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ABSTRACT

The possibility that some private colleges, when faced with relative tuition differences and/or changes, will experience a change in Scholastic Aptitude Test (SAT) averages of new students was investigated. Data on 710 private and 349 public four-year colleges for 1967 and 1971 covered tuition, income, enrollment, institutional characteristics, and academic ability measures. Thirteen subgroups of private colleges were also assessed. Based on 14 stepwise multiple regressions, it was found that during 1967-1971 the rate of change of tuition at private colleges relative to the rate of tuition change at public colleges adversely affected the SAT percentile change of most (but not all) groups of private colleges. However, the results also show that 1967-1971 changes in relative private/public tuition, and the dual tuition policies of states that help determine such relative tuition changes, do not determine most of the SAT percentile changes experienced by private colleges during the period. Most of the SAT percentile change was related to institutional characteristics and may reflect the consequences of choice changes rather than the impact of a dual-tuition rate policy by states. Questions about the consequences of dual tuition systems are also identified. (SW)

Private/Public Tuition Change: Does It Affect Private College SAT Admission Standard?

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Introduction

Collegiate undergraduate education in the United States has historically featured both privately owned and operated institutions and publicly (government) sponsored and managed institutions.[1]

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[1] Frederick Rudolph, The American College and University: A History (New York: Random House, Inc., 1965), pp. 188-189.

Public colleges began to be founded in the post-Revolutionary period after the attempts of several state governments, including New York, to take over private educational facilities, such as Kings College (Columbia University) were found to be illegal in the Dartmouth College case.[2]

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[2] Elchanan Cohn and Larry L. Leslie, "The Development and Finance of Higher Education in Perspective," Subsidies in Higher Education: The Issues, eds. Howard P. Tuckman and Edward Whalen (New York: Praeger Publishers, 1980), pp. 16-17.

Along with this dual system of control for higher education institutions (HEIs) there developed, mainly after the Civil War, a dual price (tuition) system, with private HEIs usually charging higher tuition rates than their public counterparts which typically benefited from direct government subsidies.[3]

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[3] Allan M. Cartter, The Responsibility of States for Private Colleges and Universities, p. 3. This speech was delivered before the Southern Regional Education Council, circa August 1967. The late Professor Cartter kindly made a copy of this speech available to this writer.

The establishment of a dual tuition system due to differential public subsidies for private and public HEIs is difficult to explain using public finance theory if the outputs of these HEIs are thought to be substitute goods. Musgrave's Allocation and Distribution fiscal functions are categories one can use when attempting an economic explanation of the dual tuition practice in United States higher education.[4]

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[4]Richard A. Musgrave, The Theory of Public Finance (New York: McGraw-Hill Book Company, 1959), pp. 6-21.

In Musgrave's Allocation role for government the provision of subsidies is appropriate when significant spillover benefits are associated with the private benefits produced by HEIs.[5]

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[5]Ibid., p.6.

Few people would deny that positive social spillovers are associated with the private benefits provided by HEIs. Yet this apparent social consensus fails to explain the United States practice of providing differential subsidies to private and public HEIs. Private HEIs frequently just receive indirect subsidies, such as property tax exemption; public HEIs typically receive direct operating subsidies as well as such indirect subsidies. I know of no research which demonstrates that private HEI's produce smaller spillovers per undergraduate than public HEIs, yet the dual tuition practice has persisted since the end of the Civil War.[6]

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[6]Rudolph, The American College: A History, pp, 188-189.

Tuition has been and continues to be charged to undergraduate at both private and public HEIs, although admittedly at different rates, suggesting that higher education should be thought of as a private want as well as a social want in Musgrave's terminology.[7]

[7] Musgrave, The Theory of Public Finance, pp. 8.

Such an approach justifies paying for at least part of the cost of higher education from the public budget. It does not, however, necessitate government operation of HEIs nor the provision of direct subsidies to just public HEIs. Concerning public wants of a social or merit nature Musgrave states: "... the goods and services needed to satisfy public wants must be paid for out of general revenue..., they need not be produced under the direct management or supervision of the government."[8]

[8] Ibid., 15. Emphasis of Musgrave.

Examination of Musgrave's Distribution fiscal role is no more useful than the examination of the Allocation role in providing insight into the logic of dual tuition practice found in the United States.

Credit market imperfections, interfamily differences in wealth and the resultant differences in ability to provide loan collateral, and interfamily differences in current income to pay HEI tuition can be used to justify the government provision of grants and loans to potential undergraduates with substantially impeded access to HEIs due to these differences. What is not explained by the Distribution role of government is the custom in the United States of making the grants directly to the HEI rather than directly to the student with

the demonstrated need. Nor does the Distribution role of government explain the United State custom of only making the direct institutional grant when the HEI is operated by a unit of government.

Empirical Studies of the Dual Tuition Policy

The restriction of direct grants mainly to public HEIs, for whatever reasons, changes relative private/public tuitions. Economists have been diligent in attempting to identify the consequences induced by the public policy of private/public tuition subsidy differentials.

Studies by Hansen and Weisbrod for California and Windham for Florida suggest that in the 1960s the subsidy of public HEIs in these states out of public funds had the unintended regressive impact of redistributing income from low to high income families since the incidence of participation in higher education benefits by higher income families exceeded their participation in tax funding. The opposite was found to be true of the lower income families.[9]

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[9]W(illiam) Lee Hanson and Burton A. Weisbrod, "The Distribution of the Costs and Benefits of Public Higher Education: The Case of California," Journal of Human Resources 4 (Spring 1969): 176-191. Douglas M. Windham, Education, Equality, and Income Redistribution, (Lesington, Mass.: Heath Lexington Books, 1970), pp. 48-50.

On the use of the proper age/income cohorts for such studies and conclusions see: Gary A. Moore, "Income Redistribution from Public Higher Education Finance Within Relevant Age Cohorts," Economics of Education Review 2 (Spring 1982): 175-187. Mark Blang, "The Distributional Effects of Higher Education Subsidies," Economics of Education Review 2 (Summer 1982): 209-231.

Other adverse consequences attributed to the dual tuition practice in higher education include a misallocation of resources within traditional private and public sectors and between traditional HEIs and alternative less traditional sources of education and skills acquisition.

Professor Peltzman, using the ratio of median income of male college graduates to that of male high school graduates in 1960 as a proxy for the rate of return to higher education, found the ratio insignificantly positive when regressed against private educational spending in the various states but significantly negative when regressed against public sector educational expenditures in the same states.[10]

[10] Sam Peltzman, "The Effect of Government Subsidies-in-Kind on Private Expenditures: The Case of Higher Education," Journal of Political Economy 81 (January/February 1973) pp. 13-14 and 24-25.

A misallocation of resources between private and public sectors is suggested by this finding.

Professor Peltzman also estimated that in the late 1960s for each 100 in-state students enrolled in public institutions with educational subsidies-in-kind, which is alternative terminology for the dual tuition practice, private HEIs enrolled 57 fewer students than they otherwise would have enrolled.[11]

[11] Ibid., p. 17.

Furthermore, each dollar spent by the government on in-state students at public HEIs is estimated to reduce private educational expenditures by seventy-one cents.[12]

[12] Ibid., p. 16.

Professor McPherson reached a similar conclusion. Using 1972 state cross-section data, he estimated that for each ten (10) students attracted

to a public HEI by a relative tuition difference seven (7) would otherwise have enrolled at a private HEI.[13]

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[13]Michael S. McPherson, "The Demand for Higher Education," Public Policy and Private Higher Education, eds. David W. Breneman and Charles E. Finn, Jr. (Washington, D.C.: Brookings Institution, 1978), p. 182, Table 3-10.

Clearly the dual tuition practice in the 1960s and early 1970s reallocated students away from private section HEIs and toward public HEIs. The social utility of this student reallocation is not obvious.

The Peltzman and McPherson findings also imply that the dual tuition practice, with its mainly public sector subsidy, has induced more students to attend a HEI than would have a no-subsidy case. Even though the subsidies built into the dual tuition practice probably induce more students to seek a higher education, this effect may be faint praise since the use of direct need-conditioned grants to student might have increased total higher education enrollment even more.

A number of studies for the 1960s and early 1970s suggest that a 50 percent decrease in tuition for all potential students would only increase total higher education enrollment by 15 percent.[14]

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[14]Ibid., pp. 180-181.

