

2.0 FINDINGS

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This chapter of the report presents the findings of the study and background information on the issue. The chapter is organized into sections related to the four main objectives or activities of the study:

- Tuition and Fees and Enrollment Information
- Current Board policies;
- Determination of the cost of instruction;
- Analysis of the results of the survey of ACC students; and
- A model for setting out-of-district tuition Revenues and expenditures.

2.1 TUITION AND FEES AND ENROLLMENT INFORMATION

For the purposes of this study, Austin Community College policies, tuition, and enrollment information were compared to those of the other eight large, urban Texas community colleges districts. The seven districts are: Alamo Community College District, Collin County Community College District, Dallas Community College District (Richland College), El Paso Community College, Houston Community College System, North Harris – Montgomery Community College District, San Jacinto Community College District, and Tarrant County Community College District.

In general, tuition and fees at ACC are higher than those charged at the other large, urban community colleges in Texas, on average. (See *Table 2-1* and *Exhibit 1*.) In 1997-98 Austin Community College charged in-district fees of \$38 per semester credit hour compared to an average \$27.32 at other large, urban Texas community colleges and \$28.92 at all Texas community colleges. In 2001-02 ACC charges \$44.58 per credit hour for in-district students, while the other large, urban Texas community colleges are charging an average of \$35.05 per credit hour.

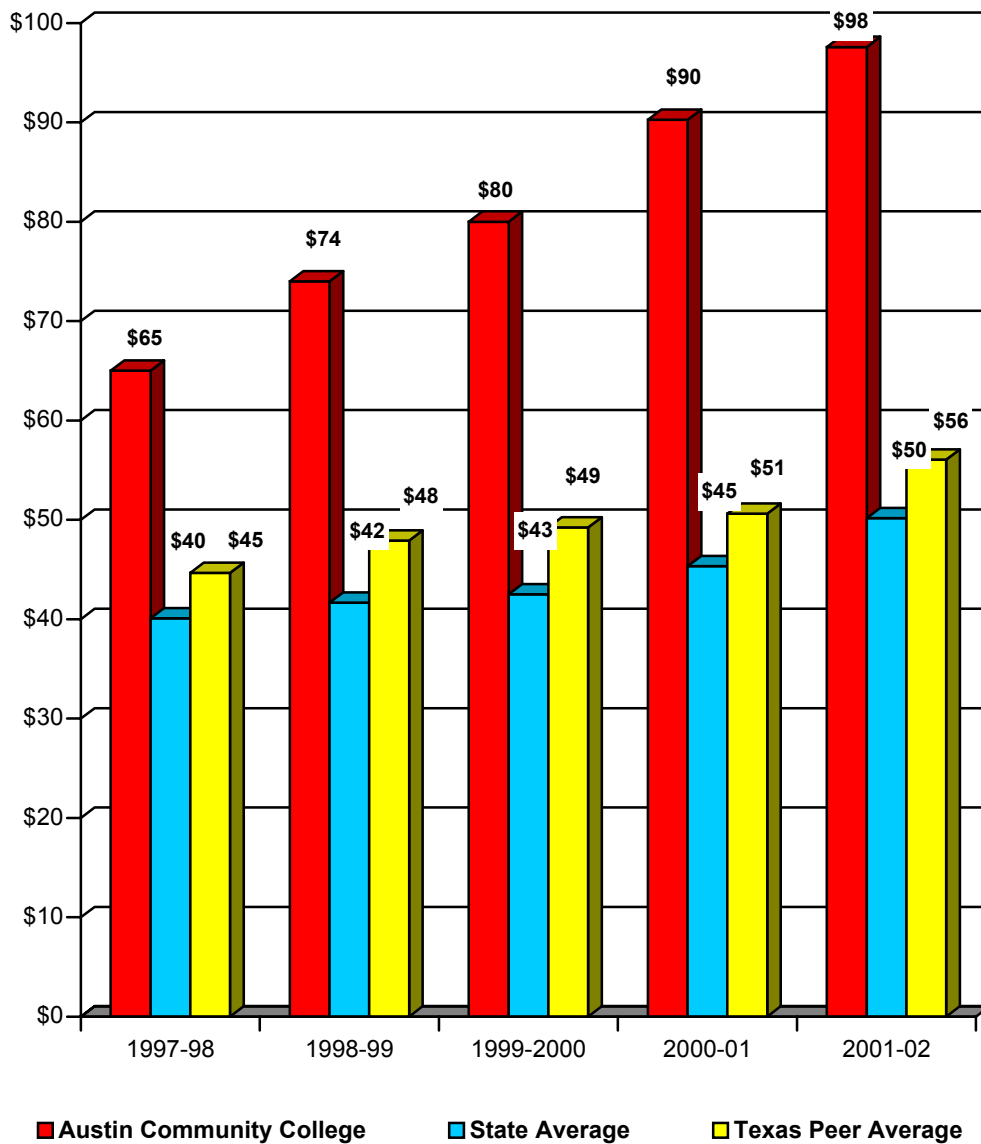
TABLE 2-1
1997-98 TO 2001-2002 TUITION AND FEES PER CREDIT HOUR
AUSTIN COMMUNITY COLLEGE AND TEXAS PEER COLLEGES

