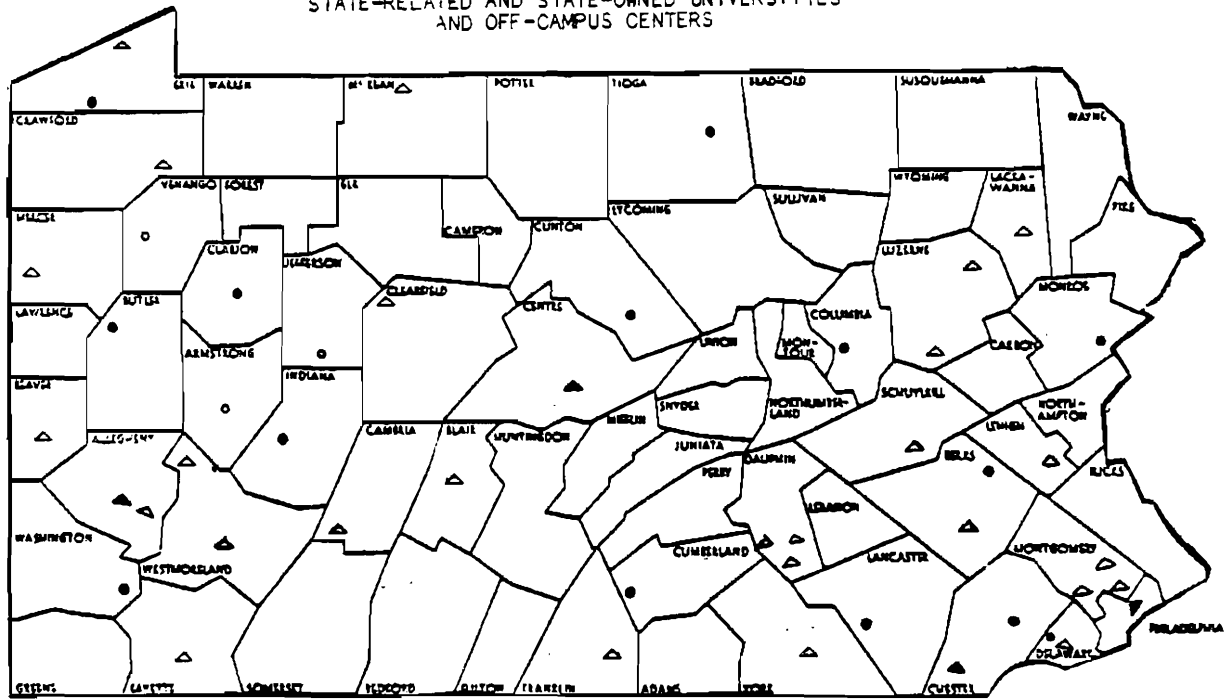


**INSTRUCTIONAL OUTPUT
AND FACULTY SALARY COSTS
OF THE STATE-RELATED
AND STATE-OWNED UNIVERSITIES**

**ANALYSIS OF 1986-87 DATA
REPORTED UNDER 1986 APPROPRIATIONS ACTS
AND PUBLIC SCHOOL CODE**

**Staff Report
General Assembly of the Commonwealth of Pennsylvania
JOINT STATE GOVERNMENT COMMISSION
108 Finance Building
Harrisburg, Pennsylvania
February 1988**

STATE-RELATED AND STATE-OWNED UNIVERSITIES
AND OFF-CAMPUS CENTERS



- ▲ State-related university
- State-owned university
- △ Branch of State-related university
- Branch of State-owned university

State-Related Universities

- | | |
|---|---|
| <p>Penn State (Centre)
 Allentown Campus (Lehigh)
 Altoona Campus (Blair)
 Beaver Campus (Beaver)
 Behrend College (Erie)
 Berks Campus (Berks)
 Capitol Campus (Dauphin)
 Delaware Campus (Delaware)
 DuBois Campus (Clearfield)
 Fayette Campus (Fayette)
 Hazleton Campus (Luzerne)
 Hershey Medical Center (Dauphin)
 King of Prussia Center for
 Graduate Studies (Montgomery)
 McKeesport Campus (Allegheny)
 Mont Alto (Franklin)
 New Kensington (Westmoreland)
 Ogontz Campus (Montgomery)
 Schuylkill Campus (Schuylkill)</p> | <p>Penn State (Centre) (cont.)
 Shenango Valley Campus (Mercer)
 University Center
 at Harrisburg (Dauphin)
 Wilkes-Barre Campus (Luzerne)
 Worthington Scranton
 Campus (Lockawanna)
 York Campus (York)
 Pittsburgh (Allegheny)
 Bradford Campus (Mckean)
 Greensburg Campus (Westmoreland)
 Johnstown Campus (Cambria)
 Titusville Campus (Crawford)
 Temple (Philadelphia)
 Ambler Campus (Montgomery)
 University Center
 at Harrisburg (Dauphin)
 Lincoln (Chester)</p> |
|---|---|

State-Owned Universities

- | | |
|--|---|
| <p>Bloomsburg (Columbia)
 California (Washington)
 Cheyney (Delaware)
 Clarion (Clarion)
 Venango Campus (Venango)
 East Stroudsburg (Monroe)
 Edinboro (Erie)
 Indiana (Indiana)
 Armstrong Campus (Armstrong)
 Punxsutawney Campus (Jefferson)</p> | <p>Kutztown (Berks)
 Lock Haven (Clinton)
 Mansfield (Tioga)
 Millersville (Lancaster)
 Shippensburg (Cumberland)
 Slippery Rock (Butler)
 West Chester (Chester)</p> |
|--|---|

FOREWORD

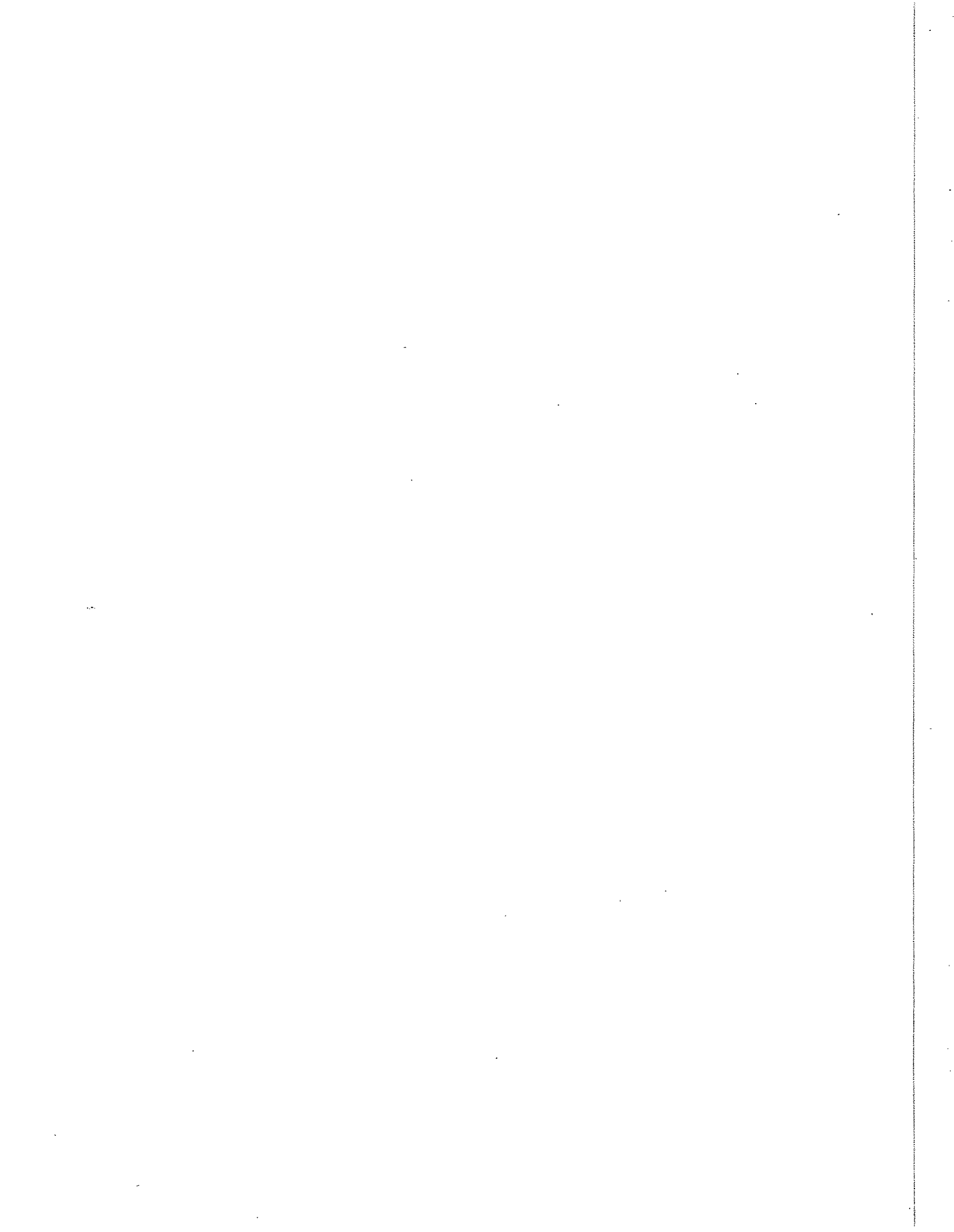
This 15th annual report contains an analysis of the instructional output, instructional faculty salary cost, tuition and appropriations for Pennsylvania's State-related and State-owned universities--the Commonwealth's public universities.

1986-87 output, salary cost, tuition and appropriation data from the universities and other sources are summarized and significant changes from the previous year noted. Prior years' data for the same variables are presented and underlying trends pointed out.

Output and salary data are combined to form a measure of cost efficiency--instructional faculty salary cost per student credit hour produced. Tuition and appropriation data are combined to form a measure of cost sharing--the percentage of total instructional cost borne by taxpayers.

Finally, data from other sectors of higher education in Pennsylvania and from other states are introduced to place the data and analysis for the public universities into perspective.

DONALD C. STEELE
Research Director
Joint State Government Commission



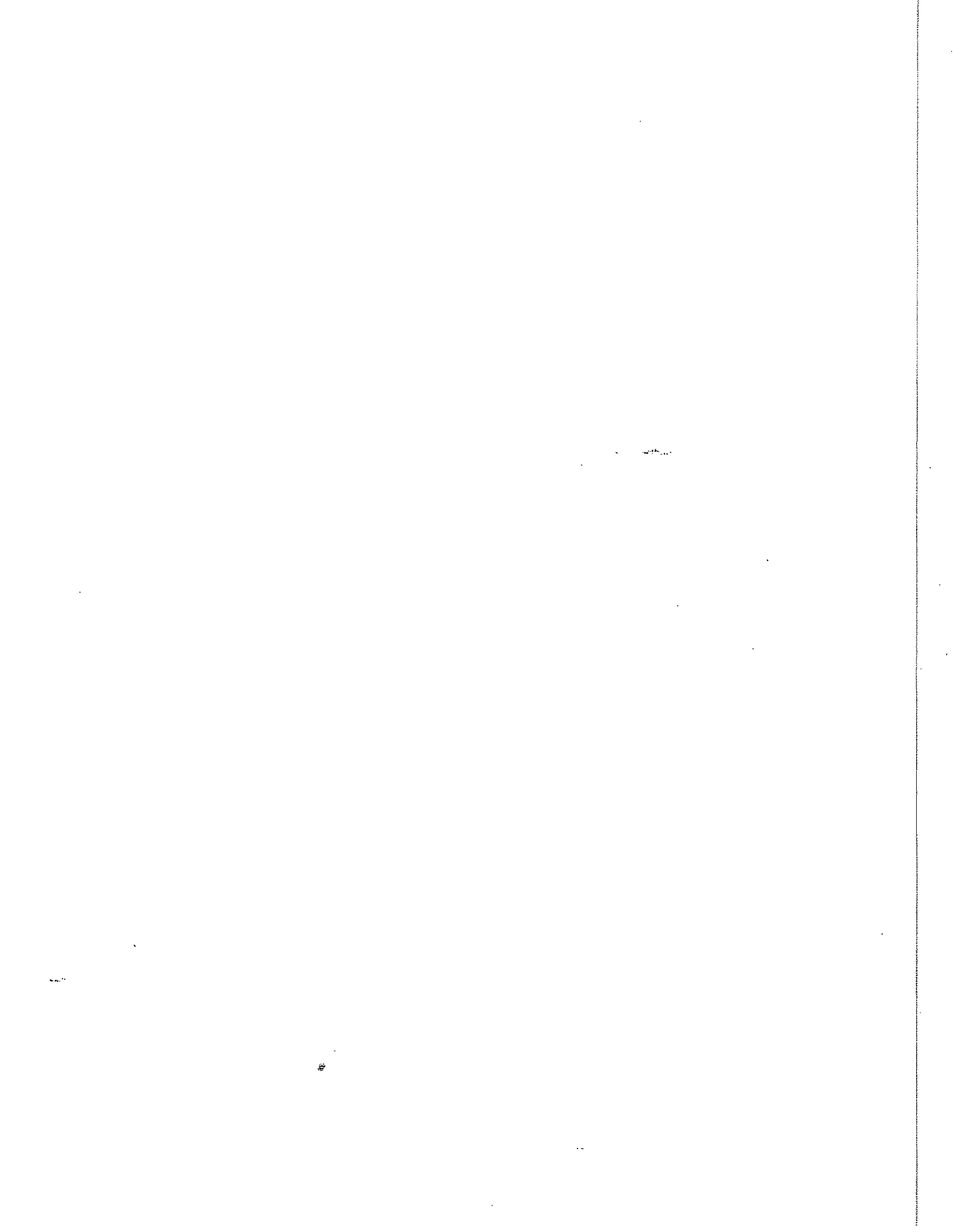
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SUMMARY