In principle a cheaper way to enhance higher education enrollment by a certain number (to get a larger enrollment increase with a given budget appropriation) is to target aid at the most price sensitive students. Bishop estimated that for 1961 $1 million in direct aid to low income students of all ability levels would have induced 710 more students to seek a higher education while the same $1 million given as a direct grant to the HEI, and therefore available to the student only in the

form of an in-kind subsidy thru lower tuition and increased staffing at the HEI, induces only 436 more high school graduates to attend a HEI full-time.[15]

[15] John Bishop, "The Effect of Public Policies on the Demand for Higher Education," Journal of Human Resources 12 (Summer 1977): 295-298.

Thus in-kind subsidy dollars to public HEIs seem to have only about 60 percent of the enrollment enhancing power of a direct student grant dollar aimed at the most price sensitive (low income) students, and attendant with this lack of enrollment enhancing efficiency is the shifting of substantial members of undergraduate from private to public HEIs with no apparent gain in social benefits, while possibly generating a regressive distribution of educational benefits relative to tax contributions of families.

Nor may the consequences of the dual tuition policy be confined to the traditional higher education sector. Hanson suggests that young people who realize that college cannot satisfy their vocational aspirations are discouraged from persuing alternative sources since they and/or their parents must pay the full, unsubsidized cost of those alternatives while also paying taxes to subsidize college students.[16]

[16] W(illiam) Lee Hansen, "Income Distribution Effects of Higher Education," American Economic Review 60 (May 1970): 339.

The numerous questions raised about the consequences of the dual tuition system used to finance private and public sector HEIs in the United States has led Windham to conclude:

"The traditional methods of macro-educational intervention--public control and subsidization--would appear to be under question everywhere but in actual practice."[17]

[17] Douglas M. Windham, "Economic Analysis and the Public Support of Higher Education: The Divergence of Theory and Practice," Economic Dimensions of Education, (Washington, D.C.: A Report of a Committee of the National Academy of Education, May 1979), p. 118.

The Historical Experience

Using data on direct student charges for tuition, fees, and room and board, Professor Allan M. Cartter found that for about the first fifty-five years of the twentieth century total student charges for attending a private residential college were between 1.5 and 1.6 times those incurred in attending a similar public institution. Starting in the late 1950's this ratio started to widen reaching 2.2 to 1 in the early 1970's.[18]

[18] Carnegie Commission on Higher Education, Higher Education: Who Pay? Who Benefits? Who Should Pay? A Report (New York: McGraw-Hill Book Co., June 1973), p. 64. The same historical trend can be documented by using the data in Tables II and III.

Table I presents disaggregated data for room and board and tuition at private and public HEIs through 1977. It shows very little change in the private/public ratio for room and board. In 1955 it was 1.18; by 1975 it declined slightly to 1.07. In contrast, the private/public tuition ratio for full-time resident degree students increased from 3.21 in 1955 to 4.93 in 1975, before declining slightly to 4.56 in 1977. Clearly the increased cost of attending a private HEI is due almost totally to relative tuition increases rather than to relative increases in the cost of auxiliary services at private HEIs. When surveying similar relative cost information for the 1960's and 1970's Breneman and Finn conclude that "where the choice lies between resi-

TABLE I

AVERAGE CHARGES FOR FULL-TIME RESIDENT DEGREE STUDENT BY CONTROL

1955-56, 1965-66, 1969-70, 1974-75, AND 1977

Item	1955-56 Amount	1965-66 Amount	1969-70 Amount	1974-75 Amount	1977 Amount
Public					
Tuition & Required Fees	$ 164	$ 251	$ 324	$ 482	$ 549
Board (Seven-Day Basis)	401	442	511	672	708
Dormitory Rooms	141	286	370	556	597
Total Board and Room	542	728	881	1,228	1,305
Private					
Tuition & Required Fees	$ 527	$1,141	$1,533	$2,381	$2,505
Board (Seven-Day Basis)	436	496	562	731	748
Dormitory Rooms	205	345	437	632	643
Total Board and Room	641	841	999	1,363	1,391
Ratios					
Private Room & Board / Public Room & Board	$\frac{\$641}{542} = 1.18$	$\frac{\$ 841}{728} = 1.16$	$\frac{\$ 999}{881} = 1.13$	$\frac{\$1,363}{1,228} = 1.11$	$\frac{\$1,391}{1,305} = 1.07$
Private Tuition / Public Tuition	$\frac{\$527}{164} = 3.21$	$\frac{\$1,141}{251} = 4.55$	$\frac{\$1,533}{324} = 4.73$	$\frac{\$2,381}{482} = 4.93$	$\frac{\$2,505}{549} = 4.56$

SOURCES: Seymour E. Harris; A Statistical Portrait of Higher Education, A Report of the Carnegie Commission on Higher Education (New York: McGraw-Hill Book Company, 1972), p. 676.
National Center for Educational Statistics, Digest of Educational Statistics, 1974 (Washington, D.C.: U.S. Government Printing Office, 1975), p. 117, table 127.
National Center for Educational Statistics, Digest of Educational Statistics - 1976 Edition (Washington, D.C.: U.S. Government Printing Office, 1977), p. 157, table 258.

dential attendance at a public or private college, nontuition cost differences are inconsequential."[19]

[19] David W. Breneman and Chester E. Finn, Jr., "An Uncertain Future," Public Policy and Private Higher Education (Washington, D.C.: The Brookings Institution, 1978), p. 28.

Table II demonstrates that through 1956 there was an approximately 50-50 split between the private sector for first time student enrollments. By 1975 only 22.8% of first time students are enrolling in private HEIs.

Increased government subsidy rates clearly benefited public HEI enrollments. The absolute state and local government average per student subsidy in 1973-74 was $1881 at public HEIs and $262 at private HEIs, with the state and local per student subsidy at private HEIs in twenty-two states ranging between $0 (n = 8) and $25.[20]

[20] Robert O. Hartman, "Federal Options for Student Aid," Public Policy and Private Higher Education, eds. David W. Breneman and Chester E. Finn, Jr. (Washington, D.C.: Brookings Institution, 1978), pp. 274-253, table 5-A2.

The Question Studied

This work extends the economic analysis of the dual price system in United States higher education by examining the impact of changes in the ratio of private to public tuition, other measures of relative tuition, real income, enrollments, and other relevant economic variables on the average academic ability of new students entering four-year private HEIs in 1967 and 1971.

TABLE II

FIRST TIME ENROLLMENTS IN FOUR YEAR INSTITUTIONS BY INSTITUTIONAL CONTROL AND MARKET SHARE 1932-68 AND 1970-76

	Enrollment			Market Share (%)	
	Public	Private	Total	Public	Private
1932	145,530	131,880	277,410	52.5%	47.5%
1934	132,438	122,339	254,777	52.0%	48.0%
1936	156,771	143,024	299,795	52.3%	47.7%
1938	152,360	136,791	289,151	52.7%	47.3%
1940	172,026	156,561	328,587	52.4%	47.6%
1942	155,594	146,397	301,991	51.5%	48.5%
1944	102,329	99,509	201,838	50.7%	49.3%
1946	248,760	198,438	447,198	55.6%	44.4%
1948	240,921	267,530	508,451	47.4%	52.6%
1950	230,758	242,800	473,558	48.7%	51.3%
1952	208,031	207,288	415,319	50.1%	49.9%
1954	235,565	219,041	454,606	51.8%	48.2%
1956	286,368	265,779	552,147	51.9%	48.1%
1958	328,242	272,117	600,359	54.7%	45.3%
1960	395,884	313,209	709,093	55.8%	44.2%
1962	445,191	324,923	770,114	57.8%	42.2%
1964	539,251	363,348	902,599	59.7%	40.3%
1966	610,000	379,000	989,000	61.7%	38.3%
1968	705,891	370,186	1,076,077	65.6%	34.4%

TABLE II - Continued

FIRST TIME DEGREE-CREDIT ENROLLMENT IN ALL HIGHER EDUCATION INSTITUTIONS 1970-76

	Enrollment			Market Share (%)	
	Public	Private	Total	Public	Private
1970	1,338,000	442,000	1,780,000	75.2%	24.8%
1971	1,339,000	426,000	1,765,000	75.9%	24.1%
1972	1,322,000	418,000	1,740,000	76.0%	24.0%
1973	1,343,000	414,000	1,757,000	76.4%	23.6%
1974	1,436,000	418,000	1,854,000	77.5%	22.5%
1975	1,475,000	435,000	1,910,000	77.2%	22.8%
1976	1,486,000	436,000	1,922,000	77.4%	22.6%

SOURCES: John S. Greene, ed., Standard Education Almanac, 1972 (Orange, N.J.: Academic Media, 1972), table 117, p. 142. Also, 1971 Edition, table 125, p. 136.
U.S. Department of Health, Education and Welfare, Biennial Survey of Education in the United States, 1954-56 (Washington, D.C.: U.S. Government Printing Office, 1959), p. 79.
U.S. Department of Health, Education and Welfare, Digest of Educational Statistics - 1970 (Washington, D.C.: U.S. Government Printing Office, 1970), p. 75.
National Center for Educational Statistics, Digest of Educational Statistics - 1976 Edition (Washington, D.C.: U.S. Government Printing Office, 1977), p. 88, table 89.