IN-DISTRICT	97-98	98-99	99-00	00-01	01-02
Alamo Community College District	\$26.58	\$31.58	\$33.92	\$34.75	\$39.92
Collin County	\$26.75	\$26.33	\$27.58	\$28.00	\$30.42
Richland Community College	\$22.08	\$23.08	\$24.08	\$23.42	\$26.00
El Paso Community College	\$35.00	\$36.25	\$40.92	\$45.92	\$45.92
Houston Community College System	\$28.00	\$30.00	\$32.00	\$37.00	\$39.00
N. Harris – Montgomery	\$27.83	\$30.00	\$29.00	\$31.00	\$32.83
San Jacinto Community College	\$22.50	\$29.25	\$22.67	\$22.83	\$28.50
Tarrant Community College	\$29.83	\$35.25	\$35.42	\$37.25	\$37.83
Peer Average	\$27.32	\$30.22	\$30.70	\$32.52	\$35.05
State Average	\$28.92	\$30.92	\$31.50	\$33.50	\$35.83
Austin Community College	\$38.00	\$41.00	\$41.00	\$45.25	\$44.58
OUT-OF-DISTRICT					
Alamo Community College District	\$53.58	\$53.58	\$55.92	\$56.75	\$65.42
Collin County	\$33.75	\$33.33	\$35.58	\$36.00	\$38.42
Richland Community College	\$37.92	\$38.92	\$44.08	\$43.42	\$46.00
El Paso Community College	\$35.00	\$36.25	\$40.92	\$45.92	\$63.50
Houston Community College System	\$47.00	\$49.00	\$56.00	\$61.00	\$68.00
N. Harris – Montgomery	\$62.00	\$70.00	\$69.00	\$71.00	\$72.83
San Jacinto Community College	\$36.50	\$43.25	\$36.67	\$36.83	\$44.50
Tarrant Community College	\$41.83	\$47.25	\$47.42	\$49.25	\$49.83
Peer Average	\$44.65	\$47.90	\$49.24	\$50.61	\$56.06
State Average	\$40.08	\$41.67	\$42.50	\$45.33	\$50.17
Austin Community College	\$65.00	\$74.00	\$80.00	\$90.25	\$97.58
OUT-OF-STATE					
Alamo Community College District	\$99.58	\$99.58	\$105.58	\$102.75	\$118.42
Collin County	\$68.75	\$68.33	\$70.58	\$71.00	\$75.92
Richland Community College	\$71.42	\$72.42	\$74.08	\$73.42	\$76.00
El Paso Community College	\$56.25	\$57.50	\$58.50	\$63.50	\$63.50
Houston Community College System	\$102.00	\$104.00	\$106.00	\$111.00	\$113.00
N. Harris – Montgomery	\$72.00	\$83.33	\$74.00	\$81.00	\$87.83
San Jacinto Community College	\$66.50	\$73.25	\$66.67	\$66.83	\$70.50
Tarrant Community College	\$147.83	\$151.25	\$149.42	\$149.25	\$148.83
Peer Average	\$85.54	\$88.71	\$88.10	\$89.84	\$94.25
State Average	\$74.50	\$76.92	\$78.00	\$79.75	\$84.58
Austin Community College	\$143.00	\$152.00	\$158.00	\$168.25	\$177.58

Source: Texas Association of Community Colleges

In 1997-98, ACC charged out-of-district tuition and fees of \$65 per semester credit hour, compared to an average of \$44.65 at the other large, urban Texas community colleges and an average of \$40.08 at all Texas community colleges. In 2001-2002 ACC charges \$97.58 per credit hour for out-of-district students, while the other large, urban Texas community colleges are charging an average of \$56.06 per credit hour.

EXHIBIT 1
TUITION AND FEES PER SEMESTER CREDIT HOUR FOR
OUT-OF-DISTRICT STUDENTS, 1997-98 TO 2001-02
AUSTIN COMMUNITY COLLEGE AND PEER COLLEGES



During this five-year time period, the difference between ACC and the other large Texas community colleges has increased from \$20.35 per credit hour to \$41.52 per credit hour, an increase of over 100 percent. On an annual basis, in 1997-98, the average out-of-district student enrolling for 12 hours in the fall and spring semesters at the other large, urban Texas community colleges paid \$1,071.60 compared to \$1,560 at ACC, a difference of \$488.40. In 2001-02, a student at the other large, urban Texas community colleges would pay \$1,345.44 compared to \$2,341.92 for an ACC student, a difference of almost \$1,000.

During the five-year period 1997 through 2001, the number of out-of-district students enrolled at Austin Community College decreased from 7,658 students in the fall semester to 5,301 students, a 30.8 percent decrease. On the other hand, the number of in-district students increased 11 percent from 16,606 to 18,406. This information is displayed in *Table 2-2*.

TABLE 2-2
AUSTIN COMMUNITY COLLEGE
FALL TERM HEADCOUNT ENROLLMENT
IN-DISTRICT AND OUT OF-DISTRICT STUDENTS

FALL SEMESTER	IN-DISTRICT	OUT-OF-DISTRICT
1996	16,606	7,658
1997	17,110	7,637
1998	17,327	7,081
1999	18,434	5,745
2000	18,406	5,301

Source: Austin Community College Form CBM001.

The Texas Higher Education Coordinating Board provides similar, but not identical, information for each community college district in its Annual Data Profile of the community colleges. The THECB data show total annual enrollment for out-of-district students for all academic and technical students enrolled for credit, and includes non-resident students.

Table 2-3 displays information on annual out-of-district credit student counts as reported to THECB for Austin Community College and the other eight large, urban Texas community colleges. During the time period 1996 to 2000, Austin Community College out-of-district enrolled declined by 11.1 percent, or 1,748 students. In total, the other large, urban Texas community college districts increased the enrollment of out-of-district students by 3,613 students, or 4.6 percent.

TABLE 2-3
ANNUAL OUT-OF-DISTRICT CREDIT ENROLLMENTS, 1996 TO 2000
AUSTIN COMMUNITY COLLEGE AND PEER COLLEGES

DISTRICT	1996-97	1997-98	1998-99	1999-2000	CHANGE 1996 TO 2000	
					NUMBER	PERCENT
Austin Community College	15,800	15,422	15,134	14,052	-1,748	-11.06%
Alamo CCD:	8,052	8,259	7,814	8,015	-37	-0.46%
Northwest Vista College	33	32	138	305	272	824.24%
Palo Alto College	1,963	2,018	1,745	1,789	-174	-8.86%
Saint Phillips College	2,020	2,180	2,056	1,952	-68	-3.37%
San Antonio College	4,036	4,029	3,875	3,969	-67	-1.66%
Collin County	4,274	4,992	4,848	5,444	1,170	27.37%
Dallas CCD - Richland	2,076	2,396	2,603	2,875	799	38.49%
El Paso CCD	7,449	7,491	7,023	6,759	-690	-9.26%
Houston CCS	30,309	31,965	33,154	34,664	4,355	14.37%
North Harris-Montgomery Community College District:	9,463	9,510	7,220	6,130	-3,333	-35.22%
Kingwood College	793	798	750	718	-75	-9.46%
Montgomery College	988	1,185	1,008	943	-45	-4.55%
North Harris College	3,486	3,304	2,047	1,723	-1,763	-50.57%
Tomball College	4,196	4,223	3,415	2,746	-1,450	-34.56%
San Jacinto College District:	12,830	12,346	13,202	13,919	1,089	8.49%
Central Campus	5,466	5,085	5,342	5,492	26	0.48%
North Campus	1,889	1,962	2,069	2,265	376	19.90%
South Campus	5,475	5,299	5,791	6,162	687	12.55%
Tarrant County College District::	4,807	4,908	4,848	5,067	260	5.41%
Northeast Campus	1,202	1,034	1,077	1,137	-65	-5.41%
Northwest Campus	945	962	987	967	22	2.33%
South Campus	1,835	1,786	1,646	1,701	-134	-7.30%
Southeast Campus	825	1,126	1,138	1,262	437	52.97%
TOTAL	79,260	81,867	80,712	82,873	3,613	4.56%

Source: Annual data profiles, Texas Higher Education Coordinating Board.