1. In Fall 1986, of the total number of full- and part-time students enrolled in institutions of higher education in Pennsylvania, approximately 40 percent were enrolled in the Commonwealth's public universities: 130,605 in the 4 State-related universities and 86,165 in the 14 State-owned universities. From the previous year, the total number of full-time equivalent (FTE) students, based on student credit hours produced, increased by 1 percent in the State-related universities as a group, and by 3 percent in the State-owned universities as a group.
2. During the 1986-87 school year, the number of bachelor's and graduate degrees conferred by the public universities, not including medical degrees, totaled 35,828: 20,941 by the State-related universities and 14,887 by the State-owned universities. From the previous year, these degree totals represent a decrease of 1 percent for the State-related group, and an increase of 2 percent for the State-owned group.
3. Since 1981-82, the total number of FTE students in the public universities has remained fairly stable, despite a decline in the Commonwealth's population of 18- to 24-year-olds by over 11 percent. This stability would appear to be attributable to a larger percentage of Pennsylvania high school graduates attending the public universities, and to a relative increase in the enrollment of older "non-traditional" students attending these institutions.
4. In Fall 1986, the overall workweek of the full-time employed faculty averaged 51.5 hours at the State-related universities, and 55.1 hours at the State-owned universities. Student contact hours averaged 8.8 and 11.6 for the two groups of institutions, respectively. Since 1981-82, average total faculty workweeks for both groups have remained nearly constant. Student contact hours have declined for the State-related group, but have remained constant for the State-owned group.

5. During the 1986-87 school year, a total of 11,007 FTE ranked and unranked instructional faculty were employed by the public universities. From the previous year, this total represents about 1 percent increases for both the State-related and State-owned universities. The average salary for these faculty of the two groups of universities was \$28,900 and \$32,200, respectively. The higher average salary for the State-owned group is due, in part, to the use of a larger percentage of faculty in the higher ranks.

6. Between 1981-82 and 1986-87, the average instructional salary for the FTE instructional faculty has increased by about \$6,100 for the State-related group (excluding Penn State, for which data are not comparable), and approximately \$6,000 for the State-owned group. The relative increase in average salary for the State-related group has served to narrow the gap in average salaries between the two groups.

7. During 1986-87, the ratio of FTE students to FTE instructional faculty averaged 17.1 for the State-related universities and 18.6 for the State-owned universities. From the previous year, these averages represent no change for the State-related group, and a 2 percent increase for the State-owned group.

8. For 1986-87, the average instructional salary cost per student credit hour (SCH cost) at the undergraduate level was \$43 for the State-related universities, and \$55 for the State-owned universities; at the master's level, SCH cost averaged \$116 and \$111 for the two groups, respectively. From the previous year, the undergraduate SCH cost increased by 5 percent for the State-related group, and by 4 percent for the State-owned group; master's SCH cost increased by 4 percent for the State-related group, and decreased by 1 percent for the State-owned group. SCH cost tends to decrease as student credit hours produced increase (for all academic levels), and tends to increase as academic levels increase (for all quantities of student credit hours produced).

9. Regression coefficients determined from 1986-87 data indicate that a decrease in average instructional faculty salary of \$1,000 could be expected to reduce overall SCH cost by approximately \$10.4 million, and an increase in average class (section) size of one student could be expected to reduce overall SCH cost by approximately \$10.1 million, in the public universities.

10. Regression analysis also shows that instructional costs per FTE student in public higher education institutions throughout the nation are positively correlated with average faculty salaries and State appropriations, and negatively correlated with average FTE students per institution (campus). When compared to other states, Pennsylvania's relatively high per student cost--in fiscal year 1986, \$6,638, the ninth highest in the nation--would appear to be mainly due to a higher-than-average faculty salary and lower-than-average FTE students per campus.
11. During 1986-87, main campus tuition and required fees for full-time in-state undergraduate students averaged \$2,924 at the State-related universities and \$1,881 at the State-owned universities, representing average increases of 8 and 5 percent over 1985-86, respectively.
12. For fiscal year 1987, the Commonwealth's general fund appropriations to the public universities totaled \$616.3 million: \$338.4 million to the State-related institutions and \$277.9 million to the State-owned universities. From fiscal year 1986 to fiscal year 1987, the change in appropriations was 7 and 6 percent for the two groups of universities, respectively. The average appropriation per FTE student was \$2,970 in the State-related group, and \$3,430 in the State-owned group. These per student averages represent one-year changes of 6 and 3 percent, respectively, for the two groups. In addition to the appropriations made directly to public universities, the Commonwealth also allocated about \$41 million from the General Fund to the Pennsylvania Higher Education Assistance Agency, which distributed these funds to students of the public universities through various grant and matching fund programs.
13. From 1981-82 to 1986-87, on an FTE student basis, average tuition and fee revenues collected by the public institutions have increased by a greater percentage than average direct Commonwealth appropriations. Hence, the percentage of total revenues from appropriations has decreased, causing the student share of instructional cost to increase.
14. During fiscal year 1985, the average student tuition at a public institution of higher education in Pennsylvania (including four-year institutions, two-year institutions, medical schools and research institutions) was \$2,455, almost 88 percent higher than the U.S. average of \$1,306. Total State and local appropriations per FTE student were \$3,138, about 26 percent less than the U.S. average. On an FTE student basis, appropriations

average. On an FTE student basis, appropriations to all public institutions of higher education in Pennsylvania are considerable lower than, and total instructional costs somewhat higher than, the national averages. Higher-than-average tuition tends to fill the gap.

I. INTRODUCTION

In Fall 1986 there were 232 institutions which provided post-secondary education in Pennsylvania: 4 State-related universities, 14 State-owned universities, 14 community colleges, 12 private State-aided institutions and 188 private independent institutions. These public and private institutions offer students a wide range of choice with regard to size, location, programs, degrees and student charges.

In Fall 1986, 216,770 students were enrolled in the State-related and State-owned institutions--Pennsylvania's public universities--representing about 40 percent of the total enrollment in all of the Commonwealth's institutions of higher education. During fiscal year 1987, the public universities collected \$589 million in tuition and fees from students and received over \$616 million in direct appropriations for educational and general expenses from the Commonwealth, excluding amounts allocated for the Board of Governors/Chancellor's Office and System Reserve of the State System of Higher Education; these appropriations represent about 86 percent of the total appropriations made specifically for instruction to all public institutions of higher education in the Commonwealth. In addition, students in the public universities received over \$38 million in Pennsylvania Higher Education Assistance Agency (PHEAA) grants, plus about \$2.5 million in matching fund aid; these funds represent about 33 percent of the total financial aid given by PHEAA to students at all institutions of higher education.

A large proportion of Pennsylvania students and all Pennsylvania taxpayers therefore have an interest in the Commonwealth's public universities producing the highest quality instruction in the most cost-effective manner, as well as in how the cost of this instruction is shared between students and taxpayers.

This report addresses the issues of cost efficiency and cost sharing. Using data reported by the individual State-related universities, as required by their annual appropriation acts, and the individual State-owned universities, as mandated by the Public School Code, the report summarizes and analyzes the number of instructional

faculty, faculty output, faculty salaries and faculty workloads by type of institution, academic level and program area. Levels of the data for 1986-87, and changes in the data from the previous year and over the past five years are examined. Output and salary data are used to compute a measure of cost efficiency: instructional faculty salary cost per student credit hour produced. Using tuition and fee collections data reported by the individual State-related universities and the State System of Higher Education (SSHE), and appropriation data from the General Fund Budget, the report summarizes and analyzes the sharing of instructional costs between the two groups who must pay these costs: students and taxpayers. Current year data, plus one- and five-year changes are again examined. Tuition and appropriation data are used to compute a measure of cost sharing: the percentage of total instructional cost borne by taxpayers. The effects of PHEAA programs on the student share of costs is also examined.

The report is thus an in-depth analysis of the "instructional" or "educational and general" functions of the public universities of the Commonwealth. The report does not include activities related to "line-item" appropriations (e.g., medical schools), capital projects, governmental or foundation grants, contracts, gifts, etc.

The report also does not address the critically important issues of the quality of education provided by Pennsylvania's public universities, or the "fairness" of cost sharing between students and taxpayers in the Commonwealth. These highly complex and controversial issues are beyond the scope of the report.

The report is intended for use by a variety of persons: by legislators for making appropriation decisions; by university administrators for evaluating policies related to faculty output, salaries and workloads; and by Pennsylvania citizens, for making informed judgments about the levels and shares of costs related to public higher education in the Commonwealth.

II. INSTRUCTIONAL OUTPUT

For analyses of instructional output, three alternative measures of output are useful in different ways. Full-time equivalent (FTE) students, computed from student credit hours, are the best measure by which to compare student enrollments in institutions with diverse full- and part-time student mixes. Student credit hours are helpful in analyzing academic levels and program areas, which are closely related to both institutional missions and instructional costs. Degrees granted by student majors are an important indicator of student interests and career objectives, and thus are useful in the analysis of societal and economic conditions and trends.

FULL-TIME EQUIVALENT (FTE) STUDENTS

In Fall 1986, Pennsylvania Department of Education data¹ show that a total of 548,757 full- and part-time students were enrolled in the 232 public and private institutions of higher education in the Commonwealth. Of this total, 216,770 students (40 percent) were enrolled in Pennsylvania's public universities: 130,605 (24 percent) students were enrolled in the State-related universities, and 86,165 (16 percent) in the State-owned universities. From the previous year, total enrollments at all of the Commonwealth's colleges and universities increased by 8,907 students (nearly 2 percent); at the public universities, total enrollments increased by 5,277 students (over 2 percent).

During the 1986-87 school year,² the total student credit-hour production of the public universities was the equivalent of 194,833 full-time students: student credit hours equaled 113,775 FTE students (58 percent) at the State-related universities, and 81,058 (42 percent) at the State-owned universities (table 1).³ The number of FTE students at the State-related institutions ranged from 58,598 at Penn State (main campus plus branch campuses) to 1,321 at Lincoln, and at the State-owned institutions from 13,026 at Indiana to 1,440 at Cheyney.

Table 1

FULL-TIME EQUIVALENT STUDENTS BY LEVEL¹
1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)

Institution ²	Total				Undergraduate				Graduate ³			
	FTE students	One-year change	Percentage change		FTE students	One-year change	Percentage change		FTE students	One-year change	Percentage change	
			One-year	Five-year			One-year	Five-year			One-year	Five-year
			change	average			change	average			change	average
State-related												
Penn State	58,598	974	2%	a	53,266	828	2%	a	5,332	146	3%	a
Pittsburgh	28,704	-163	-1	b	21,189	-103	b	b	7,515	-60	-1	-2%
Temple	25,152	418	2	b	19,486	654	3	3%	5,666	-236	-4	-7
Lincoln	1,321	62	5	-3%	1,115	21	2	-3	206	41	25	-2
Total	113,775	1,291	1	a	95,056	1,400	1	a	18,719	-109	-1	a
State-owned												
Indiana	13,026	296	2	b	12,151	250	2	b	875	46	6	4
West Chester	9,013	478	6	2	8,212	391	5	1	801	87	12	3
Bloomsburg	6,622	279	4	1	6,238	259	4	1	384	20	5	1
Millersville	6,438	218	4	2	5,844	152	3	2	594	66	13	b
Slippery Rock	6,323	127	2	3	6,038	117	2	3	285	10	4	b
Kutztown	6,068	79	1	4	5,783	50	1	5	285	29	11	2
Clarion	5,878	45	1	1	5,462	-6	b	1	416	51	14	21
Shippensburg	5,840	111	2	1	5,354	130	2	2	486	-19	-4	-1
Edinboro	5,608	92	2	b	5,294	98	2	b	314	-6	-2	-4
California	5,107	248	5	2	4,723	233	5	3	384	15	4	2
East Stroudsburg	4,410	137	3	2	3,895	17	b	1	515	120	30	18
Lock Haven	2,705	77	3	1	2,705	77	3	1	na	na	na	na
Mansfield	2,580	-146	-5	b	2,444	-124	-5	b	136	-22	-14	4
Cheyney	1,440	66	5	-6	1,217	-91	-7	-8	223	157	237	38
Total	81,058	2,107	3	1	75,360	1,553	2	1	5,698	554	11	3
All institutions	194,833	3,398	2	a	170,416	2,953	2	a	24,417	445	2	a

1. Data for each year represent the summer term preceding the academic year plus the academic year. Full-time equivalent students are calculated by dividing undergraduate student credit hours by 30 and graduate student credit hours by 24.