Why might the quality of students admitted to private HEIs change? A private HEI might enroll less academically gifted students than it would have enrolled under past admissions standards if applications declined in quantity or quality as a result of its tuition increasing relative to that of four-year public colleges and universities. Such a change may help preserve faculty or staff jobs or subsidies to graduate teaching or research activities.[21]

[21] Estelle James, "A Contribution to the Theory of the Non-Profit Organization," Stony Brook Working Papers 137(1975); pp. 2-3, 7-9 and 12-14.

Correspondingly, those private HEIs at which relative tuition declined might have an opportunity to increase their academic admissions standards and teach more talented students with less effort, freeing time for other professional activity.[22]

[22] Estelle James, "Costs, Benefits, and Envy: Alternative Measures of the Redistributive Effects of Higher Education," Subsidies to Higher Education: The Issues, eds. Howard P. Tuckman and Edward Whalan (New York: Proeger Publications, 1980), p. 134.

If these types of institutional responses were to occur, an inverse relationship would exist between relative tuition change and the academic ability of new students entering private HEIs.

FIGURE I

DEMAND CURVES AND SAT QUALITY

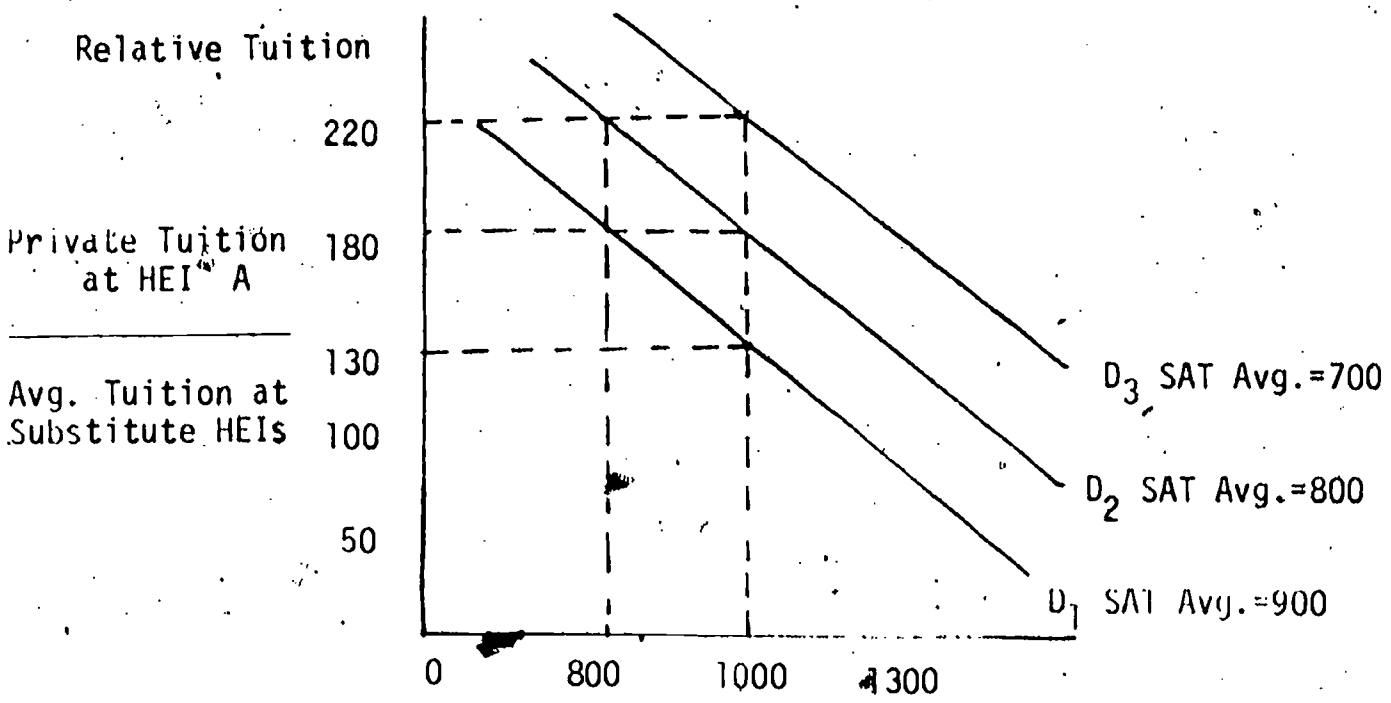

Figure I illustrates the idea that in the face of increasing relative tuition rates the private HEI will typically experience a lower average entrance test score for its admitted students if it attempts to maintain the same absolute number of students and market share. If a private HEI attempts to maintain its previous average student quality, it can do so only if it accepts a smaller percent of all students in colleges and a lower absolute enrollment.

This study examines the relationship between a change in the average academic ability of new students entering a private HEI and the change of that institution's tuition relative to tuition at both public and other private HEIs as well as to other appropriate economic variables.

Since separate markets may exist for different groups of private HEIs, this study separately examines such subgroups of private HEIs as Catholic, Nonsectarian, BLACK, TOP 50 and Universities. Table III contains a full description of the groups of private HEIs examined in this study.

TABLE III

The Subgroup Regressions: A Summary

In addition to the regression run for ALL 710 HEIs, thirteen other regressions are estimated, one for each of the following subgroups of HEIs:

1. Roman Catholic

2. Mainline Protestant, derived from the 1967 ACE data. Included in this category are Baptist, Lutheran, Methodist, Presbyterian, Episcopal, and Church of Christ affiliated HEIs. Among those denominations not included are Friends, Mennonites, Latter Day Saints, and Seventh Day Adventists.

3. Private, Nonsectarian.

4. Predominantly Black.

5. Invisible Colleges. These are defined as private HEIs with a 1967 enrollment of 2500 or less and mean SAT V+M $<$ 1000.

6. Science Leaders. These are the forty-four private HEIs that were identified by Knapp and Goodrich as outstanding undergraduate educators of future American scientists.

7. Humanities Leaders. This group consists of forty-one of the forty-four private HEIs identified by Knapp and Greenberg as outstanding American educators of young humanities scholars. Berea College of Kentucky, Cooper Union of New York, and Calvin College of Michigan are not included because complete ACE data is not available.

TABLE III - Continued

8. Top Fifty (TOP 50). Elite HEIs, as defined by Spies, included those private and public HEIs with 1971 median SAT V+M $>$1300 and 1971 room, board, and tuition greater than $4000. These specifications could not be applied in this work because there are too few HEIs in the 1059 HEIs which meet the Spies specifications. A regression run is not possible because the degrees of freedom are insufficient. Therefore, to approximate the Spies concept of Elite HEIs the Top Fifty of the 710 private HEIs, in terms of 1967 mean SAT V+M scores, are used in a regression.

9. Carnegie Codes 11-14 (Universities). This group includes research and doctoral granting universities.

10. Carnegie Codes 21-32 (ARTS). Included in this group are Liberal Arts HEIs and comprehensive undergraduate colleges and universities.

11. Miller's Highest quality. Mean SAT V+M $\geq$ 1100 on the 1967 ACE file.

12. Miller's Middle quality. Mean SAT V+M $\geq$ 800 $<$1100 on the 1967 ACE file.

13. Miller's Lowest quality. Mean SAT V+M $<$800 on the 1967 ACE file.

ACE Data Used

Data on 710 private and 349 public four-year HEIs for 1967 and 1971, secured from the American Council on Education (ACE) and enhanced through the addition of in-state tuition rates for the public HEIs, constitutes the data base used in this study.[23]

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[23] Otis W. Singletary, ed., American Colleges and Universities, 1966, 10th ed., (Washington, D.C.: American Council on Education, 1968). W_____ Todd Furniss, ed., American Colleges and Universities, 1971, 11th ed., (Washington, D.C.: American Council on Education, 1973). Charles E. Burckel, ed., The College Blue Book, Vol. I, 12th ed., (Los Angeles: College Planning Programs, Ltd., 1968).