North Harris – Montgomery CCD experienced the largest loss of out-of-district enrollment, 3,333 students, or 35.2 percent while Dallas – Richland College increased the most, 38.5 percent or 1,170 students. Among the nine community college districts in this analysis, North Harris – Montgomery CCD charges the second highest tuition per credit hour for out-of-district students and has the second highest differential between in-district and out-of-district tuition. El Paso CCD also experienced a loss of 9.3 percent or 690 out-of-district enrollments while Collin County, Houston, San Jacinto, and Tarrant all increased out-of-district enrollment over this time period. Collin County, Dallas – Richland, San Jacinto, and Tarrant all increased out-of-district enrollments and had relatively low differentials between in-district and out-of-district tuition rates.

2.2 CURRENT POLICIES ON OUT-OF-DISTRICT TUITION

2.2.1 Education Code of Texas

Chapter 54 of the Education Code of Texas establishes the parameters within which all tuition policies must be set. The Education Code makes the following provision for tuition rates at community/junior colleges:

§ 54.051 (n) Tuition for a resident student registered in a public junior college is determined by the governing board of each institution, but the tuition may not be less than \$8 for each semester credit hour and may not total less than \$25 for a semester. Tuition for a nonresident student is determined by the governing board of each institution but the tuition may not be less than \$200 for each semester.

The complete text of the tuition provisions of the Education Code may be found in Appendix A.

2.2.2 Austin Community College Policies

Austin Community College currently has the following Board Policy regarding tuition rates:

A – 4.

[1] The tuition rates for in-district college-credit students shall be set by the Board. Except when the Board explicitly directs otherwise, tuition rates for other students shall be set by the President in accordance with this policy. To the extent feasible, general charges shall be assessed as tuition.

[2] In order to maintain a tuition differential that is fair both to ACC taxpayers and to Texas-resident ACC students who live outside the taxing district, the credit-hour differential for such students shall reflect the local tax effort in support of in-district students. It shall thus be the ratio of annual property-tax revenues to annual in-district credit hours, except that any term-to-term increase in the differential shall be no more than \$3 per credit hour. The President is authorized and encouraged to use any available method to lessen the impact of this tuition differential on economically disadvantaged students.

[3] The further per-credit-hour differential in tuition rates for students who do not qualify as Texas residents shall be no less than the ratio of all revenues from state government to total credit hours by in-state students.

[4] The President may adopt rules waiving all or part of the tuition and/or other charges for senior citizens or students enrolled under a joint-credit agreement with a school district, with an annual report to the Board on the nature and extent of such waivers.

[5] The President shall set charges for non-credit and continuing-education classes that at least cover operational, indirect, and overhead costs, except where specific below-cost sectors have been approved by Board vote.

2.2.3 Policies of Other Large, Urban Texas Community College Districts

The tuition policies of the eight other large, urban Texas community college districts are included as Appendix A. Each tuition policy was taken from the publications of the community college district, as reported on the institution's web site.

The tuition policies of the Alamo Community College District, Dallas Community College District, Houston Community College System, North Harris – Montgomery Community College District, and Tarrant County College District are in the same format and contain essentially the same policy on out-of-district tuition as specified in the Education Code 54.0521; 19 TAC 21.38 (c). The policies of Collin County Community College District, El Paso Community College District, and San Jacinto College District

are not in the same format as the other five, but contain the same provisions that permit charging out-of-district students an amount different from in-district students. Until the current fiscal year, El Paso Community College did not charge any tuition differential for in-district or out-of-district Texas residents.

2.2.4 Comparisons of the Policies

The Austin Community College policy on out-of-district tuition is the only policy based on a revenue model. Because it is not based on a cost model, or a policy that permits but does not require differentials, ACC's out-of-district tuition policy has led to increases of as much as \$3 per student credit hour (SCH) per semester, or \$9 per SCH each year. Since passage of the policy in 1996, out-of-district tuition has increased \$34 per semester credit hour. As of Summer 2001, out-of-district tuition was set at \$84 per SCH, more than double the in-district rate. In fact, the out-of-district tuition rate at ACC exceeded the out-of-state tuition rate per credit hour for five of the other eight large, urban Texas community college districts: Collin County, Dallas, El Paso Community College, North Harris – Montgomery, and San Jacinto Community College

Table 2-4 displays the 2001-2002 average credit hour charges for in-district and out-of-district students and the differential between in-district and out-of-district for Austin Community College and the comparison Texas colleges. ACC's differential is two-and-one-half times as large as the average for the other eight districts. Differentials varied from a low of \$8 in the Collin County CCD to a high of \$40 in North Harris – Montgomery. All were substantially below ACC's \$53 differential.

TABLE 2-4
AVERAGE 2001-2002 CREDIT HOUR OUT-OF-DISTRICT DIFFERENTIALS
AUSTIN COMMUNITY COLLEGE AND PEER COLLEGES

COMMUNITY COLLEGE	IN-DISTRICT TUITION AND FEES	OUT-OF-DISTRICT TUITION AND FEES	DIFFERENTIAL PER CREDIT HOUR
Alamo CCD	\$30	\$55.50	\$25.50
Collin CCCD	\$30	\$38	\$8
Dallas CCD	\$26	\$46	\$20
El Paso CCD	\$46	\$63.50	\$17.50
Houston CCS	\$39	\$68	\$29
North Harris-Montgomery CCD	\$33	\$73	\$40
San Jacinto CCD	\$28.50	\$44.50	\$16
Tarrant CCD	\$38	\$50	\$12
AVERAGE	\$35	\$56	\$21
Austin CC	\$44.58	\$97.58	\$53

2.3 RESULTS OF THE SURVEY

To determine if increases in out-of-district tuition were resulting in reduced out-of-district enrollments, Austin Community College (ACC) administered a telephone survey on out-of-district tuition to a stratified random sample of its student body. The survey asked students who were enrolled at ACC in Fall 2000 about their experiences with the College, and why they chose to return or not return. A copy of the survey is included as Appendix B.

For the purpose of determining if out-of-district tuition charges were contributing to the decline in out-of-district enrollments, students were categorized into four main groups: in-district non-returning students, in-district returning students, out-of-district non-returning students, and out-of-district returning students. The survey consisted of seven multiple choice or "yes/no" questions and three open-ended questions: "The best thing about ACC is..." "The one thing that would make ACC a better college is..." and "Do you have any other comments about your experiences at ACC?"

