Larry L. Leslie
Paul T. Brinkman

Student Price Response in Higher Education

The Student Demand Studies

What happens to enrollments when colleges and universities raise their prices? Who, if anyone, is sent away? What is the net impact of higher prices and reduced enrollments upon institutional financial ledgers? These questions have been investigated in what have come to be called the "student demand studies," the phrase originating in economics as an outgrowth of demand theory.

Demand theory holds that the quantity of a particular good or service demanded is a function of price, the money income of the buyer, the prices of other goods and services, and the buyers' tastes or preferences. The theory as applied to higher education has been used to suggest that (1) enrollment rates will be negatively associated with prices charged students, especially tuition prices; (2) enrollment rates will be positively associated with amounts spent on student aid, since student aid can be viewed as reducing net prices or increasing student money income; and (3) enrollments in higher education institutions or groups of institutions will be associated positively with the tuition prices charged by competitors — for example, public college enrollments with private college tuitions and vice versa — as students exercise their preferences.

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Larry L. Leslie is professor and director of the Center for the Study of Higher Education at the University of Arizona and Paul T. Brinkman is senior program associate at the National Center for Higher Education Management Systems in Boulder, Colorado.

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Why Study Student Demand?

Student demand studies, investigations into the economic factors that affect student enrollment, are probably second in number among higher education finance research only to studies of the rate of return to education. The reasons for the many student demand studies are basically two, although an important corollary exists also. First, expanding and equalizing student acess long has been a major public policy goal, and manipulation of price has been seen as the major policy instrument for achieving this goal. The goal of student choice of institutions has been emphasized since the 1970s, and both goals have become preeminent, national higher education policy priorities. The major related policy instrument employed by the federal government has been direct subsidies to students, whereas the states typically have addressed student access and choice largely through tuition policy. Recently, the states, too, have begun to emphasize student aid, with total state student aid now exceeding $1 billion. Second, there is a very practical reason for the large number of student demand studies: such issues conform nicely with the applied research capabilities that have been developed in econometrics. The corollary is that with declining enrollments, real or expected, institutions too have a keen interest in the effects of price upon enrollments.

The Review Strategy

The following literature synthesis is not a standard review. A special point is made of this because establishing a particular reader mindset is important. First, what the article is not.

The intent of this article is not to review the existing student demand research on a case-by-case basis and then seek to render some conclusion about what this research has shown. The desire is to avoid a common failing of review articles: the judging of a certain number of studies to have shown one result, a certain number to have shown the opposite, and the author concluding that no clear answer is possible.

Instead, the overall approach taken in this review follows the guidelines for integrative reviews proposed by G. B. Jackson [29] and invokes the procedures for study identification and organization outlined by Glass, McGaw, and Smith [19] in describing preparation for meta-analysis. Simply put, our desire was to examine the literature thoroughly and systematically and to standardize the various findings in order to reach definitive conclusions where possible.

The distinction is an important one. The reader will find here some, but not many, of the familiar characteristics of review articles. Instead of thorough discussions of individual studies, the focus is on generating comparable estimates of main effects, as is characteristic of meta-analysis. Traits of the separate studies are contained in the matrix (table) and are not discussed at length in the text, again in keeping with meta-analytical procedures.

Also, little specific attention is given to assessing the quality of the studies reported, other than to eliminate obviously flawed works from the review. This is an issue of some controversy in the meta-analysis literature. As Glass and associates [19, pp. 69–92] argue, reviewer opinions are to be minimized in selecting studies. The purpose of meta-analysis is not to move the reader progressively toward better and better studies but is to consider the result of each study as a single observation to be weighed in much the same way as are the scores of separate experimental subjects in experimental studies. Some experimental subjects will be well motivated, some will not; some will pay close attention to the treatment, some will not; and so on. As Glass, McGaw, and Smith [19, p. 80] suggest, if study quality is a serious concern, such studies should be segregated and treated separately. In reviewing the empirical research, we have found only very isolated cases of obviously flawed work. Almost all of the studies located and reviewed appear in economics journals or in dissertations or reports of economic units. It is quite rare for such studies to be seriously flawed. What is more critical than general quality to the analyst is the defining traits of each study. The content of the matrix almost always explains why results vary. The text can be used to highlight such study differences for the reader and to comment upon the occasional study limitations. In the case of quality, a matrix column specifies the degree of control exercised by the researcher. Generally, the well-controlled studies employ econometric models.

We also have discovered that the central meta-analytical task in higher education finance research is standardization of study results. Contrary to more or less standard reporting formats in much of the psychology-based educational research, higher education finance results are reported in various forms and with varying degrees of completeness. Whereas published experimentally based educational research commonly reports mean scores, *n*s, and variance terms, higher education finance literature may employ different forms of dependent variable measures — such as elasticities, student price response coefficients, internal rates of return, and net present values — and often omit

completely any variance terms and even sample sizes. As Hunter, Schmidt, and Jackson [25, pp. 140–141, 157–58] point out, a complete meta-analysis cannot be performed if these parameters are lacking. What can be done is the standardization of study results to a common base, so that along with the information available in a meta-analysis matrix, a good sense of the effects of some policy change can be ascertained. Gaining such a sense as it pertains to the student demand studies is the explicit purpose of this article.