This data is used to compile the relative tuition, income, enrollment, institutional characteristics, and academic ability variables defined and discussed below. The Statistical Package for the Social Sciences (SPSS) is used to estimate long-linear stepwise multiple regressions for ALL 710 private HEIs as well as for the thirteen subgroups of private HEIs identified in Table III.[24]

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[24] Norman Mie, and others, SPSS-Statistical Package for the Social Sciences, 2nd ed., (New York: McGraw-Hill Book Co., 1975), pp. 320-361.

Data Base Not a Sample of All HEIs in the United States

The data base used in this study is not a national inventory or sample of all HEIs in the United States. The data base includes 1059 four-year HEIs, 710 private and 349 public. No private junior colleges are included in this study nor are seminaries, bible colleges or religious, business, music, art, fashion, or design institutes, nor HEIs in Alaska, Hawaii, and trust territories. Also omitted were four year HEIs which failed to report their SAT means, tuition rates,

or enrollment totals to the ACE or which were in states without any private HEIs, for comparison purposes. Furthermore, public HEIs which claim a zero tuition rate but which use disguised tuition in the form of enrollment fees, service charges or other user's fees on a credit-hour basis were recorded as charging a positive tuition. Finally, the ACE recorded tuition charges were checked for errors and needed corrections made to the data base.

Because of these deletions, adjustments, and corrections, the data base demonstrates different aggregate values than those derived from a complete inventory of all HEIs in 1967 and 1971. For example, only 45.8 percent of the 710 private data base HEIs, rather than a majority of private HEIs, experienced a relative private/public tuition increase between 1967 and 1971. Perhaps more appropriate measures of relative tuition change are found in Table IV, which reports the frequency distribution for 1967-71 private/public tuition ratio changes. Table IV shows that only 37.3 percent of the 710 private HEIs experienced relative tuition increases greater than 5 percent while 44.1 percent of the private HEIs had relative tuition decreases of more than 5 percent.

TABLE IV

PERCENT CHANGE IN PRIVATE/PUBLIC TUITION RATIO, 1967-71
FREQUENCY DISTRIBUTION FOR 710 PRIVATE HEIs

1971 Private/Public Tuition / 1967 Private/Public Tuition	n Private HEIs	Percent of 710 Private HEIs		Mean Change for Group
150% or more	24	3.4%		165.9%
125% to 149+%	70	9.9%	37.3%	134.9%
105% to 124+%	171	24.0%		114.0%
104+% to 95+%	117	16.5%		100.2%
95% to 75+%	172	24.2%		87.3%
75% to 50+%	148	20.8%	44.1%	64.0%
50% or less	8	1.1%		43.4%
Totals	710	99.9%		

The Hypothesis

It is expected that at least some groups of private HEIs, when faced with relative tuition differences and/or changes, will experience a change in SAT admission averages. An inverse relationship is expected. This relationship is expected to be particularly evident when the relative tuition rate differences and/or changes are between private and public HEIs in the same state because the dual tuition tradition in United States higher education has usually created substantial absolute in-kind tuition subsidies for in-state students attending in-state public HEIs.

The Dependent Variable--SAT Percentile Change (Δln SATIL), 1967-71

The starting point for defining the dependent variable Δln SATIL is the mean Verbal and Mathematical (V+M) Scholastic Aptitude Test (SAT) scores for the new undergraduates admitted to and actually attending a HEI in 1967 and 1971. Where a HEI used the American College

Testing Service (ACT) scores, the American Council on Education (ACE) converted these ACT scores to equivalent SAT scores and recorded these equivalents in the ACE Institutional Characteristics File.[25]

[25] ACE Research Reports, vol. 4, no. 6, Office of Research, (Washington, D.C.: American Council on Education, 1969), pp. 4-5.

However, there are two reasons why the 1967 and 1971 means of the absolute SAT V+M scores or equivalents for the new students at a HEI are not used directly to measure changes in the academic ability of students admitted to and attending a HEI. First, a 30-point change in mean SAT scores for 1967-1971 does not measure the same change when it refers to schools with an average SAT of 800 rather than to schools with an average SAT of 1100. A 30-point absolute change in any two scores can represent drastically different percentile changes.

Second, absolute SAT scores in the United States have exhibited a widely reported secular change in the 1960's and 1970's. From 1962 through 1975, mean SAT Verbal scores for the nation fell from 478 to 434, while mean SAT Mathematical scores from the nation fell from 502 to 434.[26]

[26] Malcolm G. Scully, "What is Causing the Drop in College Entrance Score?" The Chronical of Higher Education, February 17, 1976, p. 3.

From 1967-1968 through 1971-1972, national mean SAT Verbal scores fell from 466 to 450, while national mean SAT Mathematical scores fell from 494 to 482.[27]

[27] Private correspondence with June Stern, Statistical Associate, College Board Analysis Section, Educational Testing Service, Princeton, N.J.: August, 1976.

It is appropriate to exclude from this study any changes in the SAT means of HEIs due to this secular trend. This study seeks to identify changes in mean SAT V+M scores at HEIs due to relative tuition differences or other appropriate independent variables.

For these reasons, the 1967 mean SAT scores at the 1059 HEIs were converted to a percentile distribution, SATIL 67. The same was done for the mean SAT scores for the HEIs in 1971, SATIL 71. Thus, in this study only when the mean SAT score of a HEI has changed from one percentile to another during 1967-1971, has a change occurred in the academic ability (ΔSATIL) of students admitted to and attending the HEI which is independent of scaling problems and secular trends. If logs were not used an increase in SATIL at a HEI would be indicated by a positive value greater than one while a decrease in SATIL would be repesented by a positive value of less than one but greater than zero. A value of one represents no change in SATIL.

V(A). ΔSATIL at a HEI $= \left(\frac{\text{Mean SAT}_{71} \text{ percentile for a HEI}}{\text{Mean SAT}_{67} \text{ percentile for the same HEI}}\right)$

$= \left(\frac{\text{SATIL 71}}{\text{SATIL 67}}\right)$

In log form ΔSATIL is:

V(B). $\Delta \ln \text{SATIL} = \ln \text{mean SAT}_{71} \text{ percentile} - \ln \text{mean SAT}_{67} \text{ percentile}$

$= \ln \left(\frac{\text{Mean SAT}_{71} \text{ percentile of a HEI}}{\text{Mean SAT}_{67} \text{ percentile of a HEI}}\right) = \ln \left(\frac{\text{SATIL 71}}{\text{SATIL 67}}\right)$

In log values positive (+) indicates an increase in SATIL while a negative sign (-) represents a decline in SATIL during 1967-71. The larger the absolute value of Δln SATIL the larger the rate of change in SATIL at a HEI during 1967-71.

On an individual count basis, of the 710 private HEIs, 52.2 percent lost SAT quality during 1967-71 compared to 34.1 percent of the 349 public HEIs. Admissions quality gains of 5 percent or more (Table V) are reported by 56.3 percent of the public HEIs but only 30 percent of the private HEIs in the data base, with gains of 25 percent or more experienced by 34 percent of the public HEIs but only 19 percent of the private HEIs. Table V reports 1967-71 admission quality declines of 5 percent or more for 42.3 percent of private HEIs but only 29.1 percent of public data base HEIs.

TABLE V

SAT-BASED ADMISSION QUALITY CHANGES, 1967-71.
FREQUENCY DISTRIBUTION FOR PRIVATE
AND PUBLIC HEIs

Private HEIs n	Private HEIs Percent	Percent Admissions Quality Change 1971 Admissions Quality / 1967 Admissions Quality	Public HEIs n	Public HEIs Percent
135	19%	125% or more	119	34.1%
78	11%	105% to 124+%	78	22.3%
197	27.9%	104+% to 95+%	51	14.8%
146	20.6%	95% to 75+%	35	10.1%
154	21.7%	75% or less	66	19%
710	100.2%	Totals	349	100.3%*

*Totals may not equal 100 percent due to rounding.

The Independent Variables

A number of types of independent variables will be used to try to explain the SATIL change which most of the private HEIs in this study experienced during 1967-71. For example, there will always be more than one tuition variable to measure relative tuition changes. Relative tuition at a private HEI can be affected by the tuition changes at other private HEIs in its own state and out-of-state as well as tuition in in-state public four year HEIs and junior colleges which may reflect substantial public subsidies. The following notation is used for these relative tuition measures: $p_1/P_2, p_1/P_n$, where the lower case p_1 is the tuition at the private HEI being observed and the upper case P-values represents average tuition rates for various groups of HEIs.