Approximately 400 students responded to the survey, 100 in each of the four groups. Over 40 percent of out-of-district students reported that the cost of taking courses at ACC is too expensive, compared to 6 percent of in-district students. This difference in perception is statistically significant at the 0.001 level. Only 6.5 percent of out-of-district students felt that the price was the best thing about ACC compared to 14.5 percent of in-district students.

When asked what one thing would make ACC a better college, 20.5 percent of out-of-district students felt that a reduction of out-of-district costs or expansion of the district borders would make ACC a better college. Only 6.5 percent of in-district students felt that prices needed to be reduced or the district expanded. Campus upgrades, and a more student-minded environment, was recommended by 19 percent of the students surveyed. Suggestions ranged from putting in place a more efficient and user-friendly registration process and allowing online registration, upgrading computer equipment in campus computer labs, and adding more parking for student convenience.

Over 40 percent of all students surveyed believed that convenient class times and locations were positive aspects of ACC. Students, even non-returning students, noted that a campus was close to where the student lived or worked, and that classes needed were offered conveniently. Over all groups, 93 percent rated their experiences at ACC as positive or mostly positive.

Price was a major factor in the decision of out-of-district students not to enroll. Suggestions were made on improving registration, but this was not reported to be a factor in the enrollment decisions of out-of-district students.

2.4 COST OF INSTRUCTION

2.4.1 Definitions of the Cost of Instruction

Across the United States, there are many different definitions of the “cost of education” or “cost of instruction.” (In this paper the terms “cost of instruction” and “cost of education” will be used interchangeably.) Definitions vary because there are many different uses of the cost of instruction. In the context of this report, several different definitions will be explored for their utility in determining how to set out-of-district tuition.

Does the “cost of instruction” mean all education and general expenditures in one year? Does it mean educational and general revenues or expenditures per student? Does it mean state and local appropriations per student? Does it mean state and local revenues per credit hour? Does it mean expenditures per credit hour in each academic discipline? Are there more explicit definitions of the cost of instruction?

The answers to all these questions is “yes.” Each of these definitions has been used by colleges or states to determine the cost of education. In his seminal work, *The Costs of Higher Education*, Howard Bowen defines the cost of education (COE) as current educational and general expenditures, excluding research and public service, and excluding a prorated share of overhead costs attributable to research and public service, such as physical plant, accounting, etc. These expenditures include outlays for instruction, student services, student financial aid paid from institutional funds, and a prorated portion of expenditures for academic support facilities, such as libraries, administration, and plant operation.ⁱ

Definitions of the cost of education vary because of the uses made by institutions and states for the cost of instruction. In 2000, ten states (Arizona, Hawaii, Minnesota, Montana, South Dakota, Tennessee, Utah, Virginia, Washington, and West Virginia) used the cost of instruction in the tuition setting process. Each of these states defined

the cost of instruction somewhat differently, but typically relate tuition and fee charges to the “cost of education” by setting tuition as a specified percentage of the COE. Generally, for community colleges, undergraduate in-district and out-of-district tuition are set at an amount not to exceed 20 to 25 percent of the COE.ⁱⁱ

Arizona defined the cost of education as the average state expenditure made to educate a full-time equivalent student for one academic year. Capital outlay costs including new construction, debt service, and deferred maintenance expenditures were not included in the calculation. Two measures of the COE are calculated: one that includes all state expenditures, and a second that excludes research and public service expenditures.

Minnesota reported that tuition charges were related to a student’s specific COE. To do this, the cost of providing one credit hour of instruction was calculated for each discipline. A student’s tuition then was set equal to a specified percentage of the sum of the credit hour costs for those credit hours for which the student was registered.

Montana, Virginia, West Virginia, and Tennessee set tuition as a specified percent of the cost of education, usually 16-20 percent for community and technical colleges. Each defined the cost of education differently: average instruction expenditures for a full-time student during the academic year; average instruction and instruction-related expenditures for a full-time student for one semester; average per student unrestricted education and general expenditures, minus research and public service; or average per student total unrestricted education and general expenditures.

2.4.2 Direct, Indirect, Fixed, Variable, Semi-Variable, Average, and Marginal “Cost”

Within the costs of instruction, there are direct and indirect costs, fixed costs, average costs, variable costs, and marginal costs. The direct costs of instruction are those derived from expenditures by units (generally, academic departments) involved in

instruction. Indirect costs are those expenditures of administrative and support service units. Fixed costs are those that remain constant over the short run as volume changes. Some fixed costs are expenditures for the president's office, cost of equipment, and the costs of departmental offices.

Variable costs are those that fluctuate in proportion to the volume. Faculty salary costs are perceived to be variable costs. Semi-variable costs are those that are fixed for a certain range of units but become variable when that range is exceeded. For example, the cost of the room space to offer a class is fixed until the room becomes full. Once the capacity of the room is reached, another room will be needed. Similarly, supplies and the costs of non-instructional support staff are semi-variable.

An average cost is determined by taking total costs and dividing by one unit, be it full-time equivalent student or one headcount student. A marginal cost is one that is related to the increase in or decrease in total cost attributable to the addition or subtraction of one unit. Identification of marginal costs requires large amounts of data, and more complex statistical procedures. The concept of marginal costs is very important in the context of the "cost of instruction" as used in tuition setting at Austin Community College. The cost of adding one student at the margin needs to be considered in the process.

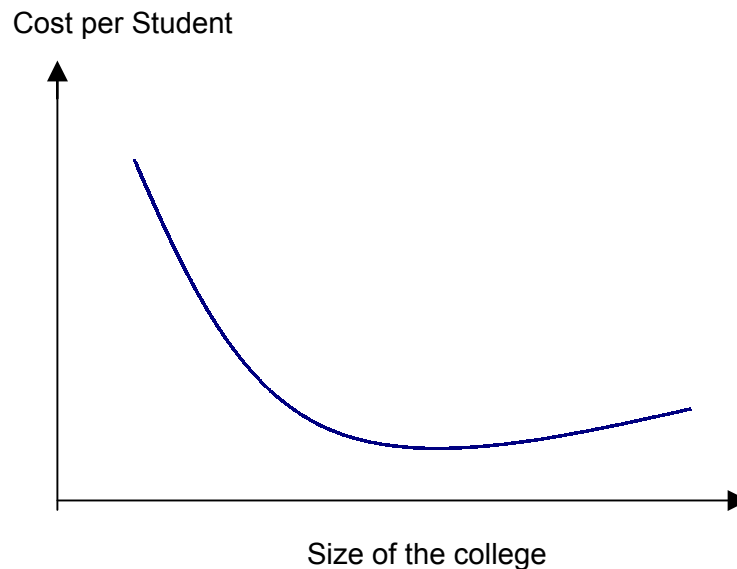
In higher education, the most frequently used "unit" is a "full-time equivalent student" (FTES), or a student credit hour. The majority of unrestricted revenues is tied to students, either through the state appropriations process, which is based on FTES, or through tuition and fees. The marginal cost of an additional student is particularly important as various meanings for the "cost of instruction" are explored.