2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.

3. In addition to the master's level, the graduate level for Penn State, Pittsburgh, Temple and Indiana University includes first professional (excluding medical) and/or doctor's levels.

a. In 1983-84, Penn State's data on FTE students were affected by two major reporting changes: a change in the university's academic calendar (to two semesters from three terms in the academic year, and to a shorter summer term); and improved data collection procedures, which permitted the first-time inclusion of activities related to the university's continuing education credit program. Since then Penn State's data are comparable to current year data from the other institutions, but are noncomparable to prior years' data from Penn State and the other institutions.

b. Rounds to less than 1 percent.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1982 to 1987.

The relationship between total enrollment and FTE students depends upon the mix of full- and part-time students enrolled at the various individual institutions. In Fall 1986, according to data from the Pennsylvania Department of Education,⁴ the ratios of full-time to total students at Pittsburgh and Temple were about two-thirds, at Penn State about three-quarters, and at Lincoln about 98 percent; at the State-owned universities the average ratio was 79 percent. The mix of full- and part-time students at each institution is related to other factors, such as academic levels, economic factors, sex, etc.

Table 1 shows that, from 1985-86 to 1986-87, total FTE students at the public universities increased by about 2 percent, the same as total enrollments. Therefore, the aggregate full- and part-time student mix did not change appreciatively. Higher-than-average FTE student increases were reported by Bloomsburg, California, Cheyney, Lincoln, Millersville, and West Chester, and FTE student decreases by Mansfield and Pittsburgh.

STUDENT CREDIT HOURS (SCH)

Production by Academic Level

During the 1986-87 school year, the student credit hours (SCH) corresponding to the FTE students in table 1 totaled about 5.7 million for Pennsylvania's public universities: 3.3 million student credit hours were produced by the State-related institutions, and 2.4 million by the State-owned institutions (table 2).

Table 2 illustrates one important dimension of the diversity in the SCH (or FTE students) produced by the Commonwealth's public universities: the mixture of SCH by academic level. Summarizing the data in this table, the percentages of SCH produced by the various institutions at the various academic levels were as follows:

<u>Institution</u>	<u>Lower division</u>	<u>Upper division</u>	<u>Total under-graduate</u>	<u>Master's</u>	<u>First professional and Doctor's</u>	<u>Total Graduate</u>
Penn State	63%	29%	92%	4%	4%	8%
Pittsburgh	52	26	78	13	9	22
Temple	43	38	81	9	10	19
Lincoln	69	18	87	13	0	13
State-owned group	67	27	94	6	0	6

Table 2

STUDENT CREDIT-HOUR PRODUCTION BY LEVEL¹
 1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)
 (in thousands)

Institution ²	Undergraduate						Graduate					
	Lower division			Upper division			Master's			First professional and doctor's ³		
	Credit hours	One-year	Five-year average	Credit hours	One-year	Five-year average	Credit hours	One-year	Five-year average	Credit hours	One-year	Five-year average
State-related												
Penn State	1,101	8%	a	497	-10%	a	64	3%	a	64	3%	a
Pittsburgh	421	b	b	214	-2	b	109	b	-2%	71	-2	-1%
Temple	311	3	2%	273	4	3%	66	b	-7	70	-8	-6
Lincoln	27	2	-3	7	3	-1	5	25	-2	na	na	na
Total	1,860	5	a	991	-5	a	244	1	a	206	-3	a
State-owned												
Indiana	245	1	b	120	4	b	21	6	4	c	c	c
West Chester	175	4	1	72	7	2	19	12	3	na	na	na
Bloomsburg	132	5	3	55	4	-3	9	5	1	na	na	na
Millersville	131	1	1	44	9	7	14	13	b	na	na	na
Slippery Rock	135	1	3	46	6	3	7	4	b	na	na	na
Kutztown	119	1	5	55	b	4	7	11	2	na	na	na
Clarion	121	1	1	43	-4	1	10	14	21	na	na	na
Shippensburg	116	1	1	44	6	3	12	-4	-1	na	na	na
Edinboro	112	b	b	47	7	1	8	-2	-4	na	na	na
California	95	4	b	47	7	10	9	4	2	na	na	na
East Stroudsburg	88	4	2	28	-9	-2	12	30	18	na	na	na
Lock Haven	57	3	-1	24	3	9	na	na	na	na	na	na
Mansfield	53	-5	b	20	-6	1	3	-14	4	na	na	na
Cheyney	21	-30	-10	15	67	b	5	237	38	na	na	na
Total	1,600	1	1	660	4	2	136	11	3	na	na	na
All institutions	3,460	3	a	1,651	-1	a	380	4	a	206	-3	a

1. Data for each year represent the summer term preceding the academic year plus the academic year.

2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.

3. The first professional and doctor's level excludes medical school data for all schools.

a. In 1983-84, Penn State's data on student credit hours were affected by two major reporting changes: a change in the university's academic calendar (to two semesters from three terms in the academic year, and to a shorter summer term); and improved data collection procedures, which permitted the first-time inclusion of activities related to the university's continuing education credit program. Since then Penn State's data are comparable to current year data from the other institutions, but are noncomparable to prior years' data from Penn State and the other institutions.

b. Rounds to less than 1 percent.

c. Included in master's level.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1982 to 1987.

The mixes of SCH by academic level produced by the individual institutions of course reflects the academic missions and programs of the institutions. Output by academic level is especially important, since instructional cost per student differs significantly by level (see chapter IV of this report).

Production by Program Area

Table 3 presents the 1986-87 school year SCH production of the public universities by Classification of Instructional Programs (CIP).⁵ Ordered in this manner, the data illustrate another important dimension of diversity in the SCH produced: the mixture of SCH by program area.⁶ These data show that both the State-related and State-owned university groups produced about two-thirds of their lower-division undergraduate SCH in six CIP: business, letters, mathematics, physical sciences, social sciences, and visual and performing arts; in the State-owned group, an additional 11 percent of the lower-division undergraduate SCH were produced in education. These SCH are related both to general distribution requirements and student majors. At the upper-division undergraduate level, the State-related group produced nearly one-half of its SCH in business, engineering and the social sciences, and the State-owned group almost 60 percent of its SCH in business, education and the social sciences. These SCH are primarily related to student majors. At the graduate level, the State-related group produced over one-half of its SCH in business, education, health and law, and the State-owned group over one-half of its SCH in education. These SCH are generated by the graduate and professional programs of the respective institutions. In all cases, the mix of SCH produced reflects the specific mission of each institution, as well as the interests of the students and faculty in it.

DEGREES

During the 1986-87 school year Pennsylvania's public universities conferred a total of 35,828 bachelor's and graduate degrees (not including medical degrees): 20,941 degrees (58 percent) were conferred by the State-related institutions, and 14,887 (42 percent) by the State-owned institutions (table 4). These degrees represent about one-half of the total bachelor's and graduate degrees (not including medical degrees) granted by all of the institutions of higher education in the Commonwealth.⁷ The data show that almost 72 percent of the degrees from the State-related group, and over 86 percent of the degrees from the State-owned group, were bachelor's degrees. About two-fifths of the total degrees from Pittsburgh and

Table 3

NUMBER AND PERCENTAGE DISTRIBUTION OF STUDENT CREDIT-HOUR PRODUCTION
BY TYPE OF INSTITUTION, LEVEL AND CIP CLASSIFICATION
1986-87
(in thousands)

CIP Classification	State-related institutions						State-owned institutions					
	Lower division	Percent- age of total	Upper division	Percent- age of total	Graduate ¹	Percent- age of total	Lower division	Percent- age of total	Upper division	Percent- age of total	Graduate ¹	Percent- age of total
Agriculture	8.4	a	15.5	2%	3.4	1%	0	0%	0	0%	0	0%
Architecture and environmental design	7.0	a	9.9	1	.3	a	0	0	.1	a	.1	a
Area and ethnic studies	9.1	a	6.7	1	.6	a	0	0	0	0	0	0
Business	130.0	7%	192.3	19	55.5	12	112.4	7	146.2	22	9.9	7
Communications	24.1	1	29.0	3	3.2	1	34.0	2	28.6	4	2.2	2
Computer and information sciences	59.2	3	23.7	2	11.0	2	47.4	3	16.9	3	1.9	1
Education	88.7	5	77.2	8	90.4	20	181.2	11	175.7	27	79.8	58
Engineering	78.9	4	138.8	14	38.8	9	2.0	a	3.3	1	.6	a
Foreign languages	74.5	4	16.2	2	4.4	1	55.0	3	8.2	1	.6	a
Health	15.1	1	69.4	7	52.9	12	8.3	1	28.1	4	4.0	3
Home economics	17.1	1	12.1	1	3.2	1	6.5	a	9.3	1	.6	a
Industrial arts	0	0	0	0	0	0	2.7	a	2.3	a	.1	a
Law	.2	a	.1	a	52.2	12	0	0	0	0	0	0
Letters	252.0	14	74.2	7	14.2	3	213.7	13	28.4	4	4.7	3
Liberal/general studies	7.6	a	1.9	a	.1	a	5.0	a	.1	a	0	0
Library and archival studies	.3	a	.3	a	3.4	1	1.6	a	2.2	a	2.7	2
Life sciences	86.3	5	30.3	3	12.4	3	87.4	5	17.5	3	2.5	2
Mathematics	235.3	13	37.9	4	7.0	2	142.1	9	22.8	3	2.4	2
Military sciences	3.2	a	2.5	a	0	0	7.6	a	2.1	a	0	0
Multi/interdisciplinary studies	18.8	1	4.9	a	1.9	a	5.1	a	1.2	a	1.2	1
Parks and recreation	2.4	a	4.9	a	1.3	a	5.5	a	4.7	1	.5	a
Personal and social development	0	0	0	0	0	0	1.0	a	0	0	.1	a
Philosophy, religion and theology	42.4	2	10.9	1	4.0	1	39.4	2	4.1	1	.2	a
Physical sciences	190.7	10	27.7	3	21.3	5	113.9	7	13.5	2	1.5	1
Psychology	93.1	5	30.2	3	8.8	2	81.3	5	33.1	5	10.2	7
Public affairs and protective services	21.2	1	34.7	3	31.9	7	14.3	1	15.6	2	1.5	1
Social sciences	269.9	15	104.6	11	17.1	4	300.9	19	69.1	10	6.2	5
Trade and industrial	11.7	1	0	0	0	0	.1	a	.5	a	0	0
Visual and performing arts	113.1	6	35.6	4	10.2	2	130.1	8	26.2	4	3.0	2
Other	0	0	.2	a	0	0	2.7	a	b	a	b	a
Total ²	1,860.2	100	991.5	100	449.3	100	1,601.2	100	659.6	100	136.7	100

1. In addition to the master's level, the graduate level for Penn State, Pittsburgh, Temple and Indiana University includes first professional (excluding medical) and/or doctor's levels.

2. Because of rounding, CIP detail may not sum to total.

a. Rounds to less than 1 percent.

b. Rounds to less than 100 student credit hours.

SOURCE: Reports provided by the individual institutions, 1987.

Table 4

DEGREES CONFERRED BY LEVEL¹
 1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)

Institution ²	Total				Undergraduate				Graduate			
	Degrees	One-year change	Percentage change		Degrees	One-year change	Percentage change		Degrees	One-year change	Percentage change	
			One-year	Five-year			One-year	Five-year			One-year	Five-year
			change	average			change	average			change	average
State-related												
Penn State	9,627	-336	-3%	-1%	8,067	-256	-3%	-1%	1,560	-80	-5%	-2%
Pittsburgh	6,290	71	1	a	3,732	43	1	2	2,558	28	1	-1
Temple	4,820	-17	a	-1	3,051	65	2	a	1,769	-82	-4	-4
Lincoln	204	-22	-10	-1	136	-21	-13	-1	68	-1	-1	-2
Total	20,941	-304	-1	-1	14,986	-169	-1	a	5,955	-135	-2	-2
State-owned												
Indiana	2,639	34	1	1	2,277	-4	a	1	362	38	12	-3
West Chester	1,436	19	1	1	1,211	28	2	2	225	-9	-4	-2
Bloomsburg	1,247	-3	a	-2	1,067	-56	-5	-1	180	53	42	-4
Millersville	1,158	12	1	a	1,032	8	1	2	126	4	3	-6
Slippery Rock	1,184	189	19	2	1,066	190	22	3	118	-1	-1	-3
Kutztown	1,075	80	8	5	963	89	10	6	112	-9	-7	-4
Clarion	1,045	22	2	1	908	10	1	1	137	12	10	2
Shippensburg	1,366	26	2	a	1,059	60	6	1	307	-34	-10	-1
Edinboro	914	17	2	-1	784	34	5	1	130	-17	-12	-6
California	870	35	4	1	745	33	5	2	125	2	2	-4
East Stroudsburg	792	-51	-6	2	673	-44	-6	2	119	-7	-6	8
Lock Haven	446	-21	-4	3	446	-21	-4	3	na	na	na	na
Mansfield	462	-24	-5	1	406	2	a	1	56	-26	-32	-1
Cheyney	253	-8	-3	-5	228	-13	-5	-5	25	5	25	-4
Total	14,887	327	2	1	12,865	316	3	1	2,022	11	1	-3
All institutions	35,828	23	a	a	27,851	147	1	1	7,977	-124	-2	-2

1. Data for each year represent the summer term preceding the academic year plus the academic year. Undergraduate degrees include only bachelor's degrees. Graduate degrees include master's at all institutions except Lock Haven which does not have a master's program, first professional (excluding medical) and doctor's at Pittsburgh and Temple, and doctor's at Penn State and Indiana University.