A real income measure, (Y/p_1), which proved to be colinear with most relative tuition measures, was also used because Table VI suggests the use of a real income variable along with relative price variables when analyzing higher education. Between 1960 and 1972, disposable income per capita increased relative to both the consumer price index and average tuition rates at public HEIs, but it did not increase as much as average tuition rates at private HEIs.

TABLE VI

INCOME, TUITION, AND CONSUMER PRICE INDEXES
1960-72 AVERAGE ANNUAL RATES OF CHANGE

Disposable income per capita	5.8%
Average tuition charge per FTE student	
Public institutions	5.3%
Private institutions	6.9%
Consumer Price Index	2.9%

SOURCE: The Carnegie Commission on Higher Education, Higher Education: Who Pays? Who Benefits? Who Should Pay? A Report and Recommendations (New York: McGraw-Hill Book Co. June, 1973), p. 64.

The enrollment market share (MS) of the private HEIs will also be included. The literature suggested that mean SATIL standards and market share (MS) and/or enrollment can be inversely related for HEIs which have and exercise a transition option.[28]

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[28] Oliver E. Williamson, Corporate Control and Business Behavior: An Inquiry into the Effects of Organization Form on Enterprise Behavior (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970), pp. 84-85.

Finally, characteristics of some of the HEIs, such as past institutional achievements in undergraduate education of science and/or humanities scholars, very high past admission standards, and religious affiliation, will be included as dichotomous (dummy) variables. These characteristics are included since they may be institutional characteristics for which some students have changed preferences or tastes, (T_1, T_2, ... T_N), during 1967-71. The above general format, summarized in equation I, will be applied to all 710 private HEIs.

$$\text{I.} \quad SATIL = z\left[(p_1/P_2), (p_1/P_3), (Y/p_1), (MS), (T_1), (T_2), \ldots, (T_n)\right]$$

While the specification of the particular variables has yet to be given, it should be noted that there are certain advantages in assuming that the factors which affect the SATIL of a HEI combine in a multiplutive manner as in II:

$$\text{II.} \quad SATIL = a(p_1/P_2)^b (p_1/P_3)^c (Y/p_1)^d (MS^f) (e^{gT_1}) (e^{hT_2}) \ldots (e^{sT_{13}})$$

The multiplicative form of equation II is intrinsically linear in logs, so the estimated values of b through f can be interpreted as elasticities.[29]

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[29] Jan Kmenta, Elements of Econometrics, (New York: The Macmillian Co., 1971), pp. 451-458 and 461.

The dummy variables T_1 through T_{13} identify institutional characteristics which may correspond to the preferences of some students. Any dummy variable found to be significant can be thought of as changing the intercept or constant term of an estimated regression.[30]

[30] Ibid., pp. 419-421.

The log-linear statement of equation II is given in equation III:

III. $$\ln SATIL = \ln a + b \ln(p_1/P_2) + c \ln(p_1/P_3) + d \ln(Y/p_1) + f \ln(MS) + gT_1 + hT_2 + \ldots\ldots + sT_{13}$$

The variables used in all of the regressions have been intentionally designed and checked to avoid zero and negative values since defined logs do not exist for these values. Natural logs are used in all regressions and calculations.

Since the intent of this study is to determine if the changes in SATIL (Δln SATIL) between 1967 and 1971 of the 710 private HE-Is can be explained in whole or in part by changes in the independent price, income, and/or market share variable during 1967-71, equation III is rewritten in equations IV(A) to IV(G) to reflect this intent. Equations IV(A) through IV(G) specify the format of the various measures of change used in the regressions as well as the other types of independent variables used.

[Change Variables]

IV(A). $\Delta \ln SATIL = \alpha + b' \Delta \ln(p_1/P_2) + c' \Delta \ln(p_1/P_3) + d' \Delta \ln(Y/p_1)$

$+ f' \Delta \ln(MS) +$

[Dummy Characteristics Variables]

$gT_1 + hT_2 + \ldots\ldots\ldots sT_{13} +$

[Scale Variables, Discussed Below]

$u \ln (p_1/P_2)_{67} + v \ln(p_1/P_3)_{67} + \ldots z \ln(e_1/E_2)_{67}$

IV(B), where $\Delta \ln(p_1/P_2) = \ln(p_1/P_2)_{71} - \ln(p_1/P_2)_{67}$

IV(C), and $\Delta \ln(p_1/P_3) = \ln(p_1/P_3)_{71} - \ln(p_1/P_3)_{67}$

IV(D), and $\Delta \ln(MS) = \ln(e_1/E_2)_{71} - \ln (e_1/E_2)_{67}$

$= \ln(MS)_{71} - \ln(MS)_{67}$

IV(E), and $\Delta \ln(Y/p_1) = \ln(Y/p_1)_{71} - \ln (Y/p_1)_{67}$

IV(F), and $\Delta \ln SATIL = \ln SATIL_{71} - \ln SATIL_{67} = \ln (SATIL_{71}/SATIL_{67})$

IV(G), and $T = 0$ or 1 for all $T_1 \ldots\ldots T_{13}$

p_1 and e_1 in equations IV(A) through IV(D) are tuition and enrollment respectively at the HEI being observed while P_2 and E_2 are average tuition and total enrollment respectively for a group of HEIs in the same state as the HEI being observed.

The value of the coefficients b', c', d', etc., in each of the regressions for the various groups of HEIs in this study are estimated using multiple regression techniques. The advantage of the log format in equation IV(A) is that in economic terms b', c', d', and f' are price, income and market share elasticities respectively.[31]

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[31] Ibid., pp. 458 and 461.

Therefore, the interpretation of the estimated regression coefficients for the change variables is straight forward since both the sign and the absolute values of the estimated coefficients have economic meaning.

In-state Tuition Variables

The regression for ALL private HEIs includes 710 private HEIs spread over 44 states. The average tuition for private HEIs was computed for each of the 44 states for 1967, (P_{37}), and for 1971, (P_{31}). The 1967 and 1971 tuition averages were also calculated for public HEIs in each of the 44 states (P_{27} and P_{21}) respectively. The second subscript (7 or 1) in this notation indicates the year for which the value is computed, namely 196*7* or 197*1*.

These averages are used to measure change in the relative tuition rate of a private HEI. 1971 tuition (p_{11}) of each private HEI included in a regression is divided by the 1971 average tuition at public HEIs in the same state as the private HEI (p_{11}/P_{21}). The same is done for the 1967 tuition date (p_{17}/P_{27}). The lower case notation indicates individual observed values while the upper case values note average tuition values.

The difference in logs for these relative tuition measures yields a measure of the geometric change in relative tuition during 1967-71, with positive (+) value indicating a relative tuition increase for private HEIs, and negative (-) values a relative tuition decline for the private HEIs being observed. This variable, labeled STINT, measures relative tuition change at in-state HEIs operated by the state (public HEIs). It is specified in V below.

V. $\text{STINT} = \Delta \ln(p_1/P_2) = \ln(p_{11}/P_{21}) - \ln(p_{17}/P_{27})$

Since the values of P_2 are average in-state tuition rates at public HEIs in the same state as the private HEI being observed, STINT measures changes in relative in-state private/public tuition during 1967-71.

PRINT, defined in VI below, measures relative tuition changes, 1967-71, between private HEIs in the same state, using log values. The average tuition rate for the private HEIs (P_3) in each of the 44 states is calculated for both 1967 (P_{37}) and 1971 (P_{31}). The tuition (p_1) for each of the particular private HEIs in a state is divided by the average tuition for all private HEIs in the same state as the observed institution (p_1/P_3). This is done for 1971, (p_{11}/P_{31}), and 1967, (p_{17}/P_{37}).

VI. $PRINT = \Delta \ln(p_1/P_3) = \ln(p_{11}/P_{31}) - \ln(p_{17}/P_{37})$

Thus, PRINT measures the relative tuition rate change between a private HEI and the average of all private HEIs in the same state, 1967-71.

The same format is followed to construct one more in-state measure of relative tuition rate change. JRINT is included in the regressions to cover in-state public junior colleges.

Thus, in all the regression there are at least three in-state price variables to determine how the tuition charges at a private HEI changed compared to average tuition charges at public (STINT), private (PRINT) and junior colleges (JRINT) in the same state as the private HEI being observed. The various subgroup regressions include an additional in-state tuition variable to measure relative tuition changes (CHINT) between the HEIs in the same state with that subgroup Characteristic.

While the market for HEIs is not intra-state exclusively, the emphasis is upon in-state tuition comparisons because in 1968 forty-one of forty-eight states educated between 71% and 96% of the undergraduates from their states at in-state HEIs, and because most public HEIs charge substantially lower tuition rates for in-state students as compared to out-of-state students.[32]

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[32]National Center for Educational Statistics, Residence and Migration of College Students, Fall 1968 (Washington, D.C.: U.S. Government Printing Office, 1970), pp. 18-19, Table 8.