2.4.3 *Economies of Scale and Scope*

One of the basic principles of economics is that the size or scale of operation is likely to effect the cost of one unit of production. In higher education, an increase in the size of the institution may result in reductions in unit costs, or cost of a full-time equivalent student; this phenomenon is called an *economy of scale*. Similarly, if increases in institutional size result in increases in unit costs or the cost of a full-time equivalent student, the phenomenon is called a *diseconomy of scale*. Funding mechanisms such as the funding formula used in Texas may recognize these differences by providing a fixed cost factor such as a minimum guaranteed funding base to ensure that smaller institutions have the necessary resources to offer a basic level of services; or by providing differential amounts for more complex institutions.

A typical relationship between size and cost is shown in *Exhibit 2*. As institutional size increases, factors that appear to decrease unit cost tend to predominate until a point is reached when factors raising unit costs tend to be predominant. The result is a u-shaped curve where the minimal point on the curve represents the lowest unit cost. In higher education, this lowest point may actually be a range over which the factors that keep costs down and those that drive costs up are in balance.

EXHIBIT 2
HYPOTHETICAL COST CURVE BETWEEN SIZE OF COLLEGES
AND COST PER STUDENT



Bowenⁱⁱⁱ notes that the primary factors that drive the costs of higher education down is what he calls the “lumpiness” of many of the resources used. For a college to operate at all, it must have some faculty, a few administrative officers, some buildings and grounds, books, and equipment whether the college enrolls five students or 5,000. These costs to operate an institution or program no matter how many students are involved are called “fixed costs,” as defined above. The cost per student for these initial overhead items or fixed costs decreases as the number of students increases, until a point is reached when the staff and facilities are fully employed and an additional student would require additional resources. The costs that are added for additional students or additional outputs are called “variable costs.” “Marginal costs” are defined as those costs associated with the recent addition or deletion of students from a program; the terms “variable” and “marginal” costs are sometimes used interchangeably, and will be used interchangeably in the discussions on cost at ACC.

As the institution expands further, more resources would be added in the lumpy fashion, with costs continuing to be spread over additional students, and unit costs again would fall. Large enrollments also increase average class size, resulting in further economies of scale because instructors' salaries remain the same, but are spread over more students.

Bowen also notes that the "lumpiness" of resources gives rise to three different types of diseconomies of scale. One of these diseconomies is the rising cost of institutional coordination of larger and more academic units within the college. While Bowen calls this a diseconomy of scale, other economists label this phenomenon a "*diseconomy of scope*."^{iv} Economies of scope are defined by Cohn et al as "complementarity between outputs that results in lower per-unit costs when two more outputs are produced simultaneously."^v In other words, economies of scope occur when a college produces credit hours, continuing education hours, and public service.

A second diseconomy of scale noted by Bowen is the possible deterioration in quality as the size of the college increases. He calls a deterioration in quality an increase in unit cost because the value of the service decreases. The third diseconomy of scale occurs, according to Bowen, when increasing size results in additional recruitment expenditures and student financial aid, thus increasing unit costs.

Bowen was not the first economist to study economies and diseconomies of scale in higher education. Early studies were completed in the 1920s, but the first studies of note were completed in the 1960s, all showing that certain economies of scale did exist for colleges.^{vi} In 1972, the Carnegie Commission on Higher Education determined that there was a definite relationship between size of an institution and cost per student. For a public community college, cost reductions occurred at the breaking point between 600 and 800 full-time equivalent students.^{vii} Earlier work by the Commission had resulted in these recommendations for optimal college/university size:

	MINIMUM	MAXIMUM
Doctoral universities	5,000	20,000
Comprehensive universities	5,000	10,000
Liberal arts colleges	1,000	2,500
Two-year colleges	2,000	5,000 ^{viii}

Obviously, **ACC is above the maximum size for most efficient operation.**

In his seminal work on university costs, Bowen concluded the following:

- Large institutions spend a substantially smaller percentage of their educational expenditures for institutional support and student services than do small institutions.
- Most large institutions spend relatively less per student for plant operation and maintenance than do small institutions.
- Large institutions spend a greater percentage of their resources for teaching than do comparable small institutions.
- Size appears to have no consistent effect on the percentages spent for scholarships and for academic support. However, large institutions spend relatively less on libraries than do small institutions.^{ix}

Bowen concluded that economies of scale appear to be most pronounced for institutional support, student services, and plant, resulting in large institutions being able to devote a larger share of their resources to instruction. As a result, larger institutions were able to pay higher average faculty salaries than smaller institutions could. Similarly, large institutions had less building space per student than smaller institutions and also employed relatively more “other staff” than small institutions.

Paul Brinkman and Larry Leslie completed a meta-analysis on 60 years of research on economies of scale in higher education.^x The literature in the review included books, dissertations, reports, and journals dating from the 1920s. For two-year institutions, their review of the studies found the following:

- Large economies of scale are found in expenditures for administration and operation and maintenance of plant.
- Total educational and general costs per student decrease as size increases.

- Substantive size-related economies of scale are most likely to occur at the low end of the enrollment range.
- Instructional expenditures have the least reductions in unit costs related to size.
- The extent to which a set of institutions experience economies or diseconomies of scale depends on the scope and variety of programs and services offered (i.e., economies and diseconomies of scope), salaries paid, and how resources are used on the campus.
- Institutions with between 1,000 and 2,000 FTE students can experience adverse economies of scale.

In contrast to the meta-analytical results, Broomall et al. examined economies of scale for Virginia institutions using regression analysis and concluded that economies of scale are not a function of the type and size of a college or university. Moreover, no economies or diseconomies of scale or scope appeared as complexity or size of the institution increased.^{xi}

2.4.4 Calculation of Marginal and Average Cost of Instruction

Although a significant body of literature exists on average costing for colleges and universities, there is not much on the calculation of marginal or variable costs for a two-year college because the measurement issues and techniques are so complex. To calculate average costs, the total of revenues or expenditures is determined, and divided by some unit of student measure, such as the number of full-time equivalent students, the number of headcount students, or the number of weighted or unweighted student credit hours.

