollment, i.e., as employment possibilities lessen, individuals may be more likely to enter college. A countervailing force is that fewer employment possibilities mean that students and their families have fewer funds for financing a college education. See, for example, Ahlburg, McPherson, and Schapiro (1994), Blakemore and Low (1983), Corazzini, Dugan, and Grabowski (1972), and Jackson (1988).

[7]See Jackson (1988) and St. John and Noell (1989), both described later.

[8]The Fuller, Manski, and Wise (1982) study was an earlier version of the work that led to Manski and Wise (1983), *College Choice in America.*

[9]Although they are loath to admit it, most institutions must loosen their admissions standards as demand lessens. The high percentage of fixed costs in colleges (for such things as physical plant and tenured faculty) requires institutions to maintain enrollment levels even if the quality of students applying for admission declines. See Dembner (1995) for the story of one institution that found itself in this situation.

[10]Whereas an SPRC provides an estimate of the percentage change in enrollment for a tuition increase of a fixed dollar amount, elasticities estimate the percentage change in enrollment for a given *percentage* change in tuition.

[11]Because Rouse uses lower average tuition prices than Leslie and Brinkman (1987), she converted the standard $100 increase to a percentage increase, which averaged 8%. Thus, her enrollment changes are expressed as a response to an 8% tuition increase.

[12]This example is complicated somewhat by the fact that there is less evidence confirming that tuition changes are symmetrical, i.e., that a $100 cut in tuition would increase enrollments the same amount that a $100 rise in tuition would decrease them.

[13]For an excellent review of the literature on this topic, see O'Brien (1992).

[14]Earlier programs, such as the Perkins Loan program (created as part of the National Defense Education Act in 1958) and Educational Opportunity Grants (part of the Higher Education Act of 1965), also provided need-based aid. However, the size and scope of these and similar programs were negligible compared to the size of the college-going population until the 1972 reauthorization. Because the BEOGs were not fully funded by Congress until 1974, this year is often used as the beginning of the program. See chapter 4 of Mumper (1996) for a history of the creation of federal financial aid programs.

[15]The coefficient of financial aid alone was not statistically significant for all types of institutions, but it was statistically significant when private institutions were examined alone (coefficient of 0.38).

[16]St. John's findings on tuition effects were described in section 2.

[17]For simplicity of this example the demand curves are assumed to be linear.

[18]Again, it is important to note that these relationships are discussed *ceteris paribus.*

[19]This study looked at white students only, due to small sample sizes of minority students in the CPS. Students were divided into three income groups: low, medium, and high.

[20]See, for example, Behrman, Kletzer, McPherson, and Schapiro (1992); Schwartz (1986); and Jackson (1990). Becker (1993) has an excellent explanation of the theoretical link between ability and college entry.

[21]The studies reviewed in this section analyzed the experiences of white, black, and sometimes Hispanic students. Very few student demand studies have examined other racial groups, largely because of small sample sizes in the major cross-sectional data sets.

[22]This study also examined students in NLS72, but because of small sample sizes of minorities in this survey, they reported results by race only for the two HSB cohorts.

[23]See McPherson and Schapiro (1994) and Frances and Morning (1993) for data on the income distribution of students by sector.

[24]See National Center for Education Statistics (various years).

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