In fact corresponding out-of-state tuition measures (STOUT, PROUT, CHOUT) were included in all regressions, but they almost always proved colinear

or failed to enter the regression. Only the in-state public/private tuition change measure, STINT, failed to demonstrate colinearity with one or more of the other tuition measures. This is fortunate since STINT, the in-state private/public tuition variable is the tuition variable of greatest interest in this study.

The Market Share and Real Income variables reported are defined in equations IV(D) and IV(E) respectively above.

Table VII reports the mean arithmetic values for 1971/1967 changes in SATIL (1971 SATIL/1967 SATIL), STINT (Public/mean private in-state tuition), PRINT or CHINT (Private/mean private in-state tuition), USMS (1971 market share/1967 market share) as well as DSTINT (1967 private/mean 1967 public in-state tuition variable defined below as a scale variable).

The Dummy Variables

There are eleven dummy variables used in the regression for ALL HEIs. Table VIII summarizes the dummy variables included in the ALL regression as well as those dummy variables included in the thirteen subgroup regressions. The eleven dummy variables used in various regressions include TOP 50, Portestant, Catholic, Nonsectarian, BLACK, and Invisible HEIs. In addition, past leaders in undergraduate Science and Humanities education are identified using dummy variables, as are Universities. Finally, the two Miller categories, Lowest and Highest, based upon mean SAT V+M scores, are included as dummy variables. The intercept term of the estimated regressions will be interpreted as relating to Miller's Middle HEIs or Liberal Art (HEIs, or to OTHER religiously-affiliated HEIS which have neither a Catholic or mainline Protestant affiliation, being discussed. The estimated beta value

TABLE VII

1967-71 CHANGES IN RELATIVE TUITIONS, MEAN ADMISSION QUALITY, AND ENROLLMENT SHARES FOR HEI GROUPS AND 1967 PRIVATE/PUBLIC TUITION RATIOS FOR PRIVATE HEI GROUPS

GROUP NAME	n HEIs	Change In SAT-Based Admissions Quality: 1971 Mean / 1967 Mean	Change In Private / Public Tuition Ratio: 1971 Ratio / 1967 Ratio	Change In Private Group / Private ALL Tuition Ratio: 1971 Ratio / 1967 Ratio	Change In Enrollment Shares: 1971 Share / 1967 Share	1967 Relative Tuition: 1967 Private / 1967 Public
Public	349	110.2%	-	-	-	-
ALL Private	710	96.1%	97.4%	100.0%	83.8%	4.91
Catholic	191	82.5%	97.6%	101.6%	83.3%	4.38
Mainline Protestant	187	100.6%	99.4%	100.7%	89.2%	4.46
Nonsectarian	250	99.7%	97.2%	99.5%	80.4%	5.77
BLACK	35	59.9%	109.9%	105.7%	92.6%	3.55
Invisible	297	106.6%	99.3%	101.2%	87.3%	3.67
Science Leaders	44	95.3%	92.0%	99.1%	92.7%	5.61
Humanities Leaders	41	99.7%	95.6%	98.8%	83.5%	7.15
TOP 50	50	99.8%	105.0%	99.4%	88.1%	8.00
Universities	56	100.4%	101.5%	98.5%	80.7%	7.37
Liberal ARTS	654	95.5%	96.8%	100.2%	85.0%	4.70
Miller's Lowest	37	235.4%	105.6%	102.3%	89.5%	3.65
Miller's Middle	486	95.3%	97.2%	100.0%	82.5%	4.43
Miller's Highest	187	96.3%	96.8%	99.8%	85.6%	6.39

and sign of a dummy variable will be interpreted as shifting α, the intercept term in equation IV(A) above.

The Scale Variables

All the variables discussed so far, except the dummy variables, use log value to measure relative changes in tuition rates, real income, or market share between 1967 and 1971. However, the ΔSATIL experience of a private HEI could be due to other forces, such as the absolute tuition difference between that HEI and other private or public HEIs, or the absolute market share which this HEI was able to attain in the past. Literature on student responses strongly indicates measures of tuition difference should be included in the regressions. These factors are called scale factors since they relate to absolute 1967 tuition values or their differences rather than to change in these values during 1967-71.

These scale variables, which use 1967 data exclusively, are all basically the denominators (D) of the 1967-71 relative change variables they are named after. The prefix D is used to emphasize that these variables are a measure absolute differences in 1967.

XVII. DSTINT = $\ln (p_{17}/P_{27})$.

p_{17} is the 1967 tuition rate at the private HEI being observed while P_{27} is the average 1967 tuition at all public HEIs in the same state as the private HEIs being observed.

XVIII. DPRINT = $\ln (p_{17}/P_{37})$

P_{37} is the average 1967 tuition at all private HEIs in the same state as the private HEI being observed.

XIX. DJRINT = $\ln (p_{17}/P_{47})$

Corresponding out-of-state scale variables were also used, as were appropriate scale variables constructed for the subgroups of HEIs in the various subgroup regressions.

An alternative formulation of these scale variables, namely p_{17}-p_{27}, could not be used to measure the 1967 private/public or other absolute dollar tuition gaps because such a measure could generate zero values and preclude the use of log-linear regressions.

Thus the 1967 scale variables measure relative tuition rates (ratios) rather than absolute dollar tuition gaps or differences.

Of the scale variables, only DSTINT failed to demonstrate severe colinearity problems. DSTINT was able to contribute meaningfully to the findings reported in Table IX.

Limitations of This Study and Its Findings

Before presenting a summary of the main findings it is appropriate to discuss the limitations of this study. First, the findings are specific to 710 four-year private HEIs in forty-four states during 1967-71.

Second, three variables of possible influence are not included in the regressions. Two of these are demographic in nature, namely changes in college-age population due to differences in migration and natural growth between states, and changes in the average size of families with college-age members.[33]

[33] McPherson, "Demand for Higher Education," pp. 145-152.

Since this study only covers a four-year time span the omission of these demographic variables is probably acceptable.

TABLE VIII

COMPARATIVE ELASTICITIES ESTIMATED FOR DUMMY VARIABLES

Regression Name	All	Catholic	Protestant	Nonsectarian	Black	Invisible	Science	Humanities	Top 50	Universities	Arts	Miller's Lowest	Miller's Middle	Miller's Highest
Variable Name														
Catholic	-.36	L	L	L	NS	-.53	N	N	-.04	-.13	-.39	+1.17	-.38	-.20
Protestant	-.13	L	L	L	NS	-.18	NS	NS	-.03	NS	-.14	NS	-.16	NS
Nonsectarian	NS	L	L	L	NS	NS	+.37	NS	M	NS	NS	NS	NS	NS
Black	-1.19	-2.58	-1.80	-.47	L	-1.22	N	N	N	N	-1.19	-2.11	-.74	N
Invisible	+.18	+.16	NS	+.12	NS	L	NS	N	L	N	+.19	NS	+.19	L
Science	-.15	N	-.46	NS	N	-.57	L	NS	-.01	NS	-.21	N	-.32	NS
Humanities	NS	N	NS	NS	N	N	-.30	L	+.01	NS	NS	N	NS	NS
Top 50	NS	NS	NS	NS	N	L	NS	NS	L	NS	NS	L	L	NS
Universities	NS	NS	NS	NS	N	N	NS	NS	NS	L	L	N	NS	NS
Arts	M	M	M	M	M	M	M	M	M	L	L	L	M	M
Miller's Low	+1.00	+2.32	+1.30	NS	NS	+1.00	N	N	L	N	+.97	L	L	L
Miller's Middle	M	M	M	M	M	M	M	M	L	M	M	L	L	L
Miller's High	NS	NS	+.19	NS	N	L	NS	NS	L	-.06	+.10	L	L	L

KEY: M. Variables omitted to avoid Dummy Variable Trap.
N. No III-Is in this category.
L. Logically unnecessary to include this variable.
NS. Beta estimate not significant in F-tests of 1%, 5%, nor 10%.

The third variable not included, a measure of intrainstitutional price discrimination, is of more concern. The financial aid offers of HEIs have been found to be important to students' institutional choices.[34]

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[34]Susan C. Nelson, "Financial Trends and Issues," Public Policy and Private Higher Education, eds. David W. Brenneman and Chester E. Finn, Jr. (Washington, D.C.: Brookings Institution, 1978), pp. 78-79.
Sacks, The Admissions Dilemma, p. 130.