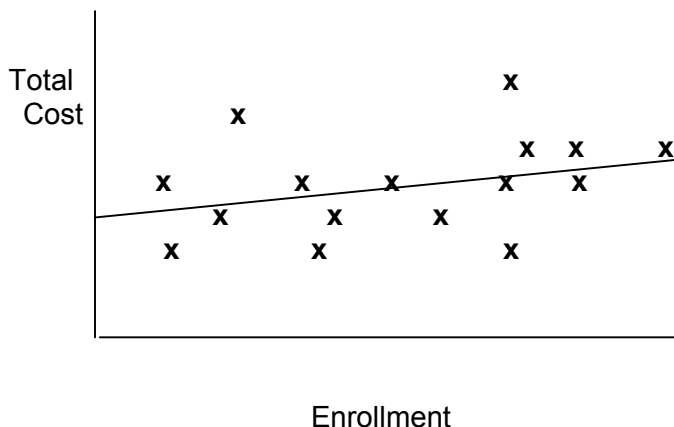
There are three basic methods for computing or estimating marginal costs, and each may be used at various levels of detail: the regression method, the fixed- and variable-cost method, and the incremental-cost method.

2.4.4.1 Regression Method

Regression is a statistical technique that may be used to estimate relationships between costs and a measure of output, such as full-time

equivalent students.^{xii} The figure in *Exhibit 3* represents a simple linear regression of total cost and enrollment for a group of institutions, such as all community colleges in Texas.

EXHIBIT 3
EXAMPLE OF THE REGRESSION METHOD OF
DETERMINING MARGINAL COST



The regression technique is used to “fit a line” through the “x”, and the slope of the line mathematically represents the relationship between total costs and enrollment, and is an estimate of the marginal cost of an additional student. This technique is used in many business settings to estimate marginal costs but is very difficult to estimate with precision.

2.4.4.2 The Fixed-and Variable-Cost Method

The fixed- and variable-cost method involves the classification of all the costs of an institution as either fixed or variable. Once costs are classified, the marginal cost analysis is relatively simple: the estimate of marginal cost is simply the average variable-cost. Fixed costs are thus excluded from the analysis.^{xiii}

In this method, policy determines the classification of costs into the fixed and variable category. For example, for each academic department, administrative salaries for the chair and support personnel, and equipment would

be classified as fixed costs, while faculty and supplies could be considered variable costs. The difficulty is in classifying all costs into the fixed and variable categories, and in completing a cost study so that all costs can be allocated into the fixed or variable category. Cost studies are time consuming and expensive to complete, if done at a level of detail sufficient to allocate faculty and staff time across categories. In addition, the classification of expense categories into fixed or variable costs is almost entirely judgmental and political.

2.4.4.3 The Incremental – Cost Method

The incremental method estimates the costs directly related to changes in volume. Each periodic (usually annual) change in total costs is assessed to determine if it is most appropriately associated with changes in volume, with changes in the environment, or with decision factors.^{xiv} Costs related to environmental or decision factors are removed from the analysis and the remainder is divided by the change in volume (number of credit hours or FTES). For example, consider the case where the cost of operating academic programs rose by \$1,000,000 from one year to the next, and the number of student FTES generated fell by 60, and \$900,000 of the increased cost was due to inflation (which is an environmental factor), and \$190,000 was attributable to the addition of five new programs with a new faculty member for each program (a decision factor). The residual of -\$90,000 would be the effect of volume changes. Dividing this volume change by the change in enrollment (-60) results in a marginal cost of \$1,500 per student.

The incremental approach is theoretically a simple method, but separating environmental and decision factors is very complex.

2.4.4.4 Calculation of Marginal and Average Cost of Instruction of Austin Community College

To demonstrate the differences in methods of estimating the average and marginal (variable) cost of instruction at Austin Community College, each of the calculation methods discussed above were used, and compared to the average cost of instruction under various definitions of the cost of instruction. For the purposes of this study, the following definitions of “cost of instruction” were used:

- A. *Total Education and General Expenditures per Full-time equivalent student*
- B. *Total Education and General Expenditures per annual credit hour*
- C. *Total Education and General Expenditures, less Public Service, per FTES*
- D. *Total Education and General Expenditures, less Public Service, per annual credit hour*
- E. *Total Education and General Expenditures, less Public Service and Plant, per FTES*
- F. *Total Education and General Expenditures, less Public Service and Plant, per annual credit hour*
- G. *Expenditures for Instruction, Student Services, and Academic Support per FTES*
- H. *Expenditures for Instruction, Student Services, and Academic Support per annual credit hour*

First, the marginal or variable cost of instruction was calculated using the regression method. As the figures in *Table 2-5* show, the regression method does not work well for calculating marginal costs for ACC since the models did not explain the variation in costs. (The column headings in *Table 2-5* correspond to the definitions of Cost of Instruction listed above.) Data for five years (1997 to 2001) were used in the regressions and perhaps there was not sufficient variance in the costs to generate a good model, or more observations over a longer time period need to be made. The marginal costs that result from these analyses do not meet the test of plausibility: that is, it is unlikely that costs per student or per credit hour are decreasing at the margins, since ACC is larger than the size at which economies of scale are likely to result.

TABLE 2-5
COMPARISONS OF CALCULATION OF MARGINAL COST OF INSTRUCTION

DEFINITION	REGRESSION VALUE		AVERAGE COST
	R-SQUARE	MARGINAL COST	
A	0.019	-\$9,003	\$7,265
B	0.003	-\$19	\$190
C	0.009	-\$5,794	\$7,097
D	0.002	-\$14	\$186
E	0.034	-\$11,796	\$6,544
F	0.010	-\$35	\$171
G	0.073	-\$9,228	\$5,111
H	0.010	-\$35	\$134

The second method of calculating marginal costs, the fixed- and variable-cost method, then was calculated and compared to the average cost. For this calculation, it was necessary to classify all of the different categories of expenditures at ACC as either fixed or variable. When this process was complete, costs that do vary with enrollment were summed and defined as total variable cost. Average variable cost, or total variable cost divided by output defined either as total credit hours or FTES, was then used as an estimate of marginal cost. To do this properly would have required a complete cost study, which is beyond the scope of this study. Consequently, estimates of the fixed costs were made by using algorithms rather than the policy decisions on the variability of various categories of costs. These policy decisions can be basically political decisions on the calculation of costs.