Standardizing the Student Demand Studies

The difficulties in rendering study results comparable in higher education finance are considerable; indeed, the problems of classical meta-analysis studies seem trivial by comparison. In studies of higher education finance the large task is in standardizing study results.

The necessary standardization process for the student demand studies is complex arithmetically if not conceptually. The process involves (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. The standardization techniques employed for this study were based upon those developed in a landmark study by Jackson and Weathersby [28], who calculated a student price response coefficient (*SPRC*) for a hypothetical first-time student from a family earning $12,000 in 1974 and facing a college cost of $2,000 per year.

Each of the three adjustments numbered above bears elaboration. Consistent with Jackson and Weathersby, the *SPRC* employed for this article was the change in participation rates among 18–24-year-olds as a result of a $100 higher education price increase. For most studies, at least some conversion is necessary. Often, researchers report (statistically controlled) percentage enrollment variations as prices change for a single institution over time. For comparability to other studies, such institutional enrollment changes must be converted to enrollment *rate* changes. When enrollment changes are reported as a *SPRC*/$100, the institutional enrollment percentage can be corrected by multiplying by 0.33, the enrollment rate for eligible 18–24-year-olds in the common base year of the study (1982). However, many studies report student response to price change in another form, the price elasticity of demand, ϵ. This elasticity is defined in the following: $\epsilon = E/P$, where E is the percentage change in enrollment and P is the percentage change in price. Since the $SPRC = E/\$100$ price change, the $SPRC = \epsilon$ after the

$100 is converted to a percentage figure, provided that both values are expressed in or are converted to enrollment rates. (For example, suppose $\epsilon = 0.5$ for a $500 price change on a base price of $5,000. Then, by substitution, $E = \epsilon \times \$500/5000 = 0.5 \times 0.1 = 0.05$ and the $SPRC = 0.05 \times \$100/500 = 0.01$; that is, $SPRC = 1\%$.)

Conversions of elasticities to *SPRCs* may be straightforward; however, there are important exceptions as shown by Chisholm and Cohen [12, pp. 18–19], who identify errors made by Jackson and Weathersby [28]. Chisholm and Cohen show that the mathematical properties of elasticities are such as to render comparisons across studies hazardous, particularly time-series studies. Employing the arithmetic procedures above, Jackson and Weathersby utilized tuition elasticities to estimate enrollment effects at a $2,000 total cost basis. Their use of elasticities would not produce errors in the case of time-series studies if the rate of tuition change were the same as the rate of total cost change, but such has not been the case, and the problem is especially serious in converting data from old time-series studies. Using Campbell and Siegel's [8] landmark study as an illustration, we observe that the tuition increase was 148 percent of total direct cost increase between 1927 and 1963. Since Campbell and Siegel indexed their data (1927 values = 100), their tuition elasticity of −0.44 equates to a total cost elasticity of −0.65. The result, ceteris paribus, is almost a 50 percent understatement of the Campbell and Siegel *SPRC* by Jackson-Weathersby—from this error alone. When only elasticities are provided, errors can only be avoided by returning to the original cost information and calculating *SPRCs* from those data. The standardization procedure used for this article was to convert tuition elasticities to total cost elasticities (actually, tuition plus room and board elasticities) where necessary.

Standardizing price levels is the second necessary task. For this article all values were converted to academic year 1982–83 constant dollars. Directly related to this, Jackson and Weathersby made an additional error that materially affected their results. After using the average 1974 total cost value of $2,000 to convert elasticities to *SPRCs*, they then deflated again by the 1974 Consumer Price Index (CPI) value.

Further, it is believed that a superior deflation mechanism exists. In this study, student costs are deflated by a national student cost index created from actual tuition and room and board costs over time. The argument is that in making the enrollment decision students respond to changes in the actual prices they face—tuition, room and board, and so forth—not to the market basket prices of the CPI. An investment

framework would argue more for the CPI deflator because under this framework students are presumed to weigh costs and benefits of alternative investments.

The third and final major correction that may be required is in converting all participation rates to the 18–24-year-old base. Many studies report results in terms of later college participation rates among high-school sophomores or juniors (Project Talent based studies) and high-school seniors (SCOPE based studies, among others). These rates are as much as twice as high as the 18–24-year-old participation rate, and adjustments to achieve comparability to the 18–24-age cohort are mandatory. Again, Jackson and Weathersby, whose work is considered seminal in this area, neglected to make this adjustment. At one point in their analysis, Jackson and Weathersby [28, p. 643] speak of the "eligible" population, but the participation rate employed differs from the rate for 18–24-year-old high-school graduates, the group typically considered as "eligible" in the literature, or from the rate for 18–24-year-old high-school graduates who have not completed four years of college. It is worth noting before leaving this discussion that Jackson and Weathersby's errors often cancel out.