2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.

a. Rounds to less than 1 percent.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1982 to 1987.

Temple were graduate degrees; graduate degrees from Lincoln were one-third, and from Penn State less than 17 percent, of total degrees. In the State-owned group, graduate degree production exceeded 15 percent at only East Stroudsburg, Shippensburg and West Chester.

Table 4 shows that, from 1985-86 to 1986-87, total degrees conferred by the public universities increased by less than 1 percent; this small increase in total degrees reflects a 1 percent increase in total undergraduate degrees and a 2 percent decrease in total graduate degrees.

RELATIONSHIP BETWEEN SCH AND DEGREES

For the 1986-87 school year, the minimum student credit hours required for a bachelor's degree averaged 120 for the State-related universities, and 127 for the State-owned universities; the SCH minimums for a master's degree averaged 27 and 30 for the two types of institutions, respectively.

The data in tables 2 and 4 can be combined to show the actual SCH produced per degree conferred for the various institutions and academic levels. These data indicate that undergraduate SCH produced per bachelor degree averaged 198 for Penn State, 170 for Pittsburgh, 192 for Temple, 246 for Lincoln, and from 203 (Edinboro and West Chester) to 152 (Shippensburg) for institutions in the State-owned group. Graduate SCH produced per graduate degree averaged 82 for Penn State, 71 for Pittsburgh, 77 for Temple, 73 for Lincoln, and from 214 (Cheyney) to 38 (Shippensburg) for the State-owned group. The excesses of actual SCH production over minimum degree requirements represent the credit-hour output for students who have dropped out of school without receiving degrees, the output for students who have taken courses over and above minimum degree requirements, and the output related to fluctuations in cohorts of enrollments.

These data also show that SCH produced per degree changed from 1985-86 to 1986-87 as follows:

	<u>Under- graduate</u>	<u>Graduate</u>
Penn State	5%	8%
Pittsburgh	-2	-2
Temple	1	1
Lincoln	18	27
State-owned groups	0	10

OUTPUT TRENDS

FTE Students

Between 1981-82 and 1986-87, total FTE students decreased by 450 (2 percent) at Pittsburgh, 256 (1 percent) at Temple, and 204 (13 percent) at Lincoln; noncomparable data for Penn State do not permit a five-year comparison of FTE students.⁸ For the State-owned universities as a group, total FTE students increased by 4,690 (6 percent). Several SSHE institutions report increases of 10 percent or more total FTE students during this time: California (12 percent), Kutztown (22 percent), and Slippery Rock (14 percent). At Cheyney, FTE students declined by 31 percent.

The total increase of 3,780 FTE students in Pennsylvania's public universities (excluding Penn State) occurred during a period when the Commonwealth's population of 18- to 24-year-olds was declining by some 173,000 persons (11.5 percent).⁹ This slight FTE increase appears to be attributable in part to a larger percentage of Pennsylvania high school graduates attending the Commonwealth's public universities. For the most part, however, the increase is widely believed to be due to a relative increase in the enrollment of older "non-traditional" students at these institutions.

Degrees Conferred

Between 1981-82 and 1986-87, total degrees conferred increased by 2 percent at Pittsburgh, and decreased by 7 percent at both Temple and Lincoln. At the State-owned universities, total degrees increased by about 4 percent.

During this time, the number of undergraduate degrees granted by most of the Commonwealth's public universities has increased, relative to the number of graduate degrees granted.

SCH to Degree Ratios

As a result of largely corresponding changes in enrollments and degrees at most institutions, ratios of undergraduate student credit hours to degrees have remained substantially unchanged over the past five years. Given relative shifts from graduates to undergraduates, however, ratios of graduate SCH to degrees have increased at the State-owned universities.



III. INSTRUCTIONAL FACULTY INPUT

The principal input into producing instructional output, whether measured by FTE students, student credit hours or degrees, is instructional faculty. Other inputs, complementary to faculty in the instructional process such as plant and equipment, administrative staff and overhead, are ordinarily not utilized in units directly assignable to specific instructional outputs. To avoid making an essentially arbitrary allocation of the costs of such inputs to instruction, instructional faculty and instructional faculty salary are the only input and cost measures considered in this report.

FULL-TIME EMPLOYED FACULTY AND WORKLOADS

In Fall 1986, a total of 9,805 teaching and research faculty were employed full time by Pennsylvania's public universities: 5,535 persons (56 percent) were employed full-time by the State-related institutions, and 4,270 (44 percent) by the State-owned institutions (table 5). This set of faculty represents a total increase of 79 faculty members (1.4 percent) for the State-related group, and a total decrease of 5 faculty members (negligible percentage change) for the State-owned group, from Fall 1985.¹⁰

Table 5 shows that in Fall 1986, the overall average reported workweek of the full-time employed faculty in the public universities was 53.0 hours: 51.5 hours were reported for full-time employed faculty members in the State-related institutions, and 55.1 hours for those in the State-owned institutions. These overall average workweeks represent virtually no change from those of the previous year.

Total hours spent by these faculty in classroom and other contact with students averaged 8.8 per week at the more research-oriented State-related institutions (a decrease of 0.4 hours from last year), and 11.6 per week at the smaller State-owned institutions (an increase of 0.2 hours). In the various institutions, total faculty workweeks were divided into the following activities:¹¹

Table 5

FULL-TIME EMPLOYED FACULTY WORKWEEKS BY TYPE OF ACTIVITY
1986-87, AND PERCENTAGE CHANGE FROM 1985-86

Institution ¹	Full-time ² employed faculty head count	Average weekly hours ³											
		Student contact				Instruc- tional support	Percent- age		Other university service	Percent- age change	Total work- week	Percent- age change	
		Total	Percent- age change	Under- graduate	Graduate		Research	change					
State-related													
Penn State	2,755	8.9	-3%	7.1	1.8	20.2	1%	11.3	3%	11.3	-3%	51.7	a
Pittsburgh	1,586	8.6	-4	4.8	3.8	15.8	-2	16.2	5	11.2	1	51.8	a
Temple	1,122	9.0	-7	5.9	3.1	14.0	-11	12.5	33	15.1	-4	50.6	a
Lincoln	72	11.3	5	10.2	1.1	18.9	4	13.4	20	10.0	-12	53.6	4%
Total	5,535	8.8	-4	6.2	2.6	17.7	-2	13.0	8	12.0	-3	51.5	0
State-owned													
Indiana	676	11.8	-2	10.7	1.1	17.7	-2	10.3	-1	17.9	-2	57.7	-2
West Chester	431	11.6	-2	10.4	1.2	18.8	-1	9.5	3	20.8	a	60.7	0
Bloomsburg	328	11.4	-1	10.7	.7	17.0	1	7.8	-4	17.4	2	53.6	a
Millersville	297	11.3	-1	10.8	.5	15.7	-1	9.3	-3	16.7	1	53.0	-1
Slippery Rock	333	11.9	1	11.4	.5	18.7	0	9.2	0	16.4	-2	56.2	a
Kutztown	321	12.2	1	11.8	.4	17.7	4	7.7	-3	16.5	2	54.1	2
Clarion	323	11.1	1	10.5	.6	17.2	-4	8.2	12	14.4	-2	50.9	a
Shippensburg	291	10.5	1	9.5	1.0	17.1	3	7.7	-1	16.4	-3	51.7	0
Edinboro	301	12.6	0	11.9	.7	19.2	-1	7.4	0	14.3	-5	53.5	-1
California	267	11.4	12	10.4	1.0	16.1	-1	7.2	-1	18.7	4	53.4	3
East Stroudsburg	239	11.2	2	10.4	.8	19.1	8	9.6	7	16.6	-5	56.5	3
Lock Haven	169	11.5	1	11.5	na	17.6	1	7.2	0	17.4	1	53.7	1
Mansfield	172	10.4	2	10.0	.4	20.1	-2	9.7	1	18.4	12	58.6	3
Cheyney	122	10.8	6	10.1	.7	14.2	0	7.9	5	14.1	-23	47.0	-6
Total	4,270	11.6	2	10.8	.8	17.7	0	8.7	1	17.1	-1	55.1	a
All institutions	9,805	10.0	-2	8.2	1.8	17.7	-1	11.1	6	14.2	-2	53.0	a

1. Arranged in descending order with respect to total full-time equivalent students for 1986-87.

2. The number of full-time employed faculty for 1986-87 represents those reported by each school for the fall term.

3. Average calculated using only those full-time employed faculty in the fall who reported a complete workweek of 100 hours or less.

a. Rounds to less than 1 percent.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1986 and 1987.

<u>Workweek activity</u>	<u>Penn State</u>	<u>Pitts- burgh</u>	<u>Temple</u>	<u>Lincoln</u>	<u>State- owned univer- sities</u>
Student contact	17.2%	16.6%	17.8%	21.1%	21.1%
Instructional support	39.0	30.5	27.7	35.2	32.1
Research	21.9	31.3	24.7	25.0	15.8
Other university service	<u>21.9</u>	<u>21.6</u>	<u>29.8</u>	<u>18.7</u>	<u>31.0</u>
Total	100.0	100.0	100.0	100.0	100.0

For the most part, these divisions of time by function also represent little change from last year.

FTE INSTRUCTIONAL FACULTY AND SALARIES

During the 1986-87 school year, a total of 11,007 ranked and nonranked full-time equivalent (FTE) instructional faculty were employed by the public universities: 6,638 FTE instructional faculty (60 percent) were employed by the State-related institutions, and 4,369 (40 percent) by the State-owned institutions (table 6). This set of instructional faculty represents a total increase of 51 faculty members (about 1 percent) for the State-related group, and an increase of 42 faculty members (about 1 percent) for the State-owned group, from 1985-86.^{12,13}

The overall average instructional salary of the FTE instructional faculty in the public universities was \$30,200: \$28,900 was the average salary for the FTE faculty in the State-related institutions, and \$32,200 for those in the State-owned institutions (table 6). These overall average salaries represent an increase of \$1,600 (5.9 percent) for the State-related group, and an increase of \$1,700 (5.6 percent) for the State-owned group, from the previous year.

Average salaries for the FTE instructional faculty at the State-related institutions ranged from \$29,500 at Penn State to \$20,700 at Lincoln, and at the State-owned institutions from \$38,800 at Cheyney to \$30,600 at Millersville.¹⁴

The data in table 6 show that the smaller State-owned universities utilize larger numbers of higher ranked FTE faculty--professors and associate professors--than do the larger and more research-oriented State-related universities: 66 to 41 percent. The latter schools provide a significant amount of instruction using instructors and nonranked persons (largely graduate research

Table 6

AVERAGE INSTRUCTIONAL SALARIES OF FULL-TIME EQUIVALENT INSTRUCTIONAL FACULTY AND PERCENTAGE DISTRIBUTION BY RANK¹
1986-87
(Dollars in thousands)

Institution ²	FTE instructional faculty		Average instructional salary		Professor		Associate professor		Assistant professor		Instructor		No rank ³	
	Number	Percentage change 1985-86 to 1986-87	Amount	Percentage change 1985-86 to 1986-87	Average instructional salary	Percentage of faculty	Average instructional salary	Percentage of faculty	Average instructional salary	Percentage of faculty	Average instructional salary	Percentage of faculty	Average instructional salary	Percentage of faculty
State-related														
Penn State	3,217	2%	\$29.5	8%	\$47.3	15%	\$35.3	18%	\$28.5	26%	\$20.5	18%	\$21.9	23%
Pittsburgh	1,794	1	29.3	5	44.4	20	31.6	27	25.2	19	16.0	11	23.6	23
Temple	1,527	-2	27.7	2	39.4	27	30.6	25	25.6	15	15.6	16	18.4	17
Lincoln	100	5	20.7	-3	27.5	16	26.2	9	20.7	41	17.8	21	13.8	13
Total	6,638	1	28.9	6	43.6	19	32.8	22	27.0	21	18.4	16	21.7	22
State-owned														
Indiana	681	3	31.3	7	38.9	35	32.6	26	26.4	26	18.4	12	19.5	1
West Chester	471	-1	31.5	5	38.6	28	32.8	35	26.2	25	21.2	12	49.2	a
Bloomsburg	344	1	31.3	4	39.8	28	32.2	31	26.6	29	21.4	12	na	0
Millersville	349	6	30.6	5	37.5	33	31.1	32	25.1	27	18.2	8	34.9	a
Slippery Rock	330	1	32.5	7	40.0	40	32.6	23	26.0	26	21.3	11	43.8	a
Kutztown	329	4	32.8	5	40.9	30	33.0	35	26.9	27	20.9	8	33.6	a
Clarion	303	-1	32.0	9	39.9	32	32.7	29	26.2	31	21.5	7	19.6	1
Shippensburg	297	2	33.3	3	39.6	40	32.4	34	26.3	20	20.6	6	na	0
Edinboro	318	a	32.5	1	37.1	46	31.4	29	25.9	23	18.1	2	27.3	a
California	257	-1	32.9	4	39.7	40	32.8	33	25.6	17	18.1	10	16.6	a
East Stroudsburg	251	2	30.9	5	37.3	41	30.3	29	23.3	24	20.4	6	3.4	a
Lock Haven	156	3	34.7	5	42.2	35	33.8	39	26.5	20	22.1	6	36.0	a
Mansfield	156	-5	32.1	8	40.2	31	32.5	34	26.3	27	18.4	8	na	0
Cheyney	127	-7	38.8	12	44.5	37	35.8	48	36.1	9	32.9	5	20.6	1
Total	4,369	1	32.2	6	39.3	35	32.5	31	26.1	25	20.2	9	23.2	a
All institutions	11,007	1	30.2	6	41.2	25	32.6	26	26.6	23	18.9	13	21.7	13

1. Average instructional salary is calculated by dividing the total instructional salary paid to all staff members in the respective rank categories by their total full-time equivalency in the instructional function. One full-time equivalent faculty represents one full-time workload for two terms (one academic year). The summer term is treated as one term or one-half the academic year. Data for each year represent the summer term preceding the academic year plus the academic year.