The 1971 ACE Institutional Characteristics File, but not the 1967 ACE Institutional Characteristics File, lacked sufficient data to construct a measure of intrainstitutional price discrimination. Therefore, 1967-71 changes in price discrimination could not be included in this study as a variable.

Limitations also exist because the ACE data are specific to individual HEIs, rather than to students, and because these data often had to be aggregated for groups of HEIs. Such aggregation contributes to low R^2 values. Yet the range of R^2 values, reported in Table X, from 17.9 percent (ALL) to 69.2 percent (Miller's Lowest), with a mean R^2 value for the thirteen (13) significant regressions of 35.9 percent, is not unacceptable.

Similar studies often generate low R^2 values. For example, one study, using 1972 student-specific data for graduating seniors in the National Longitudinal Survey (NLS) and follow-up data for 1973 and 1974 on the actual work/military/educational activities of these young people, was able to explain only 15 percent of the observed wage level variations.[35]

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[35]Nolfi, Experiences of Recent High School Graduates, pp. 1 and 10.

The study states:

> "We find, as others have, that much of the process of school choices and work success is currently unmeasurable; luck, random influences, or factors that are beyond the measurement with the NLS variables have a very strong impact."[36]

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[36]Ibid., p. 1.

Finally, multicollinearity among the various private sector tuition measures precludes comment about competition between groups of private HEIs in most cases. This study was not designed to have private/public competition between HEIs as its only focus. It was also designed to determine if changes in SATIL experienced by various private HEIs are the result of their tuition changing during 1967-71 relative to average tuition for various groups of private HEIs. Unfortunately all the various measures of 1967-71 change in relative private tuitions (PRINT, PROUT, CHINT, CHOUT) demonstrated serious collinearity problems, resulting in the construction of composite variables which do not have a clear economic interpretation, or they simply failed to enter the initial regressions. Therefore, positive statements about the nature of price competition between various types of private HEIs as a result of 1967-71 tuition changes cannot be made based upon this study since regression coefficients could not be estimated for these variables for inclusion in Table IX.

The Humanities Regression - Not Significant

Humanities is the only regression which is not statistically significant. The Humanities F-value is 1.70 compared to an F = 1.84 for significance at the 10 percent level. None of the dummy variables are significant in the Humanities regression. STINT (+1 percent) and DPRINT (+1 percent) are significant among the quantitative variables

as are the composite variables RELTHUM (+1 percent) and HUMTDIFF (+1 percent). Only in the TOP 50 and mainline Protestant regressions is STINT also positive (+). DPRINT is only found in the ALL and Humanities regressions. DPRINT is positive (+) in both cases.

Major Findings

Fourteen (14) stepwise multiple regressions, which include relative price, real income, market share, and institutional characteristics variables, are estimated in this study to determine if one or more of these variables are systematically related to the change of SATIL experienced during 1967-71 by the 710 private HEIs in this study. The possibility was explicitly entertained that private/public tuition ratios greater than one, and changes in those ratios during 1967-71 as a result of the tuition subsidies provided by states to their in-state students attending public HEIs would result in lower SATIL at private HEIs. Such an outcome is documented in Table IX for most groups of private HEIs in this study. This is an important finding.

In Table IX the STINT variable, which measures the change in relative private/public tuition during 1967-71, is negative (-) for the ALL, Catholic, Nonsectarian, Invisible, ARTS, Science, Miller's Middle, and Miller's Highest groups of HEIs. However, the TOP 50 and mainline Protestant HEIs in the 1967-71 experienced improved SATIL when their tuition increased relative to average tuition at public HEIs.

Table X contains the most important finding of this study. The institutional characteristics variables make a much larger contribution to the R^2 of each regression than do the STINT and

TABLE IX

ESTIMATED ELASTICITIES FOR QUANTITATIVE VARIABLES

	All	Catholic	Protestant	Nonsectarian	Black	Invisible	Science	Humanities	Top 50	Universities	Arts	Miller's Lowest	Miller's Middle	Miller's Highest
STINT 70	-.26	-.66	+.42	-.22	NS	-.33	-.68	+.09	+.02	FF	-.19	NS	-.24	-.22
DSTINT 700	+.10	NS	NS	+.20	+1.33	FF	+.33	NS	NS	NS	+.11	+.66	+.15	NS
DPRINT 720	+.25	TDIFF	F	TDIFF	TDIFF	F	TDIFF	+.10	NS	TDIFF	TDIFF	TDIFF	F	TDIFF
DSTOUT 730	TDIFF	F	TDIFF	F	F	F	TDIFF	TDIFF	TDIFF	NS	TDIFF	F	TDIFF	TDIFF
USMS 69	NS	+.32	NS	NS	+1.69	NS	NS	FF	-.03	NS	FF	NS	NS	+.09
DUSMS 690	+.11	+.23	NS	+.06	-.52	FF	+.30	NS	-.01	-.06	+.13	-.69	+.15	+.05
CHINT 65	L	RELT	RELT	RELT	RELT	F	NS	NS	RELT	RELT	RELT	RELT	RELT	F
DCHINT 650	L	TDIFF	-.55	TDIFF	TDIFF	TDIFF	+.51	NS	-.11	TDIFF	TDIFF	NS	TDIFF	TDIFF
DCHOUT 640	L	F	F	TDIFF	TDIFF	TDIFF	TDIFF	F	TDIFF	F	TDIFF	F	F	TDIFF
STCCINT 75	X	X	X	X	X	X	X	X	X	-.07	D	X	X	X
DSTCCINT 750	X	X	X	X	X	X	X	X	X	NS	D	X	X	X

KEY: RELT. Included in Composite Variable measuring 1967-71 tuition change.
TDIFF. Included in Composite Variable measuring 1967 absolute tuition differences.
X. Experimental Instate Tuition Variable defined for Universities and Arts only.
F. Failed to enter initial regression run.
FF. Failed to enter second regression run which includes Composite Variables.
M. Variable omitted to avoid Dummy Variable Trap.
L. Logically unnecessary to include this variable.
N. No HEIs are in this category.
NS. Beta estimate not significant in F[illegible] 1%, 5%, nor 10%.
D. Variable dropped because data is [illegible]n variables STINT and DSTINT.

TABLE X

R^2 CONTRIBUTIONS (%) OF DUMMY VARIABLES, STINT, 1967-71 PRIVATE/PUBLIC TUITION (CHANGE) AND DSTINT, (1967) PRIVATE/PUBLIC TUITION DIFFERENCE

REGRESSION NAME	1 TOTAL R^2	2 CHANGE IN R^2 DUE TO DUMMY VARIABLES	3 2/1 = DUMMY PERCENT OF R^2	4 CHANGE IN R^2 DUE TO STINT	5 4/1 = STINT PERCENT OF R^2	6 CHANGE IN R^2 DUE TO DSTINT	7 6/1 = DSTINT PERCENT OF R^2
All	.17870	.14099	79.0%	.00567	3.1%	.00301	1.7%
Catholic	.20498	.08647	42.2%	.02594	12.7%	.00091	0.4%
Protestant	.33820	.27774	82.1%	.01483	4.4%	.00124	0.4%
Nonsectarian	.20018	.03842	19.2%	.01941	9.7%	.02185	10.9%
Black	.49209	.11218	22.8%	.01802	3.7%	.03932	8.0%
Invisible	.23133	.17395	75.2%	.01007	24.1%	NONE	NONE
Science	.60723	.27978	46.1%	.06721	11.1%	.04904	8.1%
Humanities	.47822	.20744	43.5%	.02052	4.3%	.00277	0.6%
Top 50	.56289	.17386	30.9%	.05603	10.0%	.00870	1.5%
Universities	.50429	.10983	21.8%	.01705 STUNIVINT	3.4%	.00080	0.2%
Arts	.19329	.14376	33.7%	.00473	2.4%	.00314	1.6%
Miller's Low	.69209	.48850	70.6%	.01679	2.4%	.02216	3.2%
Miller's Middle	.16081	.09411	58.5%	.00561	3.5%	.00668	4.2%
Miller's High	.29833	.14030	47.0%	.03753	12.6%	.00664	2.2%

NOTE: Change in R^2 for the Dummy Variables is conservatively measured at the point where the first Quantitative Variable starts to enter the regression. In some regressions additional Dummy Variables subsequently entered.

DSTINT variables separately or combined (except for Nonsectarian HEIs). The institutional characteristics contribution to total R^2 ranges between 82.1 percent (Protestant) and 19.2 percent (Nonsectarian). By contrast the contribution of STINT to total R^2 ranges between 24.1 percent (Invisible) and 2.4 percent (ARTS and Miller's Lowest). The contribution of STINT to R^2 is never more than one-half that of the institutional characteristics in a regression, and it is usually much less than half (Table X, columns 3 and 5).