Although these are the major comparability issues, there is no doubt that some problems remain. One of the potentially more troublesome of these to the reader concerns comparability of *SPRC*s between micro and macro studies where own-price and cross-price (prices charged by competitors) elasticities may be confused or interpretations may be contentious. Specifically, the issue arises in studies of single institutions versus studies of the entire higher education environment; enrollment effects upon individual institutions may be confused with effects upon the entire system. From a macro perspective, our primary interest is in the discouragement effect of tuition increases; that is, how many students do not participate in higher education because of price increases? From the micro (institutional) perspective, interest primarily is not in discouragement from *overall* participation but only from enrollment in the institution itself: some of the students who leave an institution when tuition is raised will attend elsewhere. In deriving their estimates from tuition and enrollment data for a number of institutions, cross-sectional study results reflect explicitly the impact of whatever prices are charged in the sample. Time-series studies, on the other hand, include such forces in a somewhat different way: they implicitly factor in price changes of others as they occur over time, without specifying what those price changes are. Since the time-series and cross-

sectional results reported in the matrix do not seem to vary much, this difference apparently is not important.

Other Review Studies

Before examining the meta-analytical matrix and the twenty-five studies tabled there, a brief discussion of seven previous reviews is in order. The major reason is that two of these reviews also attempted to produce comparable *SPRC*s, and two others addressed the problems of conducting such standardizations. The remaining three reviews were standard, commentary-type analyses.

The first review and the first to calculate standardized values was Jackson and Weathersby's 1975 article [28]. Although they examined only seven studies and committed the important errors discussed above, their work largely has been well-received and has served as a base for subsequent work. Our own analysis begins with the Jackson-Weathersby base. Suffice it to say here that Jackson and Weathersby concluded that a $100 price increase was associated with roughly a 1 percentage point decline in the participation rate among the 18–24-year-old population. As noted, their work, though cited broadly for over a decade, is substantially in error.

In 1978, without recognizing the errors discussed above, Michael McPherson [36] extended the Jackson-Weathersby method to three more studies and obtained consistent results. (McPherson did identify some minor calculation mistakes made by Jackson and Weathersby.) McPherson's work was centered upon tuition policies and their impacts upon private institutions; hence, McPherson calculated cross-price elasticities and contemplated the effects of public tuitions on enrollments at independent institutions.

Weinschrott's [44] major purpose in conducting his review was to analyze rigorously a small number of student demand studies by testing and utilizing five evaluative criteria. Weinschrott used these criteria and more specific points to attack the Jackson and Weathersby work, labeling it "meaningless" (p. 1). Weinschrott pointed out that the studies Jackson and Weathersby compared were both time-series and cross-sectional; were of both aggregated groups, individuals, and institutions; used a variety of functional forms; and defined the variables in widely disparate ways (p. 1). Our own assessment of the Weinschrott statements is that they are essentially correct but are largely beside the point; results from these disparate studies are valid and reliable.

Chisholm and Cohen [12] also focused primarily on methodological issues related to comparing the student demand studies, especially the inappropriateness of converting elasticities in the manner of Jackson and Weathersby. Their review dealt, in considerable part, with the mathematics of student demand calculations and is organized by type of analytical model employed. Their reviews of previous studies, though sometimes penetrating, were very brief. Of particular interest to institutions, Chisholm and Cohen remind us that price elasticities of enrollment beyond 1.0 yield reduced institutional revenues when those prices are raised.

Cohn and Morgan [14] and especially Hyde [26] provided broad, commentary-type reviews of many of the better-known student demand studies. These reviews contain the more traditional, paragraph-length summaries of important studies; Hyde addresses some of the secondary issues such as student price response by family income and to forms of student aid. The California Postsecondary Education Commission [7] has offered a more recent but less detailed summary that adds little to what already is known.

The Student Demand Studies

Approximately thirty empirical works have considered this important question of price and relationship to enrollment. The twenty-five empirical studies that could be standardized are present in Table 1. They were selected largely because they contained quantitative estimates that could be transformed into a common value, the student price-response coefficient (*SPRC*) — specifically, the percentage change in enrollment per $100 change in price — discussed above. The studies summarized cover or include public and private colleges; two-year and four-year institutions; national, state, individual, district, and institutional samples; experiments, hypothetical situations, and secondary analyses; old data and new (from 1927 to the 1980s); well controlled and (a few) poorly controlled designs; published results from dissertations, journals, and reports; cross-sectional and time-series designs; regression, logit, Bayesian, descriptive, discriminate, and correlational statistics; and more.

The results of all studies in Table 1 are in the expected direction: enrollment declines when prices are raised (negative coefficients) and increases when prices are lowered (positive coefficients in Table). When prices are adjusted to 1982–83, the mean price response is about 0.7 percentage points. That is, for every $100 increase in tuition price — given 1982–83 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. (This is not greatly different from the Jackson-Weathersby results because their errors largely cancelled out.) 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. Again, this is a rough estimate from very disparate studies. The 2.1 percent figure may be misleading because most studies show impacts upon freshmen only. Upperclassmen will be less responsive.

However, the degree of consistency among many of the estimates is reassuring. The modal result is 0.6 percentage points per $100 and a 1.8 percent enrollment decline, and these results tend strongly to be from studies that should give the most valid results for the nation overall. Further, many other studies show results in the very close range of 0.5 to 0.8 percentage points. Results markedly above or below the modal responses tend to balance each other out, except there are more results above the mode than below, yielding the slightly higher mean result. As a best estimate for public policy purposes, a $100 tuition price increase appears to be associated with a 0.6 percentage point decline in the 18–24-year-old participation rate and an enrollment decline of 1.8 percent, ceteris paribus. Of course, one would anticipate some differences, depending on the particulars. For example, the effect presumably would be less where costs are higher, such as in the case of private colleges, as we shall see later.