2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.

3. The full-time equivalency of nonranked faculty members is based on the time spent in instruction by all nonranked personnel, including lecturers, administrators, librarians, research staff and graduate assistants.

a. Rounds to less than 1 percent.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1986 and 1987.

assistants). Therefore, even though the average salary for each of the faculty ranks (except instructors) is lower for the State-owned group, the larger percentages of faculty in the top ranks raises this group's overall average salary above that for the State-related group.

RELATIONSHIP BETWEEN FTE STUDENTS AND FTE INSTRUCTIONAL FACULTY

The data in tables 1 and 6 can be combined to show FTE students per FTE instructional faculty for the various institutions. During the 1986-87 school year, the ratios of FTE students to FTE faculty were as follows:

Penn State	18.2
Pittsburgh	16.0
Temple	16.5
Lincoln	13.2
State-owned group	18.6
Overall	17.7

From 1985-86 to 1986-87, the overall average ratio of FTE students to FTE faculty increased by 1 percent. Individual institutions with increases in the student-to-faculty ratio of 3 percent or more include Bloomsburg, California, Cheyney, Clarion, Temple and West Chester; only Kutztown decreased by as much as 3 percent.

INPUT TRENDS

Faculty

Between Fall 1981 and Fall 1986, the total full-time employed faculty--the faculty whose workweek activities are examined in this report--increased by 87 (6 percent) at Pittsburgh and 1 (1 percent) at Lincoln, and decreased by 110 (9 percent) at Temple. At the State-owned universities as a group, the full-time employed faculty increased by 100 (2 percent).

Between 1981-82 and 1986-87, the total FTE instructional faculty--the faculty whose instructional output and salary cost are the focus of this report--decreased by 30 (2 percent) at Pittsburgh and 139 (8 percent) at Temple, and increased by 3 (3 percent) at Lincoln. At the State-owned group, the FTE instructional faculty increased by 171 (4 percent). Viewing these changes together, it is clear that the ratio of full-time to total faculty has increased for

Lincoln and the State-owned group and decreased for Pittsburgh and Temple.

Faculty Workweek Activities

Between 1981-82 and 1986-87, average student contact hours decreased by 1.1 (11 percent) at Pittsburgh, 0.4 (4 percent) at Temple, 0.8 (7 percent) at Lincoln, and 0.1 (1 percent) for the State-owned group. Since the average total faculty workweeks for both the State-related and State-owned groups have remained approximately constant during this time, decreases in student contact hours have been largely offset by increases in other faculty workweek activities.

Average FTE Instructional Faculty Salaries

Between 1981-82 and 1986-87, the average instructional salary of the FTE instructional faculty increased by \$6,600 (29 percent) at Pittsburgh, \$5,700 (26 percent) at Temple, \$3,000 (17 percent) at Lincoln, and \$6,000 (23 percent) for the State-owned group. These increases were caused by two separate factors at each of the individual institutions: (1) changes in the salaries of faculty members or groups; and (2) changes in faculty rank distributions. Between 1981-82 and 1986-87, the percentage of FTE instructional faculty in the top two faculty ranks (professor and associate professor) increased by 2 percent at Pittsburgh and 3 percent at Temple, but decreased by 7 percent at Lincoln. During this five-year period, the faculty in the two top ranks at the State-owned universities decreased by 6 percent. The relative decline in the percentage of top-ranked faculty in the State-owned group has helped to narrow the gap between the average instructional salary for the FTE instructional faculty in this group and the corresponding average salary for the faculty in the State-related group.

Student-to-Faculty Ratios

Between 1981-82 and 1986-87, the ratio of FTE students to FTE instructional faculty increased significantly at the following institutions: Temple (7.8 percent), California (5.9 percent), Edinboro (6.7 percent), Mansfield (4.4 percent), Slippery Rock (4.9 percent) and West Chester (4.9 percent). Over this interval, the student-to-faculty ratio decreased significantly at Lincoln (15.9 percent) and Cheyney (21.5 percent).

IV. COST EFFICIENCY

Cost efficiency is the minimization of the input cost of producing a given level of output. In higher education the simplest measure of cost efficiency is instructional cost related to some measure of instructional output. In this report, the cost efficiency measure utilized for Pennsylvania's public universities is instructional faculty salary cost per student credit hour produced.

INSTRUCTIONAL FACULTY SALARY COST PER STUDENT CREDIT HOUR PRODUCED (SCH COST)

By Academic Level

During the 1986-87 school year, the instructional faculty salary cost per undergraduate-level student credit hour produced (undergraduate SCH cost) averaged \$41 for Penn State, \$45 for Pittsburgh and Temple, and \$60 for Lincoln. The average undergraduate SCH cost for the State-owned universities ranged from \$102 at Cheyney to \$49 at Indiana, and averaged \$55 for the State-owned group as a whole (table 7).

Table 7 shows that the instructional faculty salary cost per master's-level student credit hour produced (master's SCH cost) averaged \$108 for Penn State, \$135 for Pittsburgh, \$97 for Temple, and \$76 for Lincoln. The average master's SCH cost for the State-owned universities ranged from \$221 at Cheyney to \$65 at East Stroudsburg, and averaged \$111 for the State-owned group as a whole.

Table 7 also shows that while SCH cost varies widely among individual institutions, two important general relationships are evident. First, SCH cost tends to vary inversely with the quantity (or scale) of output produced: for all academic levels (especially the undergraduate lower and upper divisions), average instructional faculty salary cost per student credit hour produced tends to decrease as the quantity of student credit hours produced increases. Second,

Table 7

AVERAGE INSTRUCTIONAL FACULTY SALARY COST PER STUDENT CREDIT HOUR BY LEVEL¹
 1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)

Institution ²	Undergraduate			Undergraduate			Upper			Master's		
	Total under-graduate	Percentage change		Lower division	Percentage change		Upper division	Percentage change		Total master's	Percentage change	
		One-year	Five-year average		One-year	Five-year average		One-year	Five-year average		One-year	Five-year average
State-related												
Penn State	\$41	8%	a	\$34	6%	a	\$58	16%	a	\$108	9%	a
Pittsburgh	45	7	6%	33	6	6%	68	10	6%	135	2	6%
Temple	45	-4	2	38	-3	4	53	-4	1	97	3	b
Lincoln	60	13	12	51	13	13	94	12	8	76	6	12
Total	43	5	a	34	3	a	59	9	a	116	4	a
State-owned												
Indiana	49	7	4	38	6	5	72	7	4	157	3	2
West Chester	52	-2	4	44	2	7	71	-9	1	106	-5	b
Bloomsburg	54	2	5	44	0	4	77	4	8	83	-3	2
Millersville	54	6	5	43	5	3	87	5	5	86	13	4
Slippery Rock	55	8	3	45	7	3	85	8	4	113	-7	2
Kutztown	59	9	4	41	5	3	96	10	6	95	-4	3
Clarion	55	10	6	45	10	5	81	11	7	73	-22	-10
Shippensburg	54	4	5	47	2	5	71	3	4	109	3	4
Edinboro	59	-2	3	52	-2	4	76	-3	1	127	13	4
California	52	-2	2	43	2	2	68	-8	-1	123	-5	1
East Stroudsburg	59	5	5	48	9	6	95	7	6	65	-12	0
Lock Haven	67	6	5	52	-2	3	101	15	6	na	na	na
Mansfield	63	11	3	42	2	2	116	17	5	122	-8	9
Cheyney	102	-6	13	90	-3	13	119	-26	11	221	-22	8
Total	55	4	4	45	5	4	81	4	4	111	-1	2
All institutions	48	4	a	39	3	a	68	8	a	115	3	a

1. The instructional faculty salary cost per student credit hour for each level was calculated as follows: the instructional salary for each rank was assigned by level according to the percentage distribution of the course (assigned) credits within each rank. The salary determined by this method for each rank was summed by level and divided by the total student credit-hour production at that level. In the case of individual instruction, one course credit was attributed to every three student credit hours produced in individual instruction.

2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.

a. In 1983-84, Penn State's data on instructional salaries and student credit hours were affected by two major reporting changes: a change in the university's academic calendar (to two semesters from three terms in the academic year, and to a shorter summer term); and improved data collection procedures, which permitted the first-time inclusion of activities related to the university's continuing education credit program. Since then Penn State's data are comparable to current year data from the other institutions, but are noncomparable to prior years' data from Penn State and the other institutions.

b. Rounds to less than 1 percent.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1982 to 1987.

SCH cost tends to vary directly with academic level: for all quantities of SCH produced, SCH cost tends to increase as academic level increases.

Compared to 1985-86, the 1986-87 undergraduate SCH cost increased by \$3 (8 percent) at Penn State, \$3 (7 percent) at Pittsburgh, and \$7 (13 percent) at Lincoln; at Temple, this cost decreased by \$2 (4 percent). For the State-owned universities as a group, undergraduate SCH cost increased by an average of \$2 (4 percent); large one-year increases in undergraduate SCH cost were computed for Clarion, Kutztown, Mansfield and Slippery Rock, and decreases for California, Cheyney, Edinboro and West Chester.

By Program Area

In both types of public universities, SCH cost also varies considerably by program area (table 8).¹⁵ Programs (CIP) with substantially higher than average undergraduate SCH cost ("high-cost" CIP) at the State-related universities include agriculture, architecture and environmental design, area and ethnic studies, engineering, health, law, and trade and industrial; for this group of institutions, psychology is a "low-cost" undergraduate CIP. For the State-owned group, architecture and environmental design, engineering, health, industrial arts, and trade and industrial are "high-cost" undergraduate CIP, while liberal/general studies is a "low-cost" undergraduate CIP.

Like table 7, table 8 clearly shows that SCH cost tends to vary inversely with scales of output, and directly with academic levels, at most institutions.

DETERMINANTS OF SCH COST

The appendix to this report presents a model of SCH cost determination. This model shows that there are three variables which university administrators can control (at least to some extent) to influence SCH cost, or cost efficiency: average instructional faculty salary, average class (section) size, and the number of classes (sections) per course offered.

Average Instructional Faculty Salary

Average instructional faculty salaries tend to vary directly with faculty ranks (see table 6). Since faculty ranks also tend to correlate positively with academic levels, average faculty salaries

Table 8

AVERAGE INSTRUCTIONAL FACULTY SALARY COST PER STUDENT CREDIT HOUR¹
BY TYPE OF INSTITUTION, LEVEL AND CIP CLASSIFICATION
1986-87

CIP classification	State-related				State-owned			
	Undergraduate				Undergraduate			
	Total under- graduate	Lower division	Upper division	Master's	Total under- graduate	Lower division	Upper division	Master's
Agriculture	\$57	\$49	\$61	\$151	--	--	--	--
Architecture and environmental design	66	53	75	520	\$111	--	\$111	\$703
Area and ethnic studies	58	42	79	162	--	--	--	--
Business	37	32	40	63	41	\$33	47	91
Communications	35	18	49	117	50	38	64	107
Computer and information sciences	49	45	60	78	48	42	64	117
Education	54	36	75	68	65	48	83	85
Engineering	61	64	59	142	96	58	119	63
Foreign languages	48	41	84	149	68	58	139	136
Health	82	77	83	270	103	83	109	136
Home economics	39	22	63	121	59	42	71	167
Industrial arts	--	--	--	--	99	86	116	519
Law	57	41	85	116	--	--	--	--
Letters	39	36	50	149	54	50	87	150
Liberal/general studies	30	27	45	35	13	13	5	--
Library and archival sciences	31	31	30	85	75	67	80	94
Life sciences	35	27	56	200	62	48	130	309
Mathematics	36	33	60	126	51	46	79	163
Military sciences	--	--	--	--	--	--	--	--
Multi/interdisciplinary studies	52	40	97	131	55	43	102	67
Parks and recreation	54	28	66	100	69	61	79	212
Personal and social development	--	--	--	--	--	--	--	--
Philosophy, religion and theology	43	36	70	193	45	40	96	176
Physical sciences	40	36	67	184	76	59	218	374
Psychology	25	17	50	148	44	34	69	99
Public affairs and protective services	48	29	60	108	55	38	70	70
Social sciences	36	28	57	154	45	36	86	178
Trade and industrial	66	66	--	--	99	103	98	--
Visual and performing arts	46	33	89	192	67	52	143	330
Other	34	--	34	--	110	105	1,602	658
Total	43	34	59	116	55	45	81	111

1. The instructional faculty salary cost per student credit hour for each level was calculated as follows: the instructional salary for each rank was assigned by level according to the percentage distribution of the course (assigned) credits within each rank. The salary determined by this method for each rank was summed by level and divided by the total student credit-hour production at that level. In the case of individual instruction, one course credit was attributed to every three student credit hours produced in individual instruction.