The R^2 contributions for DSTINT in column 7 of Table X range from 10.9 percent for Nonsectarian HEIs to 0.2 percent for Universities. Only for the Nonsectarian HEIs does the combined effects of STINT and DSTINT (1967-71 relative private/public change and 1967 absolute private/public tuition difference) on R^2 (20.6 percent) exceed the R^2 effects of the dummy variables (19.2 percent). For all other regression runs the effect on R^2 of the dummy variables exceeds that of STINT and DSTINT by a factor of two (2) to sixteen (16).

To the extent that the institutional variables are also student preference variables, these findings indicate that taste changes are by far the most important cause of the 1967-71 SATIL changes experienced by the groups of private HEIs in this study. STINT, which in part reflects changes in a state tuition subsidies at public HEIs contributes only modestly (thought with a negative impact) to the SATIL changes experienced in 1967-71 by most groups of private HEIs in this study.

Admittedly, the stepwise regressions are structured in such a way as to encourage such a finding. The dummy variables were afforded the opportunity, but not forced, to enter the regressions

before any quantitative variable, such as STINT, entered. This conservative procedure, which allows the variables which are not subject to direct public control to have their impact first and fully, is thought to be desirable before making judgments about the impact of such a long established policy as the dual tuition system of most states.

This finding that the non-price variables, which may reflect taste changes, are more important than the 1967 private/public tuition ratio (DSTINT) or the 1967-71 tuition changes (STINT), is consistent with the surmize of McPherson, based upon bits and pieces of information, that:

> ".....growth in the tuition gap that occurred during the 1960's accounted for less than half of the shift in enrollment from private to public institutions that took place at the time. The rest presumably resulted from....non-price factors....." [37]

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[37] "The Demand for Higher Education," p. 184.

The small impact of STINT and DSTINT on the SATIL of most groups of private HEIs between 1967-71 should not be interpreted as support for dual tuition-rate policies. Any such selective subsidy policy by states can be challenged on the basis of both equity and efficiency. Rather this finding simply emphasizes that if one ignores changes in preferences for certain institutional characteristics one is likely to overestimate the negative consequences of the dual tuition-rate policy on private SATIL during 1967-71.

The Beta Estimates for the Dummy Variables--Their Consistency

Table VIII reports a consistent lack of significance of some characteristic variables while there is a remarkable consistency of the signs of the estimated betas for institutional characteristics which are significant in more than one regression. For example, in Table VIII:

1. Protestant carries a negative (-) sign in all five (5) of the regressions it enters with significance elasticities ranging from .03 to .18.

2. BLACK is negative (-) in all eight (8) of the regressions in which it is significant with six (6) of the eight (8) elasticities larger than 1.19 in absolute value.

3. Invisible is positive (+) in the five (5) regressions in which it is significant with elasticities clustered between .12 and .19.

4. Science is negative (-) in the six (6) regressions which include Science as a significant variable with absolute elasticity values between .01 and .57.

5. Miller's Lowest is positive (+) in each of the six (6) regressions in which it was found to be significant, with elasticities between .97 and 2.32.

6. Catholic was negative (-) in seven (7) of the eight (8) regressions in which the variable was significant with negative elasticities between .04 and .53.

7. Universities is not significant in any of the eight (8) regressions in which it could have demonstrated significance.

8. TOP 50 proved to be not significant in all eight (8) of the regressions in which it was included.

9. Nonsectarian was not significant in nine (9) of the ten (10) regressions which it could enter.

10. Humanities was insignificant in seven (7) of the nine (9) regressions which it could enter.

Miller's Highest is the only characteristic variable which demonstrates a somewhat more varied pattern. Miller's Highest is not significant in four (4) of the seven (7) regressions it could enter. Miller's Highest enters two regressions, Protestant (+) and ARTS (+) with positive signs while it carries a negative (-) sign in the Universities regression. The respective elasticities in Table X are +.19, +.10, and -.06.

The pattern of consistency in the significance and signs for many of the characteristics variables within various groups of HEIs also suggests the conclusion, already discussed in connection with Table XI, that some significant changes in SATIL during 1967-71 have been identified in this study which are not explained by the price, income, and market share variables.

Secondary Findings

Is it reasonable to attribute the 1967-71 SATIL experience of the BLACK HEIs to a change in tastes or preferences? Clearly the movement toward Civil Rights for black citizens -- de jure and de facto -- had much to do with the 1967-71 SATIL experiences of predominantly BLACK HEIs. Yet one of the most impressive and unanticipated findings of this study is that these BLACK HEIs, despite the loss of some of their best and brightest students, were not threatened in 1967-71 with extinction due to loss of Market Share (Table VII).

Only Science HEIs in the United States had a better National Market Share retention during 1967-71 (Table VII). This secondary finding was not anticipated.

By contrast, Catholic HEIs in the 1967-71 have the second largest SATIL loss (82.5 percent in Table VII), a slightly larger than av[illegible] loss of market share, and the second highest elasticity (-.66) for STINT. Clearly Catholic HEIs are far more threatened by taste changes and dual tuition policies in their ability to survive compared to BLACK HEIs. Such an outcome was predicted in the literature for BLACK and mainline Protestant HEIs but not for Catholic HEIs.

Also unanticipated is the 106.6 percent 1971 SATIL in Table VII for Invisible HEIs and the above average 1971 National Market Share for Invisible private HEIs of 87.3 percent. The STINT elasticity for Invisible HEIs is -.33. The literature anticipated that Invisible HEIs would have to abandon most admission standards in the face of a declining market share.

The research and doctoral Universities in this study retained the same SATIL in 1971 (100.4 percent). The STINT variable failed to enter the regression for private Universities but STUNIVINT is significant and negative (-). Therefore, during 1967-71 these private Universities appear to be adversely affected relative to in-state public Universities by the dual tuition policy of most states. Perhaps the drastic drop in the market share of private Universities (80.7 percent of 1967 in Table VII) is also related to the student protests at many of these Universities during 1967-71.

Based upon the literature, an expectation was formed that all but the Miller's Lowest and Invisible groups of private HEIs

would have a transition option - a trade-off between student quality and enrollment - which they could exploit in the face of adverse economic events. In fact, only the TOP 50 private HEIs appear to have such a transition option as only the TOP 50 HEIs demonstrate a negative (-) elasticity (Table IX) for the Market Share Change variable.

It was not anticipated that Miller's Lowest HEIs would gain SATIL in many cases (ALL, Catholic, Protestant, Invisible, and ARTS) relative to Miller's Middle HEIs in the same group (Table IX). Protestant and Miller's Highest and ART HEIs also gained SATIL relative to their Miller's Middle peers. Rather the literature search led to the expectation that mainline Protestant, TOP 50, Humanities, Science, and/or Universities within groups of private HEIs would gain SATIL as a result of a shift in preferences toward academic distinction. Such shifts in SATIL favoring these HEIs within larger groups of HEIs can be identified in Table IX for Miller's Highest Protestant HEIs only. In fact, in most cases where elasticities are estimated (Protestant and Science), the signs are all negative (-), just the opposite of the expected result of a search for academic distinctiveness. This expectation was particularly strong for past Science leaders. Yet the signs for Science are consistently negative (-) in Table IX. The loss of student talent (SATIL) at Science leaders relative to other HEIs in the same groups is another unanticipated finding of this study. It was also not anticipated that Science HEIs would have the highest STINT elasticity (-.68) in the study, rather than Miller's Lowest (NS) or Invisible (-.33). Humanities HEIs do not have the same experience during 1967-71 except for those Humanities HEIs which are also Science leaders.

A Final Word

This study has demonstrated that during 1967-71 the rate of change of tuition at private HEIs relative to the rate of tuition change at public HEIs (STINT) adversely affects the SATIL of most (but not all) groups of private HEIs. Therefore this study contributes to the litany of faults and failings identified for or attributed to the dual price system in United States higher education and discussed above. A higher private/public tuition ratio is associated with a decline in the average academic ability of students entering most types of private HEIs.

However, this study also shows that 1967-71 changes in relative private/public tuition (STINT), and the dual tuition policies of states (DSTINT) which help determine such relative tuition changes, do not determine most of the SATIL changes experienced by private HEIs in 1967-71. Most of the SATIL change in this study is related to institutional characteristics and may reflect the consequences of taste changes rather than the impact of a dual-tuition rate policy by states.