A descriptive word or two on the studies in the table is necessary for the reader's understanding and interpretation of the results; however, as emphasized earlier, meta-analysis focuses on synthesis and downplays individual cases, except as study characteristics are important to evaluation of synthesized results.

The studies are discussed in the order of the table. The studies are alphabetized, rather than being grouped, because bases for grouping are almost as numerous as the characteristics in the table and because the categories often overlap. The reader is encouraged to group studies in the table by going through the table and checking off studies pertinent to her or his interests, e.g., studies at private institutions and studies that take student aid into account.

The first two studies tabled (AASCU) [1] report on the single tuition experiment known. Tuition was reduced experimentally at two, two-year centers of the University of Wisconsin and then was raised again to its previous level a few years later. There occasionally has been a

TABLE 1

Student Demand Meta-Analysis Matrix

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I.D. No.	Author(s), Year	Year of Data	Population	Publication Source[a]	TS or CS[b]	Price Specification[c]	Degree of Control[d]
01	AASCU, 1977	1973	WI	R	CS	Tuition	Low
02	AASCU, 1977	1976	WI	R	CS	Tuition	Low
03	Barnes, 1975	1970	NC	S	CS	Tuition	High
04	Berne, 1980	1975	NY	J	CS	Student aid	High
05	Bishop, 1977	1960	Project Talent, U.S.	J	CS	Tuition, room and board, travel	High
06	Campbell and Siegel, 1967	1927–63	U.S.	J	TS	Tuition	Low
07	Clotfelter, 1976	1970	U.S.	J	CS	Tuition	High
08	Corrazzini et al., 1972	1963	Project Talent, U.S.	J	CS	Tuition	High
09	Funk, 1972	1959–70	Creighton, U.	J	TS	Tuition	Low
10	Ghali, et al., 1977	1970	Hawaii	J	CS	Tuition, total cost	High
11	Hight, 1975	1927–72	U.S.	J	TS	Tuition	Middle
12	Hoenack, 1968	1967	U.CA	R	CS	Commute cost	High
13	Hoenack and Feldman, 1969	1963	Project Talent, U.S.	R	CS	Tuition	High
14	Hoenack and Weiler, 1975	1958–72	MN	J	CS, TS	Commute cost	High
15	Hopkins, 1974	1963–64	49 states	J	CS	Net tuition	High
16	Jackson, 1978	1972	U.S.	J	CS	Student aid	High
17	Knudsen and Servelle, 1978	1970	U.S.	J	CS	Tuition, net tuition	Middle
18	Kohn, et al., 1976	1966	IL, NC	J	CS	Tuition, room and board, commute cost	High
19	Lehr and Newton, 1978	1960–74	OR	J	TS	Tuition	Middle
20	Orvis, 1975	1970	MN	D	CS	Commute cost	High
21	Radner and Miller, 1970	1966	IL, CA	J	CS	Cost income ratio	High
22	Sulock, 1982	1969	U.S.	J	CS	Tuition	Middle
23	Tannen, 1978	1959, 1969	Census	J	CS	Foregone income net tuition, room and board	High
24	Tauchar, 1969	1966	CA	J	CS	Cost	NA
25	Wilson, 1977	1972	MN	D	CS	Commute cost	High

[a]Publication Source: D = dissertation, J = journal, R = report, S = secondary source

[b]TS = time series, CS = cross section

[c]Denotes the form of the price variable.

[d]Degree of control is a subjective matter referring to number and importance of variables controlled. For example, at one end of the continuum, the AASCU studies are descriptive studies that do not control statistically for any variables although qualifying statements are made regarding the student population and which students were affected. In contrast, most econometric analyses control for a more or less consistent set of important variables, such as family income, student ability, high school curriculum, sex, residence, number of siblings, and religion. Such studies are deemed to have a high degree of control.