FY 2001 data were used in this calculation of the marginal or variable cost of instruction. In the calculation of the marginal costs, all expenditures for Public Service were excluded from the calculation; Public Service by definition is unrelated to the students of the institution. All direct classroom-teaching costs were assumed to be variable, but indirect costs of deans and department offices were defined to be

independent of enrollment, and therefore, fixed costs. For these functions, approximately 20 percent of the Instruction program expenditures were defined to represent fixed costs. Operation and Maintenance of Physical Plant was defined to be 80 percent fixed cost, since the plant exists independent of the number of students, but certain utilities and other expenses are related to the size of the student body. The costs of institutional support were defined to be 80 percent fixed costs, and the remaining 20 percent variable, depending on the number of staff required to serve students. Similarly, 30 percent of the costs of the Student Service program were defined to be fixed, and the remainder dependent on the number of students to be registered, advised, etc. Likewise, 40 percent of the cost of Academic Support was defined as a fixed cost, since the Learning Resources Centers have to exist no matter how many students use the facilities. Scholarships program was defined to be 100 percent variable.

Mathematically, the calculation to determine what were variable costs can be expressed as follows:

Total Variable Costs = Total FY 2001 unrestricted education and general expenditures less 20 percent of unrestricted Instruction expenditures, less unrestricted Public Service expenditures, less 40 percent of unrestricted Academic Support expenditures, less 30 percent of unrestricted Student Services expenditures, less 80% of unrestricted Institutional Support expenditures, less 80% of unrestricted Physical Plant expenditures.

Or, Total Variable Costs = \$95,638,543 - \$9,808,158 - \$2,209,930 - \$3,385,185 - \$2,956,198 - \$14,871,645 - \$5,831,686 = \$56,605,741

Marginal Cost per FTES = Total variable costs divided by the number of FTES = \$4,300

Marginal Cost per Annual Credit Hour = Total variable costs divided by the number of annual credit hours = \$112.51

These calculations compare to the average cost per FTES of \$7,097 and per annual credit hour of \$186.

The third method of calculating marginal costs, the Incremental-Cost Method, was then calculated for ACC based on the change in costs and enrollments between FY 2000 and FY 2001. By subtracting one year's expenditure from the next year's, a gross change in expenditure levels can be calculated, which then may be divided by the change in the number of units of output, either FTES or annual credit hours produced. While this calculation does not exactly equal the marginal cost, it is an estimate for this increment or decrement in the scope of the college. Moreover, that cost is effected by environmental and decision factors, as well as volume factors. Consequently, the change must be adjusted for changes in the cost of living, which is perceived to provide a reasonably accurate estimate.^{xv}

For ACC, this method would be calculated as follows:

FY 2001 E & G Expenditures (less public Service) – FY 2000 E & G Expenditures (less public Service) = Change in Total Expenditures

Change in Total Expenditures – Change due to Inflation = Net Change in Total Expenditures

FY2001 Student Count – FY2000 Student Count = Change in Total Output

Marginal Cost = Net Change in Total Expenditures divided by Change in Total Output.

For ACC, the numbers are as follows:

	EXPENDITURES	FTES	ANNUAL CREDIT HOURS
FY 2001	93,428,613	13,164	503,116
FY 2000	84,247,914	13,222	506,339
Change in total Expenditures	9,180,699	-58	-3,223
Change due to inflation	9,547,676		
Net Change	-366,977	-58	-3,223
Marginal or Variable Cost		6,327	114
AVERAGE COST		6,544	171

In this case, the marginal or variable cost is less than the average cost.

In summary, a series of marginal cost calculations were made under three different methods of calculating marginal costs: the regression method, the fixed- and variable-cost method, and the incremental-cost method. The regression approach did not provide a useful method of calculating marginal costs of instruction for ACC. The average cost, fixed- and variable-cost method of marginal cost, and the incremental-cost method are compared below.

METHOD	COST PER FTES	COST PER ANNUAL CREDIT HOUR
Average Cost	\$6,544	\$171
Fixed-and Variable-cost Method	\$4,300	\$113
Incremental-cost Method	\$6,327	\$114

2.5 RECOMMENDED MODEL FOR SETTING OUT-OF-DISTRICT TUITION

To develop a recommended model for setting out-of-district tuition, Austin Community College’s policy was analyzed in the context of the Texas statutes and the policies of other large, urban Texas community college districts. In addition, the analysis was placed in the context of the results of the student survey, and in the context of the literature and research on costing and economies of scale.

In our examination of ACC’s out-of-state tuition policy, MGT made these observations, each of which is coupled with a recommendation:

Observation: ACC’s procedures call for the setting of separate tuition rates for each semester. None of the other community colleges have a policy that requires that tuition rates be adjusted each semester, unless fiscal situations are so constrained that additional revenues are required to maintain the quality of services. In fact, very few colleges or universities adjust tuition oftener than once per year. Further, the local tax revenues on which the calculation is based do not change during the fiscal year, unless collections are significantly lower than expected.

Adjusting tuition each semester does not provide the opportunity for students to plan their expenses and budgets. In addition, changing of tuition rates each semester introduces redundant procedures and makes additional work for college offices. For example, this process requires that the Financial Aid Office recalculate the cost of attendance for every student receiving student financial aid. This is a tremendous burden to place on the Financial Aid Office, and requires that additional staff and systems be in place every semester to handle the additional workload.

RECOMMENDATION ONE:

Modify Board policy to set tuition once for each fiscal year. Do not adjust tuition prices for any group of students (in-district, out-of-district, or out-of-state) oftener than once per year so that students may plan their budgets.

Observation: ACC's policy is the only out-of-district tuition policy (among the large, urban Texas community college districts) that is based on revenues, and calculates tuition using the yardstick of local tax collections. The policy has contributed in part to declining out-of-district student enrollment (as demonstrated by the results of the survey), and consequently, to less state appropriations. For every student that ACC "loses" because of increases in out-of-district tuition, there is a loss of that student's tuition, and a loss of the average state appropriation for a student. In FY 2001, the state appropriation was \$73 per credit hour, or \$2,803 per FTES.

Observation: The calculation method used by ACC based on local tax revenues per student or per student credit hour is extremely volatile. As was mentioned above, local tax revenues are the same for the entire year, unless collections are below expectations. Thus, the only change in the calculation is the number of in-district students or student credit hours. If the number of credit hours taken by in-district students declines from the previous semester, then the cost to an out-of-district student increases, even though local tax revenues have not increased. If the number of in-district student credit hours increases, then the cost to an out-of-district student should

decrease. The cost to an out-of-district student is perfectly correlated with changes in the number of student credit hours taken by in-district students, not to any change in local tax effort.