SOURCE: Reports provided by the individual institutions, 1987.

tend to vary directly with academic levels. Therefore, average instructional faculty salary has a positive effect on SCH cost by level.

Average Class (Section) Size

Average class (section) sizes tend to vary inversely with academic levels: lower-division undergraduate classes are generally larger in size than upper-division classes, and upper-division classes typically larger than master's level classes (table 9). Thus class (section) size has a negative effect on SCH cost by academic level.

Number of Classes (Sections) per Course

The number of classes (sections) per course tends to vary inversely with academic levels, but positively with the quantity of student credit hours produced at each academic level (table 10). Therefore, the number of classes (sections) per course has a positive effect on SCH cost by level.¹⁶

QUANTITATIVE ANALYSIS OF COST EFFICIENCY

The model of SCH cost in the appendix can be statistically validated and quantitative estimates of the various control variables made using the technique of multiple regression analysis. The regression model which results from this model is:¹⁷

$$\ln Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2$$

where:

Y = instructional salary cost per student credit hour (\$)

X₁ = average FTE instructional faculty salary (\$)

X₂ = average class (section) size

b₀, b₁ and b₂ are regression coefficients to be estimated from the data; ln is the natural logarithm.

Separate regressions were estimated for the State-related and State-owned university groups, using 1986-87 school year data for the lower- and upper-undergraduate divisions and various CIP for each

Table 9

AVERAGE CLASS SIZE IN CLASSROOM INSTRUCTION BY LEVEL¹
 1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)

Institution ²	Undergraduate											
	Total undergraduate			Lower division			Upper division			Master's		
	Class size	Percentage change		Class size	Percentage change		Class size	Percentage change		Class size	Percentage change	
	One-year	Five-year average	Class size	One-year	Five-year average	Class size	One-year	Five-year average	Class size	One-year	Five-year average	
State-related												
Penn State	30	a	b	31	3%	b	28	-6%	b	14	-1%	b
Pittsburgh	27	a	-1%	29	1	a	23	-2	-1%	16	3	-2%
Temple	24	5%	3	26	4	2%	22	5	3	13	5	a
Lincoln	16	1	-2	19	2	-3	11	-3	1	12	-1	-3
Total	28	1	b	29	3	b	25	-2	b	15	3	b
State-owned												
Indiana	25	5	1	31	4	1	18	6	1	7	4	3
West Chester	22	3	2	25	2	-1	16	4	6	10	6	8
Bloomsburg	21	3	-2	24	4	-2	16	1	-3	14	7	2
Millersville	21	-3	-3	26	-2	-1	13	-3	-4	11	-12	-3
Slippery Rock	23	-1	a	29	-1	1	15	a	a	11	6	2
Kutztown	22	-1	-2	28	-1	-2	14	-2	-2	12	12	-3
Clarion	28	2	-1	34	5	a	18	-3	-1	21	51	34
Shippensburg	26	a	a	28	a	1	21	a	a	12	-8	-1
Edinboro	22	2	1	25	2	1	17	3	3	9	-17	1
California	25	4	2	30	1	2	18	8	3	10	9	2
East Stroudsburg	23	-2	-1	28	-1	-1	15	-6	-2	17	13	5
Lock Haven	23	-3	-1	27	1	a	16	-10	-2	na	na	na
Mansfield	16	-7	-3	26	2	-1	8	-15	-5	7	8	-8
Cheyney	16	16	-3	19	21	-1	13	33	-2	6	-14	-6
Total	23	1	a	28	2	a	16	1	a	11	2	2
All institutions	25	1	b	29	3	b	20	-2	b	13	2	b

1. Average class size for each level is calculated by dividing total classroom student credit hours by total classroom assigned credits.

2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.

a. Rounds to less than 1 percent.

b. In 1983-84, Penn State's data on classroom student credit hours and classroom assigned credits were affected by two major reporting changes: a change in the university's academic calendar (to two semesters from three terms in the academic year, and to a shorter summer term); and improved data collection procedures, which permitted the first-time inclusion of activities related to the university's continuing education credit program. Since then Penn State's data are comparable to current year data from the other institutions, but are noncomparable to prior years data from Penn State and the other institutions.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1982 to 1987.

Table 10

AVERAGE NUMBER OF SECTIONS PER UNDERGRADUATE COURSE BY DIVISION¹
 1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)

Institution ²	Percentage change			Percentage change		
	Lower division	One-year average	Five-year average	Upper division	One-year average	Five-year average
State-related						
Penn State	6.22	-13%	a	1.64	-6%	a
Pittsburgh	2.65	-4	b	1.42	1	6%
Temple	3.50	-5	a	1.56	-5	a
Lincoln	1.67	0	1%	1.24	13	5
Total	4.11	-7	a	1.55	-4	a
State-owned						
Indiana	3.04	b	-1	1.49	-8	-3
West Chester	1.89	-3	b	1.36	2	-4
Bloomsburg	2.42	0	1	1.77	-2	1
Millersville	2.39	-1	5	1.58	-8	3
Slippery Rock	2.01	1	b	1.49	2	-1
Kutztown	2.44	2	-1	1.50	-1	-3
Clarion	1.93	2	2	1.36	-2	2
Shippensburg	2.63	1	1	1.51	2	2
Edinboro	2.18	-4	-2	1.47	1	-2
California	2.03	-2	2	1.51	-1	1
East Stroudsburg	1.54	3	1	1.29	-6	-3
Lock Haven	1.83	2	1	1.46	9	5
Mansfield	1.32	-6	1	1.84	16	9
Cheyney	1.95	5	-3	1.19	3	1
Total	2.15	0	1	1.49	-1	-1
All institutions	2.86	-2	a	1.52	-2	a

1. Average sections per course are computed as: total classroom course credit hours divided by three equals number of sections; number of sections divided by total number of courses equals average sections per course.

2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.

a. Noncomparable data.

b. Rounds to less than 1 percent.

SOURCE: Reports provided by the individual institutions, 1982 to 1987.

institution.¹⁸ The coefficient estimates obtained for the control variables are as follows:

<u>Control variable</u>	<u>State-related universities</u>		<u>State-owned universities</u>	
	<u>Lower division</u>	<u>Upper division</u>	<u>Lower division</u>	<u>Upper division</u>
ln X ₁	.70	.94	1.24	1.56
ln X ₂	-.68	-.58	-.85	-.84

All of these coefficient estimates are statistically significant at the 5 percent level or better, and all have the expected signs: SCH cost is positively correlated with average instructional faculty salary, and negatively correlated with average class (section) size. The model displays considerable explanatory power: the regressions explain from 44 to 76 percent of the variation in SCH cost across program areas, depending upon institutional type and academic level.

The quantitative values of the coefficients indicate that, for example, in the lower division of the State-owned universities, a 1 percent increase in the average instructional salary of the FTE instructional faculty (with all other control variables held constant) could be expected to increase SCH cost by 1.24 percent. Conversely, a 1 percent increase in average class (section) size (all else equal) could be expected to decrease SCH cost by .85 percent. For a given percentage change in either salary or class size, the percentage impact on SCH cost could be expected to be greater for the smaller State-owned institutions than the larger State-related ones.

The regression results can be used to estimate the overall reductions in SCH cost which could be expected from several feasible "policy actions" by university administrators:

<u>Policy action</u>	<u>State-related universities</u>		<u>State-owned universities</u>		<u>Total (\$000)</u>
	<u>Lower division</u>	<u>Upper division</u>	<u>Lower division</u>	<u>Upper division</u>	
<u>Decrease average FTE instructional faculty salaries by \$1,000</u>	\$2,000	\$2,300	\$3,000	\$3,100	\$10,400
<u>Increase average class (section) sizes by one student each</u>	1,700	1,900	2,500	4,000	10,100

In other words, the total cost savings from increasing class sizes at all of the public universities in Pennsylvania by one student each would be over \$10 million.

COST-EFFICIENCY TRENDS

Between 1981-82 and 1986-87, average instructional faculty salary cost per student credit hour for undergraduates (undergraduate SCH cost) increased by \$10 (29 percent) at Pittsburgh, \$4 (10 percent) at Temple, \$22 (58 percent) at Lincoln, and \$9 (20 percent) for the State-owned group of institutions. Master's-level SCH cost increased by \$31 (30 percent) at Pittsburgh, \$2 (2 percent) at Temple, \$28 (58 percent) at Lincoln, and \$9 (9 percent) for the State-owned group.

For the most part, increases in SCH cost were primarily related to increases in average FTE instructional salaries. At Pittsburgh, at the master's level, and at Lincoln, at both the undergraduate and master's levels, increases in SCH cost were also caused by decreases in average class sizes. For the State-owned group, the influence of increased average salaries on master's-level SCH cost was partially offset by an increase in average class size.

INTERSTATE COMPARISON OF COST EFFICIENCY

Due to insufficient data, it is presently not possible to compare the cost efficiency of public institutions of higher education in the various states, with cost efficiency defined by the SCH cost measure developed above. However, data are available to make interstate comparisons based on a cost measure related to SCH cost: total instructional cost per FTE student (student cost). The student cost measure includes the instructional faculty salaries contained in SCH cost, but also includes other related costs, allocated to instruction. Thus, while it is a more comprehensive measure than SCH cost, student cost contains a degree of arbitrariness not present in SCH cost (see introduction to chapter III of this report).

For fiscal year 1986, the U.S. average (weighted) total instructional cost per FTE student, computed for all publicly-controlled institutions of higher education, was \$6,079 (table 11). The cost per student for all of Pennsylvania's public institutions--including the State-related and State-owned universities, and community colleges--was \$6,638, 9 percent higher than the U.S. average and ninth highest in the nation.

Table 11

TOTAL INSTRUCTIONAL COST¹ PER FTE STUDENT BY STATE
ALL PUBLICLY CONTROLLED INSTITUTIONS OF HIGHER EDUCATION
FISCAL YEAR 1986

State	Rank	Instructional cost per FTE student
Alaska	1	\$10,727
Wyoming	2	8,266
Vermont	3	7,556
New York	4	7,389
Delaware	5	7,263
Kentucky	6	6,728
Idaho	7	6,661
South Carolina	8	6,655
PENNSYLVANIA	9	6,638
California	10	6,478
Indiana	11	6,426
Tennessee	12	6,351
Arkansas	13	6,344
Rhode Island	14	6,211
Iowa	15	6,192
New Jersey	16	6,184
Michigan	17	6,183
Ohio	18	6,139
Wisconsin	19	6,106
Maryland	20	6,074
Utah	21	6,058
Texas	22	6,050
Maine	23	6,039
Oregon	24	5,982
North Carolina	25	5,977
Georgia	26	5,968
North Dakota	27	5,965
Colorado	28	5,959
Minnesota	29	5,932
Virginia	30	5,887
Kansas	31	5,839
Washington	32	5,752
Mississippi	33	5,742
Alabama	34	5,709
South Dakota	35	5,618
Arizona	36	5,613
Hawaii	37	5,603
Florida	38	5,557
Missouri	39	5,517
Connecticut	40	5,468
Nevada	41	5,414
Nebraska	42	5,400
West Virginia	43	5,327
Illinois	44	5,322
Montana	45	5,245
New Hampshire	46	5,228
Massachusetts	47	5,076
New Mexico	48	5,066
Louisiana	49	4,820
Oklahoma	50	4,438
U.S. average		6,079

1. Direct instructional costs for each state include Instruction, Student Services, and Scholarships and Fellowships. Allocatable costs include Libraries, Academic Support, Instructional Support, Plant Operation and Mandatory Transfers. The latter costs are allocated to instruction on the basis of the ratio of each state's direct instructional costs to its total costs, where total costs equal direct instructional costs plus direct noninstructional costs (Public Service and Research).

SOURCE: Data provided by the Education Information Branch, U.S. Department of Education, Washington, D.C., September 1987.