TABLE 1 (Continued)
Student Demand Meta-Analysis Matrix

(9) Statistics	(10) Indiv. Students (versus Aggregate Data)	(11) Financial Aid Considered	(12) Institutional Type	(13) Special Notes	(14) *SPRC* (a) 18–24-year-old Enrollment Rate Change/$100	(14) *SPRC* (b) Institutional Enrollment % Change/$100
Descriptive	No	No	2-year	Experiment	+ 1.3	+ 4.1
Descriptive	No	No	2-year	Experiment	− 1.0	− 3.0
Linear probability	Yes	Yes	All		− 0.6	− 1.8
Regression	Yes	Yes	2-year	Applicants only	+ 0.5	+ 1.5
Logit	Yes	Yes	All	11th graders Minimum cost college	− 0.4	− 1.2
Regression	Yes	No	4-year		− 0.6	− 1.7
Regression	Yes	No	Public		− 0.5	− 1.5
Regression	Yes	No	All	10th graders	− 0.5	− 1.5
Regression	No	No	4-year priv.	Average *SPRC*, over time	− 0.2	− 0.5
Logit	Yes	Yes	Public	Hawaii	− 0.6	− 1.8
Regression	No	Yes	Public, priv.	Identification problem	− 1.1	− 3.3
Regression	No	Yes	4-year publ.	12th graders, total cost	− 0.6	− 1.8
Regression	Yes	No	All	10th graders, "indifferent"	− 1.0	− 3.0
Regression	No	No	4-year publ.	Own price response only	− 1.3	− 4.1
Regression	No	Yes	Public, priv.	Rate = % of enrollment to h.s. grads in 4 years	− 0.6	− 1.8
Discriminate, Regression	Yes	Yes	All	Aid is dependent variable	− 0.2	− 0.6
Regression	Yes	No	Private	Mid-Selective privates, Average weighted values	− 0.6	− 1.9
Logit	Yes	No	All	Estimates calculated, Average, 12th graders	− 0.6	− 1.8
Discriminate, Regression	No	Yes	All	Oregon	− 0.7	− 2.2
Regression	No	No	Public	11th graders	− 1.1	− 3.3
Logit, Regression	Yes	No	All	Average	− 0.3	− 0.9
Regression	No	Yes	Comm. Coll.	Community Colleges	− 2.4	− 7.4
Regression	No	Yes	All	14–24 age rates, Males only	− 0.8	− 2.5
Descriptive	Yes	No	Roman Cath.	Catholic High Schools	− 0.3	− 0.8
Regression, Logit	No	No	All	Distance is dependent variable	− 0.8	− 2.5

strong inclination to attach extra meaning to the results of the Wisconsin studies because experiments generally show causal effects; however, the results here really are not much different from other studies, if at all. Students in two-year schools (the Wisconsin sample) have, in several studies, tended to be more responsive to price than are students overall. The reasons are two: (1) two-year schools attract more lower-income and older students, both of whom are known to be particularly responsive to price, and (2) the tendency is strong for two-year students to attend four-year public institutions when two-year prices are raised and vice versa. Although the Wisconsin report states that very little of this substitution occurred, the first of the two reasons alone easily could explain the relatively large price response. Finally, it is worth noting that the effects of tuition declines were greater than the counter-effects of tuition increases. This is a result that has been suggested by other studies; none have shown the opposite.

The Berne study [4] considered applicants to two New York community colleges. For reasons similar to those for the Wisconsin study, one might have expected higher *SPRC*s here; but the effects of adjustments made to render the applicant data comparable to the data for the overall age group (18–24) and the fact that $100 in aid, rather than tuition, was the independent variable, apparently balanced out. Another generalization is confirmed by this study: in all cases reviewed, save one, the award of aid had a lesser effect than a tuition change of the same value. However, after the matrix work was completed, Manski and Wise's [35] excellent book on college choice became available. Manski and Wise show similar impacts for aid and tuition when schooling cost is specified in dollars per month divided by family income. More will be said later about this book.

The Bishop results [5], which relative to other studies are slightly low, are based on a model that reflected only the (educational) alternative of selecting the lowest-cost nearby college. Next, the Campbell and Siegel study [8], which utilized 1927–63 time-series data and generally is considered to be the first on this topic, yielded modal results.

Based upon a reanalysis of the Campbell and Siegel data, Hight [20] obtained relatively high price-response estimates, probably reflecting the substitution problem already discussed. (McPherson [36, p. 182] shows Hight's cross-elasticity of demand between public and private institutions to be unusually high.) Hight's work also appears to demonstrate the econometrician's most common identification problem, the inability to separate the respective influences of supply and demand.

Other results that require special comment include those of Funk [17], who examined tuition price response in a single private university. As in Funk's results, private schools invariably seem to show less student price response per $100 than do public ones. This undoubtedly is due, in part, to the average higher family incomes of students attending private institutions and to higher base costs. Low income students typically demonstrate the highest price response, followed by middle income and then high income youth. Also, a $100 price increase is proportionately smaller in private institutions than in lower-cost public institutions. Hence, one would expect a smaller enrollment effect in the former.

Next are studies that have special or unique characteristics. A special case is that of Ghali and associates [18], whose case study was of the University of Hawaii, an institution with few nearby competitors. Yet, the *SPRC* is a modal 0.6 per $100. The studies by Hoenack [21] and Hoenack and Weiler [23] use commuting distance elasticities (percentage variation in commuting costs in relation to percentage change in enrollments) to generate tuition *SPRC*s. The results reported in Table 1 are for the University of California and the University of Minnesota, respectively, and do not consider substitution. Therefore, these results, which are accurate from the perspectives of the institutions' own enrollments, are upwardly biased in terms of effects on overall participation rates. Finally, in their study Hoenack and Feldman [22] conceptualize the problem in a unique way, by postulating individuals who are "indifferent" to attendance and then observing effects of price changes.

Jackson's study [27] considers the effects of student aid. His conclusion that the mere awarding of aid is far more significant than the amount of aid is of major importance to policy. His apparent confirmation of the relative insensitivity of students to aid in comparison to tuition is tempered by his recognition that methodological differences may explain this result. Manski and Wise's [35] work does not support Jackson's findings.

The modal results of Knudsen and Servelle [30] are higher than expected at first glance for private colleges (see, for example, Funk [17]), however, their use of *net* tuition increases (tuition increases net of student aid) should yield, as it does, higher *SPRC*s for private institutions: for example, a net increase of $100 may equal a list price increase of $200. (Note that some other studies have used net tuitions too.)