RECOMMENDATION TWO:

Modify Board policy so that out-of-district tuition is not based on revenues. Rather, base out-of-district and out-of-state tuition on the cost of education.

Observation: The current calculation method for out-of-district students is based on average local tax revenues per credit hour or per student, not on marginal or variable revenues. As the preceding discussion on marginal or variable cost demonstrates, the “cost” of a student or a credit hour on the margin is substantially different from the average cost. The literature on costs in higher education supports the contention that costs used in setting funding or prices should be based on marginal or variable rather than average costs.

RECOMMENDATION THREE:

If tuition for out-of-district students is to be based on some measure of the cost of instruction, then marginal or variable costs as opposed to average costs should be considered for use in the methodology.

Observation: Local tax revenues are used for expenditures for items other than the educational services that students receive. Expenditures are made for items classified as “Public Service” and by definition, do not relate to the students at the institution. In addition, some expenditures included in “Educational and General Expenditures” in the Instruction category are made for adult basic education and continuing education that are self-supporting and not attributable to the educational services of the average student.

RECOMMENDATION FOUR:

Exclude from the calculation of the cost of education or cost of instruction all expenditures classified in the “Public Service” category of expenditure, and all expenditures for continuing education and adult basic education.

Observation: A number of different definitions can be given for the “cost of education or instruction” upon which to base tuition charges. Those explored in this study have been Total Unrestricted Educational and General Expenditures, Total Unrestricted Educational and General Expenditures less Public Service, Total Unrestricted Educational and General Expenditures less Public Service and Plant, and Unrestricted Instruction and Instruction-Related Expenditures (Instruction, Academic Support and Student Services). The average cost of education and the marginal cost of education were calculated for most of these definitions of cost. Any of these could be used to determine the tuition to charge out-of-district and out-of-state students.

RECOMMENDATION FIVE ON THE COST OF EDUCATION:

Modify Board policy so that out-of-district tuition rates are based on the Cost of Education, as defined by one of the following alternatives:

ALTERNATIVE ONE: Calculate out-of-district tuition as a percentage of the average cost of education, where the cost of education is defined as Total Unrestricted Educational and General Expenditures less expenditures for Public Service, Continuing Education, and Adult Basic Education.

FY 2001 state appropriations were equal to 40.5 percent of COE (using the Alternative One definition), and in-district tuition was 18.2 percent of the COE. If out-of-district tuition were set at 40 percent of the COE (an amount equivalent to state appropriations’ share of the COE), or more than double in-district tuition, then out-of-district tuition would have been \$72.50 per credit hour. This rate would be \$25 less than current out-of-district tuition per credit hour, but \$22 above the average for the other large, urban Texas community college districts. This rate would have been more in line with the surrounding community college districts, also.

If the rate were to be set at 50 percent of the COE, then tuition would have been \$90.66, approximately equal to actual ACC out-of-district rates in FY 2001. For out-of-state students, the tuition rate would be set equal to 100 percent of the COE, or \$181

per credit hour, \$13 higher than ACC's FY 2001 out-of-state rates. The 50 percent rate is suggested by the policies in place in other states that tie out-of-district and out-of-state rates for community colleges to 50 percent of the COE.

ALTERNATIVE TWO: Calculate out-of-district tuition as a percentage of the average cost of education, where the cost of education is defined as the marginal or variable cost for Total Unrestricted Educational and General Expenditures less expenditures for Public Service.

This recommendation is made based on the fact that changes in the cost of education are occurring at the margin, and additions or decrements in the number of students or credit hours occurs at the margin, not at the average. Using 40 percent of the marginal cost of education, as calculated under the fixed- and variable-cost method would result in an out-of-district tuition charge of \$45 per credit hour, while 50 percent of the marginal cost would be \$56 per credit hour, substantially less than current rates.

If the marginal cost of education were to be computed under the incremental-cost method, then 40 percent of the COE would set an out-of-district tuition rate of \$45.60 per credit hour and 50 percent of the COE would equal \$57 per credit hour. Out-of-state students would pay \$114 per credit hour, also less than current charges.

When combined with Recommendations One through Four, the result would be the following: **Modify Board policy to set tuition once per year based on the cost of education, where the cost of education is defined as "Total Unrestricted Education and General Expenditures, less expenditures for Public Service, Continuing Education, and Adult Basic Education."** Consider using the marginal cost of education, as opposed to the average cost of education.

ENDNOTES

ⁱ Bowen, Howard R. 1980. *The Costs of Higher Education*. San Francisco, CA: Jossey-Bass, Inc.

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ⁱⁱⁱ Bowen, Howard R. 1980. *The Costs of Higher Education*. San Francisco, CA: Jossey-Bass, Inc.

^{iv} Cohn, Elchanan; Rhine, Sherrie; and Santos, Maria. 1989. "Institutions of Higher Education as Multi-Product Firms: Economies of Scale and Scope," *Review of Economics and Statistics*, 71, 2 (May, 1989) pp. 284 – 290.

^v Ibid., p. 285.

^{vi} See for example, Hungate, Meeth and O'Connell, "The Quality and Cost of Liberal Arts College Programs" in E.J. McGrath *Cooperative Long Range Planning in Liberal Arts Colleges*. 1964. New York, Columbia University; Hawley, Boland and Boland, "Population Size and Administration in Institutions of Higher Education," *American Sociological Review*, 30 (April 1965): pp. 252-255.

^{vii} Carnegie Commission on Higher Education. 1972. *The More Effective Use of Resources*. New York: McGraw-Hill.

^{viii} Carnegie Commission on Higher Education. 1971. *New Students and New Places*. New York: McGraw-Hill.

^{ix} Bowen, op. cit., p. 182.

^x Brinkman, Paul and Leslie, Larry. 1986. "Economies of Scale in Higher Education: Sixty Years of Research," *Review of Higher Education*. Association for the Study of Higher Education, v. 10, no. 1

^{xi} Broomall, Lawrence W. B.T. McMahon, G.W. McLaughlin and S.S. Patton. 1978. *Economies of Scale in Higher Education*. Blacksburg, VA: Virginia Polytechnic Institute Office of Institutional Research.

^{xii} Allen, Richard and Paul Brinkman. 1983. *Marginal Costing Techniques for Higher Education*. Boulder, CO: National Center for Higher Education Management Systems.

^{xiii} Ibid.

^{xiv} Ibid.

^{xv} Ibid.