A regression model for explaining student cost in terms of several important control variables, similar to the SCH cost model developed above, is:

$$\ln Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3$$

where:

Y = total instructional cost per FTE student (\$)

X₁ = average full-time ranked instructional faculty salary (\$)

X₂ = average FTE students per institution

X₃ = State government appropriations per State population (\$)

b₀, b₁, b₂ and b₃ are regression coefficients to be estimated from the data, and ln is the natural logarithm.

In this model, average FTE students per institution (campus) are the size or scale variable. If average FTE students and average class size tend to be positively correlated within individual institutions, then the student cost model of cost efficiency is conceptually equivalent to the SCH cost model.¹⁹

The student cost regression equation was estimated using data for the 50 states, for fiscal 1986.²⁰ The coefficient estimates obtained are:

<u>Control variable</u>	<u>Coefficient estimate</u>
ln X ₁	.48
ln X ₂	-.07
ln X ₃	.13

All of these coefficients are statistically significant at the 5 percent level or better, and have the expected signs: total instructional cost per FTE student in public institutions of higher education throughout the nation is positively correlated with both average salary and average public support for higher education, and negatively correlated with average FTE student enrollment. The negative correlation between student cost and FTE students is evidence of "economies of scale." The regression explains about 33 percent of the interstate variation in student cost.

The higher-than-average cost per student in the public institutions of higher education in Pennsylvania would appear to be largely explained by the size (scale) of these institutions: average FTE students per public campus are about 15 percent lower in Pennsylvania than the U.S. average.

V. COST SHARING

For the most part, the instructional costs of Pennsylvania's public universities are covered by tuition and fee revenues collected from students plus monies appropriated by the General Assembly through the General Fund Budget. Of course, tuition and fees are not necessarily borne totally by students; students receive financial assistance from many sources. The Commonwealth gives financial aid to students at its public universities in two forms: grants under the State Higher Education Grant Program, and loans from or student employment by the public universities under various State Matching Fund programs. These financial aid programs, administered by the Pennsylvania Higher Education Assistance Agency (PHEAA) and also funded through the General Fund Budget, assist students in paying tuition plus other college-related expenses. PHEAA also administers Federal interest-subsidized and payment-guaranteed loans from private lenders under the State Guaranteed Student Loan and PLUS programs. Properly computed student and public shares of the total cost of instructional at the Commonwealth's public universities must consider all of these factors.

STUDENT TUITION AND FEES

Tuition and Fees for Full-Time Students

Tuition and required fees for students at the State-related universities are determined by the individual institutions. A single tuition for students at the State-owned universities is set by the State System of Higher Education; required student fees are set by the individual institutions.

Pennsylvania Department of Education data²¹ indicate that, for the 1986-87 academic year, tuition and fee charges for in-state full-time undergraduate students at the State-related universities ranged from \$3,350 (Temple) to \$2,130 (Lincoln), and in-state full-time graduate students from \$3,862 (Pittsburgh) to \$2,500 (Lincoln) (table 12). For the students at the State-owned universities, the basic tuition for Pennsylvania residents was \$1,680 for both full-time undergraduate and graduate students; required student fees for in-state full-time undergraduates ranged from \$290

(California) to \$126 (Millersville), and for in-state full-time graduates from \$290 to \$20 (same institutions). At Penn State and Pittsburgh, tuition and fees for nonresident full-time undergraduates and graduates exceeded those for residents by approximately 100 percent. At Temple, the out-of-state premium was about 75 percent for full-time undergraduates and 25 percent for full-time graduates. At Lincoln, the out-of-state premiums for the two academic levels were about 47 and 60 percent, respectively. At the State-owned institutions, nonresident undergraduates paid about 75 percent more, but nonresident graduates only about 10 percent more, than Pennsylvania residents.

Table 12 shows that at the State-related universities, tuition and fees for in-state full-time undergraduates and graduates increased by an average of 8 percent from the previous year; tuition and fees for out-of-state full-time students at both levels increased by an average of 7 percent. At the State-owned universities, the basic tuition for in-state full-time undergraduates and graduates had a one-year increase of 5 percent; required student fees for in-state full-time undergraduates increased by an average of 5.8 percent, and for in-state full-time graduates by an average of 8.7 percent.

Tuition and Fee Revenues Collected

During fiscal year 1987, revenues collected by the Commonwealth's public universities from students in the form of tuition and fees totaled \$589 million: \$431.6 million (73 percent) was collected by the State-related universities, and \$157.4 million (27 percent) by the State-owned universities (table 13). The total tuition and fee revenues represent one-year increases of 10 percent for the State-related group and 9 percent for the State-owned group.

Table 13 shows that per student tuition and fee revenues varied considerably among the public universities, from \$4,150 (Pittsburgh) to \$2,780 (Lincoln) in the State-related group, and from \$2,190 (Cheyney) to \$1,750 (California) in the State-owned group. Per student collections for the two groups of institutions increased from the previous year by 8 percent and 6 percent, respectively.

COMMONWEALTH APPROPRIATIONS

Direct Appropriations to the State-Related Universities and the State System of Higher Education

Also during fiscal year 1987, revenues received by the public universities from the Commonwealth's General Fund Budget for

Table 12

ACADEMIC YEAR TUITION AND REQUIRED FEES FOR FULL-TIME STUDENTS BY LEVEL AND RESIDENCE
1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)

Institution ¹	Undergraduate						Graduate ²					
	In-state			Out-of-state			In-state			Out-of-state		
	Tuition and required fees	Percentage change One-year Five-year average		Tuition and required fees	Percentage change One-year Five-year average		Tuition and required fees	Percentage change One-year Five-year average		Tuition and required fees	Percentage change One-year Five-year average	
State-related												
Penn State ^{3,4}	\$2,996	9%	12%	\$6,018	9%	12%	\$3,194	9%	12%	\$6,384	9%	12%
Pittsburgh ^{3,4}	3,220	7	11	6,320	7	11	3,862	8	15	7,642	8	15
Temple ⁴	3,350	7	8	5,846	7	6	3,698	7	8	4,634	7	6
Lincoln	2,130	10	9	3,130	7	9	2,500	9	7	4,000	5	6
Average	2,924	8	10	5,328	7	10	3,314	8	11	5,665	7	10
State-owned												
Indiana ³	1,904	4	7	3,300	7	8	1,828	5	7	2,020	5	10
West Chester	1,811	5	6	3,207	7	8	1,735	5	7	1,927	5	10
Bloomsburg	1,824	5	7	3,220	7	8	1,734	5	7	1,926	5	10
Millersville	1,806	5	7	3,202	7	8	1,700	5	7	1,892	5	10
Slippery Rock	1,922	5	7	3,318	7	8	1,891	3	9	2,083	3	12
Kutztown	1,848	6	7	3,244	8	8	1,728	5	8	1,920	5	11
Clarion ³	1,882	5	7	3,278	7	8	1,831	5	7	2,023	5	10
Shippensburg	1,916	5	7	3,312	7	8	1,810	5	7	2,002	5	10
Edinboro	1,950	4	8	3,346	7	9	1,938	4	8	2,130	4	10
California	1,970	6	8	3,366	8	9	1,970	11	10	2,162	10	13
East Stroudsburg	1,870	4	8	3,266	7	8	1,810	5	9	2,002	5	12
Lock Haven	1,845	5	7	3,241	7	8	na	na	na	na	na	na
Mansfield	1,905	7	8	3,301	8	9	1,780	6	8	1,972	6	11
Cheyney	1,880	6	7	3,276	8	8	1,860	6	7	2,052	6	10
Average	1,881	5	7	3,277	7	8	1,817	5	8	2,009	5	11

1. Arranged in descending order with respect to total full-time equivalent students for 1986-87.
 2. Excludes first professional level.
 3. Main campus data only.
 4. Average cost for most programs; fees vary with programs.
- na. Not applicable.

SOURCE: Pennsylvania Department of Education, Tuition and Required Fees and Room and Board Charges at Institutions of Higher Education in Pennsylvania, 1981-82 and 1982-83, and Basic Student Charges at Institutions of Higher Education, 1983-84 to 1986-87.

Table 13

TUITION AND FEE REVENUES RELATED TO FTE STUDENTS¹
 1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)

Institution ²	Tuition and fee revenues			Tuition and fee revenues per FTE student			
	Amount (in millions)	Percentage change One- year	Five-year average	Amount	One-year change	Percentage change One- year	Five-year average
State-related							
Penn State	\$208.2	12%	19%	\$3,550	\$320	10%	a
Pittsburgh	119.0	7	12	4,150	290	8	13%
Temple	100.7	9	9	4,000	260	7	10
Lincoln	3.7	17	6	2,780	280	11	10
Total	431.6	10	14	3,790	290	8	a
State-owned							
Indiana	24.5	9	11	1,880	110	6	11
West Chester	18.2	9	14	2,020	50	3	12
Bloomsburg	12.3	11	10	1,860	110	6	9
Millersville	12.6	11	12	1,960	140	8	9
Slippery Rock	11.9	6	11	1,880	70	4	7
Kutztown	12.3	12	16	2,030	200	11	9
Clarion	11.0	6	12	1,870	90	5	10
Shippensburg	11.4	7	12	1,950	100	5	10
Edinboro	10.9	11	11	1,940	160	9	12
California	9.0	9	15	1,750	60	4	11
East Stroudsburg	9.6	10	13	2,180	140	7	10
Lock Haven	5.3	9	10	1,970	110	6	9
Mansfield	5.3	5	13	2,060	190	10	12
Cheyney	3.1	15	b	2,190	190	10	9
Total	157.4	9	12	1,940	110	6	10
All institutions	589.0	10	14	3,020	210	7	a

1. FTE students include in-state and out-of-state undergraduate and graduate students.
2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.
 - a. Noncomparable FTE student data.
 - b. Rounds to less than 1 percent.

SOURCE: FTE students - reports provided by the individual institutions, 1982 to 1987; tuition and fee revenues - data provided by the individual State-related institutions, 1982 to 1987, the Pennsylvania Department of Education, Bureau of Budget and Management, 1982 and 1983, and the State System of Higher Education, Commonwealth of Pennsylvania, 1984 to 1987.

educational and general (instructional) purposes totaled \$616.3 million: \$338.4 million (55 percent) was appropriated directly to the State-related universities, and \$277.9 million (45 percent) to the State System of Higher Education for allocation to the State-owned universities (table 14).²² These appropriations represent about 86 percent of the total fiscal year 1987 appropriations made to all public institutions of higher education in the Commonwealth, specifically for instruction (the balance went to community colleges). The total appropriation revenues represent one-year increases of 7 percent for the State-related group and 6 percent for the State-owned group.

Table 14 shows that per student appropriation revenues also varied substantially among institutions. Direct appropriations per FTE student ranged from \$4,820 (Lincoln) to \$2,320 (Penn State). SSHE allocations per FTE student ranged from \$8,330 (Cheyney) to \$3,050 (Indiana). Per student appropriations and allocations increased from the previous year by 6 percent and 3 percent, respectively.

Table 14, which shows institutions arranged in descending order with respect to total full-time equivalent students for 1986-87, also clearly shows that, as FTE students increase, Commonwealth appropriations per FTE student tend to decrease. This inverse relationship indicates that the State appropriation process implicitly recognizes economies of scale in the production of SCH (or FTE students).

Appropriations to the Pennsylvania Higher Education Assistance Agency for Financial Aid to Public University Students

The Governor's Executive Budget shows that, for fiscal year 1987, Commonwealth appropriations from the General Fund to the Pennsylvania Higher Education Assistance Agency totaled about \$126 million; of this total, PHEAA data²³ indicate that about \$41 million, or approximately 33 percent, was used for grant and matching fund programs for students enrolled at Pennsylvania's public universities. The financial aid from PHEAA for fiscal year 1987 to the public universities and their students represents an increase of 12 percent over fiscal year 1986.

During academic year 1986-87, the Pennsylvania Higher Education Assistance Agency awarded over \$25 million (average academic-year award \$1,073) to 25,910 undergraduates (33 percent of the fall full-time undergraduate enrollment) at the State-related universities, and over \$13 million (average award \$726) to 19,779 undergraduates (30 percent of the fall full-time undergraduate enrollment) at the State-owned universities, under the State Higher Education Grant Program. The awards to State-related university students amounted to about 27 percent and to State-owned university students about 14 percent of the total dollar value of the grants made to students in

Table 14

STATE APPROPRIATIONS FOR INSTRUCTION RELATED TO FTE STUDENTS¹
 1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)

Institution ²	Appropriation			Appropriation per FTE student			
	Amount (in millions)	Percentage change One- year	Five-year average	Amount	One-year change	Percentage change One- year	Five-year average
State-related							
Penn State	\$136.0	6%	7%	\$2,320	\$90	4%	a
Pittsburgh ³	93.9	6	8	3,270	200	7	9%
Temple	102.1	9	9	4,060	260	7	9
Lincoln	6.4	9	12	4,820	200	4	17
Total	338.4	7	8	2,970	160	6	a
State-owned							
Indiana	39.8	5	7	3,050	80	3	7
West Chester	28.4	5	6	3,150	-20	-1	4
Bloomsburg	21.3	5	7	3,210	20	1	5
Millersville	21.2	6	7	3,290	70	2	5
Slippery Rock	20.7	8	6	3,270	190	6	3
Kutztown	19.3	8	7	3,180	200	7	2
Clarion	19.3	7	5	3,280	200	6	4
Shippensburg	18.8	5	5	3,220	80	3	3
Edinboro	20.2	5	4	3,600	130	4	4
California	17.2	5	3	3,360	-10	b	b
East Stroudsburg	15.8	6	5	3,590	100	3	3
Lock Haven	11.7	6	5	4,330	140	3	4
Mansfield	12.2	8	3	4,710	570	14	3
Cheyney	12.0	3	3	8,330	-120	-1	13
Total ⁴	277.9	6	6	3,430	110	3	4
All institutions ⁴	616.3	6	6	3,160	140	5	a

1. Appropriations include only funding for educational and general purposes.
2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.
3. Includes appropriation for Titusville campus.
4. Excludes amount of appropriation allocated to Board of Governors/Chancellor's Office and System Reserve.
 - a. Noncomparable FTE student data.
 - b. Rounds to less than 1 percent.