Lehr and Newton's study [32] is for Oregon only; Orvis' and Wilson's [37, 45] results are from distance elasticities in Minnesota, and the results tabled are converted own-price tuition elasticities only.

Radner and Miller's [38] results are small, undoubtedly because the price variations in their sample were inadequate — a potentially biasing influence frequently mentioned in the literature. Sulock's [39] high results are for community colleges; he also shows the expected high cross-price elasticity (substitution) with four-year public schools. Tauchar's study [41] is of Roman Catholic high-school students queried about their likely attendance behaviors as prices of Roman Catholic colleges hypothetically are raised.

Discussion

There are many constraints in comparing and interpreting the results of these studies. Ideally, we desire *SPRC*s in the ceteris paribus case. Most but not all results tabled here reflect instead price response in the natural environment, which reflect, among other things, the prices charged by competitors. As already noted, this implicitly is true in the case of time-series studies where tuition prices are juxtaposed with competitors' enrollment and price changes in the natural market setting. The results of cross-sectional studies explicitly reflect price effects in whatever institutions are included in the sample; implicitly, the values for each included institution reflect the structure of prices in excluded institutions in the market area, as well.

Thus, the compatibility of results is not always easily assessed with certainty. Simple corrections usually will not suffice. It is not possible, for example, simply to net out *SPRC*s for omitted variables, because the allocation of covariances to included (and excluded) variables is not really possible. Instead, what one must do is return to the particular environmental setting of each study, examine the controls, and apply judgment to interpretation of the results. In short, there is no substitute for well-designed studies, and a good deal more than that cannot be said.

It is therefore reassuring to observe that the reliability of study findings is high. Further, examination of studies yielding somewhat disparate results reveal quite consistent findings when the variations in variable specifications and institutional types are taken into account, qualitatively. Modal results appear to be good estimates for higher education institutions in the aggregate. From an institutional perspective, the enrollment effect of tuition price changes vary considerably, depending upon the institution's own price level, the characteristics of its students, its student-aid structure, its applicant pool, and, among other factors, its competitors. The second *SPRC* figure tabled (column

14b) for each study should prove quite accurate in predicting enrollment from a national aggregate level, but each institution will wish to assess its own student price environment.

The policy issues involved and institutional concerns often require greater elaboration than is offered in Table 1. There are, for example, four fairly discrete and simple findings and related issues that require only brief mention. One, where broad studies have considered more than economic effects on enrollment rates, sociological variables invariably have turned out to be most potent; economic variables generally rank about third. In other words, college attendance is associated more with such student traits as social class and parents' education than with college price. Two, student demand studies almost always concentrate on freshman enrollments. Therefore, the immediate overall effect of a tuition increase at a given institution will be less than estimated above because upperclassmen are not likely to be as sensitive to tuition change, in part because the former will be required to pay the increase for fewer years. Three, and again from an institutional perspective, tuition effects on enrollments generally are most usefully viewed from an institutional revenue basis. Tuition elasticities (which can be calculated directly from *SPRC*s) of less than one suggest increased revenues when tuitions are increased; elasticities greater than one yield revenue reductions. For revenue purposes, institutions should estimate their own price elasticity values and monitor them closely. Four, reducing tuitions will have a greater positive enrollment effect than increasing tuitions will have a negative effect.

Another issue has to do with the specification of price forms. (To achieve comparability in Table 1, either the reported price changes have been converted to tuition changes or the tuition effect is of approximately equal value to the price effect tabled.) One should not assume that all price changes impact enrollments equally. It is often suggested that of all prices, tuitions consistently show the greatest enrollment effect. Bishop [5], for example, found the price effect of tuition increases to be roughly five times greater than the effect of opportunity cost changes and room and board and travel costs to be about 60 percent greater. Bishop did acknowledge, though, that the true differences probably are much less. The tuition coefficients of Kohn, Manski, and Mundel [31] are at least five times greater than their commuting cost coefficients and are about twice as great as their room and board coefficients. Chapman's [11] results for tuition versus commuting costs for Carnegie Mellon University are consistent with this, as are those of Wilson [45] and Orvis [37].

However, Manski's later and highly regarded work with Wise [35] shows roughly equal student sensitivity among tuition, student aid, dormitory costs, and foregone earnings, even though their model was basically the same as the one developed by Kohn, Manski, and Mundel [31, pp. 105–11]. The inconsistency in findings may be explained, in part, by the differing samples of the two studies or in the differing specification of the cost variable: Manski and Wise used schooling costs as measured in dollars per month divided by the annual family income, whereas Kohn et al. simply disaggregated results into three income categories. It is plausible that student response to various price forms may vary by family income (as in fact is the case for the Kohn et al. results) but on average balance out to yield the results shown by Manski and Wise.

Manski and Wise [35] did not find a similar coefficient for commuting cost, but they acknowledge that their specification of this cost was incomplete. Hoenack's [21] work has been based on the assumption that effects of various costs are similar, and he holds, for example, that when the value of one's time is included, commuting costs effects are comparable to those of tuition.

Several explanations have been offered as to why tuition response might be relatively large. Tuition is the most visible college price, and it is the one that is most inescapable. College tuitions are conspicuous, and students are unusually conscious of them. Annual increases generally are well publicized and often are debated publicly. Although not everyone pays the full tuition, there are fewer exceptions made than, for example, is the case for institutional room and board, which often is paid by only a small minority of enrolled students. The more important policy question, however, concerns the relative student sensitivity to tuition on the one hand versus price minus student aid on the other. In the final analysis student aid may be viewed as a reduction in net price that is conceptually the same as a tuition reduction. Yet, students do not appear, from most (but not all) studies, to act as though this were true. One explanation is that at the time students exhibit price-taking behavior, i.e., make the attendance decision, they often do not know how much if any aid will be received. Further, the amount of aid offered by institutions may well vary proportionately less than tuitions vary. The students' calculus is rather complex. Consider only the simple illustration of a student facing a public tuition of $1,200 and an aid offer of $500 versus a private tuition of $6,000 and an aid offer of $2,500. Similar scenarios may be drawn for two-year versus four-year alternatives and for other student costs. Clearly, it is much simpler for

the student merely to contrast tuitions than to speculate about the numerous contingencies that student aid may engender.

The policy direction since the early 1970s has been to favor need-based student aid over low tuition as a vehicle for expanding opportunities. Results of early empirical work seemed clearly to show that students are more sensitive to tuition than to equivalent per student, aid changes [10, 16, 34, 27]. Later results tend to show less difference. Tierney's [42] results for those who apply to both public and private institutions are basically the same. Then there are the results of Manski and Wise [35] already discussed. Perhaps the scene is changing as students become more aware of aid opportunities. Hyde [26, pp. 35–42] discusses this issue from several perspectives in his review article.

Low tuitions are, of course, subsidies provided to everyone, whereas need-based student aid is more restrictive; therefore, per dollar of subsidy, aid programs, if carefully administered, should be more effective than low tuition policies if the goal is to improve access. The issue boils down to our ability to target the aid on those who would not attend without the aid versus the *perhaps* more student-responsive instrument, low tuition. If our success in the former were 0.33, tuition sensitivity would have to be thre times greater than aid sensitivity to be more effective. G. A. Jackson [27] put the cost of a well-targeted (on those in need) aid program at $3,048 for each new low-income student enrolled, compared to $9,223 for a $500 per student, universal aid program. Due to inflation and additional depletion of the potential college eligible/aspirant pool over time, (continued need-based aid should eventually deplete college aspirant pools of older, needy students), the cost would be significantly higher today.

Finally, most research indicates some superiority of grants over other forms of student aid in encouraging enrollments [2, 9, p. 62, 10, pp. 14 and 25], although again, for Tierney's [42] special population, little difference is observed.

Several efforts have been aimed at comparing the price responsiveness of special categories of students, especially categories by income class. The reason for this interest in response by income is rooted in the need-based student-aid programs of the 1970s and 1980s. Results among such studies are generally consistent. Most recent confirmation is in the work of Manski and Wise [35]. Bishop's [5] estimates show atypically high price sensitivity only for the lowest income quartile; the Kohn et al. [31] results for Illinois are generally similar except that the middle-income group also shows considerable price sensitivity. The Kohn et al. results for North Carolina, however, yield a low-income

coefficient that is positive. Interestingly, the authors largely ignore this result. Radner and Miller [38] also find student responsiveness inversely related to family income, as does Hoenack [21]. When stratifying their data by institutional type, Corazzini et al. [15], however, show a mixed pattern, with the greatest responsiveness demonstrated by the higher two income quartiles in private institutions and the greatest responsiveness among the second lowest income quartiles in both two- and four-year public institutions. In his study of students who apply to both public and private colleges, Tierney [42] actually shows slightly lower tuition responsiveness for the lowest income group. In a later study [43] using the same data set, he finds greater responsiveness in the lowest income group except for the case of low-cost institutions, where elasticities by income group are essentially equal. One would anticipate a reduction in price response differences among the various income groups as more and more need-based student aid has become available to offset price increases. That is, aid should enhance the ability of aid recipients to meet price increases, and aid, in being need-based, should particularly enhance this ability among low income students. No verification of this expectation as yet exists, but these mixed results may reflect such changes. The fact remains, however, from data as late as 1979–80, that BEOGs (Pell Grants) were estimated to be responsible for much larger shares of low-income than middle- or high-income enrollments [35, p. 119].

One study [6] examines price response among adult students (older than 25). Although *SPRC*s are low due to very small participation rates for the adult group, enrollment response actually is very high. A $100 tuition decrease is estimated to raise enrollments by roughly 25 percent, and the cost of enrolling one additional adult student is estimated to be only one-third as high as it is for traditional-age students.

Patterns by institutional type appear to agree with theory. Student price sensitivity should be greatest in the lowest cost and least selective institutions enrolling the least wealthy students. This is so because (1) a $100 price increase will be proportionately more in a low-cost institution; (2) less selective institutions are less likely to attract high ability students, who are known to have a relatively high propensity to attend college; (3) less selective institutions are less likely to have applicant pools into which they may dip if those accepted respond negatively to price; and (4) low-cost institutions are more likely to attract low income students, who are known to be more sensitive to price. We may test these propositions most easily, by examining *SPRC*s in institu-

tions at opposite ends of the cost, selectivity, student wealth continuum: community colleges and private colleges.

For three of the four community college studies in the meta-analysis, *SPRC*s were greater than 1.0 (price decrease) or less than −1.0 [1, (#1 and #2 in Table 1), 39]. The fourth study [4] may be eliminated from consideration because it evaluated the effects of price reductions (student aid) on applicants only, rather than all potential enrollees. Further, Manski and Wise recently found high price sensitivity in two-year schools but probably only because of their atypical price specification that had a built-in adjustment for family income. Because of the large range of estimates for the community college studies, the authors of this article calculated their own *SPRC* from national data for 1967 to 1972. In 1982 terms the *SPRC* value obtained was −0.9 after controlling for unemployment, race, family income, student aid, community college market share, urban versus rural residence, and previous collegiate experience.

For the three studies of exclusively private colleges, as expected, reported *SPRC*s are low, being −0.2 [17], −0.3 [41], and −0.6 [30]. The latter somewhat higher estimate was from a somewhat unique study in that the sample was limited to mid-selective private colleges. Overall, *SPRC*s at community or two-year public colleges appear to be from two to three or more times as large as those obtained in private colleges.

When these extreme cases are removed, we begin to see a high consistency in study results, except where methods employed are unusual or unique. For national studies that included the full range of public and private, two-year and four-year institutions, estimates tend to pack tightly in the −0.6 to −0.8 range. Exceptions include Jackson's [27] low estimate when student aid, rather than price, is the independent variable, and Hight's [20] high estimate that has been criticized several times in the literature as resulting from a confusion of changes in supply of higher education with changes in demand.

Most state studies that included all kinds of institutions also achieved results in the −0.6 to −0.8 range (−0.6 *SPRC* [31]; −0.7 *SPRC*) [32]; (−0.8 *SPRC* [45]). Only Radner and Miller [38], whose data have often been criticized as containing insufficient variability, obtained greatly different results (−0.3 *SPRC*).

Studies limited to the public sector have obtained similar estimates except where unusual designs and samples appear to explain deviations. For example, the results of Ghali et al. [18] translate into an

SPRC of −0.6, and Clotfelter's [13] result is a relatively low −0.5, probably as a result of his having excluded student aid. Wilson [45] and Hoenack and Weiler [23] obtained high estimates, but their results appear to exclude students who enroll elsewhere, that is, their values are own-price elasticities.

Even though the issue is not discussed in the studies reviewed here, it is fair to ask why the estimated effect of price on enrollment is not more visible in the natural world. To put it bluntly, the price of attendance has risen year after year over the past couple of decades, yet participation rates, at least in the aggregate, have not gone down accordingly or consistently. Why not? There appear to be many contributing factors. Several of them have to do with prices. First, higher education list prices until recent years have not risen significantly in real terms. Second, students often have avoided price increases by moving to lower-cost institutions, with the result that overall enrollment rates remain unaffected. Third, since 1972, need-based student-aid programs have grown astronomically. For those probably most sensitive to price, such aid ameliorates the effects of tuition increases. In effect, students have succeeded in passing increased costs on to others. For example, from national data bases, Leslie [33] found that between 1973 and 1980 the students' share of total costs declined from 28 to 18 percent, while parents and government made up the difference.

There are other reasons that are beyond, or only indirectly involve, price considerations. 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. For example, as Campbell and Siegel [8] show, the influence over time of tuition on participation rates becomes apparent only after one controls for changes in income. The growing interest in higher education on the part of women illustrates the effects of a change in preferences. Their increased participation rate has offset a decline in the rate for males and in the process probably obscured the effects of tuition increases as well. The value of a college education, as measured by the rate of return on investment, has apparently remained high in comparison to alternative opportunities, although the precise figures have been the subject of some debate. Finally, many colleges and universities have acted to enhance the real or perceived value of what they offer. The introduction of new programs, more aggressive marketing, and the like serve to counteract higher tuition. Other actions, such as lowering admission standards, may also have had a confounding effect on the relationship between tuition and enrollment. Demographic

changes, of course, are another important influence on enrollment. It may be instructive to note that despite a clear conceptual connection, the relationship between higher education enrollments and key demographic changes is not straightforward. That relationship too is masked by countervailing forces. How else are we to understand the fact that the recent decline in the number of high-school graduates has yet to be accompanied by a decline in overall higher education enrollments?

Despite the number of forces impacting on enrollment and the complexity of their interactions, few would question the need to monitor demographic changes and to reflect on how those changes might affect higher education. The same can be said for changes in the price of higher education. Prices do affect participation rate, ceteris paribus, and this phenomenon needs to be acknowledged when establishing a pricing policy. Estimated *SPRC*s lend concreteness and a measure of precision to that task, although the range of legitimate considerations clearly is extensive.

There seems little doubt that the methods employed in this article act to improve markedly on the accuracy of previous reviews of student demand studies. Nevertheless, we remain less than fully satisfied regarding study comparability. Weinschrott [44] was correct when he warned about the difficulties in achieving consistency among such disparate studies; yet the consistency of results from these disparate studies is reassuring.

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