SOURCE: FTE students - reports provided by the individual institutions, 1982 to 1987; appropriations - Governor's Executive Budget, 1983-84 and 1987-88, data provided by the Pennsylvania Department of Education, Bureau of Budget and Management, 1982 and 1983, and the State System of Higher Education, Commonwealth of Pennsylvania, 1984 to 1987.

all institutions of higher education in Pennsylvania under this grant program. These awards need not be repaid to PHEAA.

During academic year 1986-87 PHEAA disbursed State funds as allocations to institutions and aid to students in the total amounts of \$1,424,941 to the State-related universities and \$1,092,983 to the State-owned universities under the State Matching Fund Program. These funds were used by the institutions for National Direct Student Loans, nursing student loans, and as matching funds for various work-study programs, internships, etc.

In the same year PHEAA administered federal interest-subsidized and payment-guaranteed loans by private lenders to 49,817 State-related university undergraduate and graduate students (average loan value \$2,274) and 41,133 State-owned university undergraduate and graduate students (average loan value \$1,804), under the State Guaranteed Student Loan Program. Low-interest and guaranteed loans to the State-related university students represented about 26 percent and to the State-owned university students about 17 percent of the total dollar value of the guaranteed loans to students in all institutions of higher education in Pennsylvania under this program. In addition, PHEAA administered guaranteed loans to 876 State-related university students (average loan value \$2,558) and 567 State-owned university students (average loan value \$2,176) under its PLUS loan program. Under both programs the federal government reimburses lenders for the difference between market rates of interest and the lower rates charged to students, and covers student loan defaults.

COST SHARING

For 1986-87, the ratio of direct Commonwealth appropriations to total revenues from tuition, fees and appropriations (total instructional revenues) was 40 percent at Penn State, 44 percent at Pittsburgh, 50 percent at Temple and 63 percent at Lincoln (table 15). The percentage of direct Commonwealth support was unchanged from the previous year for both Pittsburgh and Temple, but decreased by 3 percent for Lincoln and 2 percent for Penn State.

For the same year, the ratio of SSHE allocations to total instructional revenues varied by institution, ranging from 79 percent at Cheyney to 61 percent at Kutztown and West Chester. Allocations to the State-owned institutions averaged 64 percent of total instructional revenues, representing no change from 1985-86.

Per FTE student, PHEAA grants and matching funds ranged from \$245 at Pittsburgh to \$116 at East Stroudsburg. On an FTE student

Table 15

TUITION AND FEE REVENUES, STATE APPROPRIATION AND STUDENT AID PER FTE STUDENT¹
1986-87, CHANGE FROM 1985-86 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1981-82 to 1986-87)

Institution ²	Per FTE student			Ratio of Appropriation to total			Student aid per FTE student ³
	Tuition and fee revenues	Appropriation	Total	Percentage	Percentage change One-year Five-year average		
State-related							
Penn State	\$3,550	\$2,320	\$5,870	40%	-2%	a	\$242
Pittsburgh	4,150	3,270	7,420	44	0	-1%	245
Temple	4,000	4,060	8,060	50	0	b	227
Lincoln	2,780	4,820	7,600	63	-3	1	223
Total	3,790	2,970	6,760	44	-2	a	239
State-owned							
Indiana	1,880	3,050	4,930	62	-2	-1	237
West Chester	2,020	3,150	5,170	61	-2	-2	117
Bloomsburg	1,860	3,210	5,070	63	-3	-1	184
Millersville	1,960	3,290	5,250	63	-2	-1	136
Slippery Rock	1,880	3,270	5,150	63	0	-1	197
Kutztown	2,030	3,180	5,210	61	-2	-2	125
Clarion	1,870	3,280	5,150	64	2	-1	201
Shippensburg	1,950	3,220	5,170	62	-2	-2	148
Edinboro	1,940	3,600	5,540	65	-2	-2	186
California	1,750	3,360	5,110	66	-1	-2	230
East Stroudsburg	2,180	3,590	5,770	62	-2	-2	116
Lock Haven	1,970	4,330	6,300	69	0	-1	184
Mansfield	2,060	4,710	6,770	70	1	-2	213
Cheyney	2,190	8,330	10,520	79	-2	1	213
Total ⁴	1,940	3,430	5,370	64	0	-1	177
All institutions	3,020	3,160	6,180	51	-2	a	213

1. FTE students include in-state and out-of-state undergraduate and graduate students. Tuition and fees are based on revenues collected by the individual institutions. State appropriations include only funding for educational and general purposes.

2. Arranged in descending order with respect to total full-time equivalent students for 1986-87.

3. Includes grants and matching funds. Does not include student loans.

4. Appropriations exclude amount allocated to Board of Governors/Chancellor's Office and System Reserve.

a. Noncomparable FTE student data.

b. Rounds to less than 1 percent.

SOURCE: FTE students - reports provided by the individual institutions, 1982 to 1987; tuition and fee revenues - data provided by the individual State-related institutions, 1982 to 1987, the Pennsylvania Department of Education, Bureau of Budget and Management, 1982 and 1983, and the State System of Higher Education, Commonwealth of Pennsylvania, 1984 to 1987; appropriations - Governor's Executive Budget, 1983-84 and 1987-88, and data provided by the Pennsylvania Department of Education, Bureau of Budget and Management, 1982 and 1983, and the State System of Higher Education, Commonwealth of Pennsylvania, 1984 to 1987; student aid - 1986-87 Impact Report to College Presidents, Pennsylvania Higher Education Assistance Agency.

basis, the PHEAA aid in these programs averaged 6 percent of tuition and fees at the State-related universities, and 9 percent at the State-owned institutions.

COST-SHARING TRENDS

Between 1981-82 and 1986-87, the average tuition and fee revenues collected per FTE student increased by 65 percent at Pittsburgh, 48 percent at Temple, 52 percent at Lincoln, and 49 percent for the State-owned universities as a group. Over the same interval, the average direct Commonwealth educational and general appropriation per FTE student increased by 44 percent at Pittsburgh, 46 percent at Temple, and 87 percent at Lincoln; the average Department of Education allocation (before fiscal year 1984) or SSHE allocation (since fiscal year 1984) per FTE student increased by an average of 20 percent at the State-owned universities.

The more rapid growth of tuition, relative to per student appropriations, has decreased the share of total instructional revenues from appropriations for all of Pennsylvania's public universities except Cheyney and Lincoln:

<u>Institution</u>	<u>1981-82</u>	<u>1986-87</u>
Penn State	*	40%
Pittsburgh	47%	44
Temple	51	50
Lincoln	59	63
Bloomsburg	66	63
California	74	66
Cheyney	77	79
Clarion	69	64
East Stroudsburg	69	62
Edinboro	71	65
Indiana	65	62
Kutztown	67	61
Lock Haven	73	69
Mansfield	76	70
Millersville	66	63
Shippensburg	68	62
Slippery Rock	68	63
West Chester	67	61

*noncomparable data

During the same time, the number of students receiving PHEAA grants decreased to about 33 from about 39 percent of the fall full-time undergraduate students at the State-related universities, and to about 30 from about 33 percent of these students at the State-owned universities. The average full-year grant amount per student increased to \$1,073 from \$652 (65 percent), and to \$726 from \$437 (66 percent), respectively, for the two groups of schools. The percentage of total student charges covered by PHEAA grants (i.e., tuition, fees, room and board, etc.) increased to 18 from 15 percent during this time.

During the same five-year period, PHEAA administered federally guaranteed loans by private lenders (under its largest loan guarantee program) to about 46 percent of the FTE students at the State-related institutions and over 50 percent of the FTE students at the State-owned institutions. The average loan guarantee amount per loan recipient under this program at the State-related universities increased to \$2,274 from \$2,272 (0.1 percent), and at the State-owned universities decreased to \$1,804 from \$1,917 (6 percent).

INTERSTATE COMPARISON OF COST SHARING

Hegis survey data²⁴ show that during fiscal year 1985 the average tuition revenue per FTE student in Pennsylvania's public institutions of higher education--State-related universities (including medical schools), State-owned universities, and community colleges--was \$2,455, almost 88 percent higher than the U.S. average for all public institutions of higher education (table 16). In 23 states the average tuition for public institutions was higher than the U.S. average. In only three states, however, was the average tuition higher than in Pennsylvania.

On the other hand, the HEGIS data show that, for the same fiscal year, total Commonwealth and local direct appropriations to the same Pennsylvania institutions amounted to \$3,138 per FTE student, nearly 26 percent lower than the U.S. average. Thirty states made direct appropriations to public higher education which were lower than the U.S. average. In only three states, however, was the average per student appropriation lower than in Pennsylvania.

Of course, direct appropriations are not the only source of public support for higher education; appropriations for financial aid programs must also be considered. However, for fiscal year 1985, reliable State and local financial aid data are not available for interstate comparisons.

In any comparison between states, varying institutional mixes--medical schools, research universities, four-year institutions,

Table 16

TUITION REVENUE, STATE AND LOCAL APPROPRIATIONS PER FTE STUDENT BY STATE
ALL PUBLICLY CONTROLLED INSTITUTIONS OF HIGHER EDUCATION¹
FISCAL YEAR 1985

State	Per FTE student		Total	Percentage of appropriations to total
	Tuition revenue	State and local appropriations		
Alabama	\$1,227	\$4,363	\$5,590	78%
Alaska	1,127	12,744	13,871	92
Arizona	1,261	3,866	5,127	75
Arkansas	1,137	4,645	5,782	80
California	869	4,768	5,637	85
Colorado	1,990	3,244	5,234	62
Connecticut	1,381	3,707	5,088	73
Delaware	2,545	3,563	6,108	58
Florida	977	4,349	5,326	82
Georgia	1,287	5,106	6,393	80
Hawaii	834	5,226	6,060	86
Idaho	1,197	4,355	5,552	78
Illinois	1,188	3,582	4,770	75
Indiana	1,800	3,799	5,599	68
Iowa	1,515	4,587	6,102	75
Kansas	1,228	4,405	5,633	78
Kentucky	1,324	5,017	6,341	79
Louisiana	1,008	4,263	5,271	81
Maine	1,625	3,839	5,464	70
Maryland	1,861	4,025	5,886	68
Massachusetts	820	3,848	4,668	82
Michigan	1,884	3,417	5,301	64
Minnesota	1,516	3,747	5,263	71
Mississippi	1,173	4,050	5,223	78
Missouri	1,371	3,410	4,781	71
Montana	939	3,519	4,458	79
Nebraska	1,220	4,183	5,403	77
Nevada	1,006	3,445	4,451	77
New Hampshire	2,836	1,998	4,834	41
New Jersey	1,572	4,302	5,874	73
New Mexico	880	4,434	5,314	83
New York	1,523	5,007	6,530	77
North Carolina	733	5,010	5,743	87
North Dakota	1,292	3,973	5,265	75
Ohio	2,116	3,429	5,545	62
Oklahoma	630	3,319	3,949	84
Oregon	1,378	3,899	5,277	74
PENNSYLVANIA	2,455	3,138	5,593	56
Rhode Island	1,743	4,081	5,824	70
South Carolina	1,339	5,239	6,578	80
South Dakota	1,514	2,763	4,277	65
Tennessee	1,186	3,804	4,990	76
Texas	641	4,884	5,525	88
Utah	1,154	4,369	5,523	79
Vermont	4,237	2,173	6,410	34
Virginia	1,664	4,065	5,729	71
Washington	1,116	3,917	5,033	78
West Virginia	877	3,938	4,815	82
Wisconsin	1,448	4,197	5,645	74
Wyoming	820	6,891	7,711	89
U.S. average ²	1,306	4,233	5,539	76

1. For Pennsylvania, includes State-related universities (including medical schools), State-owned universities and community colleges.

2. Includes the District of Columbia, not separately shown.

SOURCE: Tuition revenues and state and local appropriations - Education Information Branch, U.S. Department of Education: Current Funds Revenues and Current Funds Expenditures and Mandatory Transfers of Institutional Units of Higher Education, Fiscal 1985.

two-year institutions, etc.--play a large role in determining revenues and costs. However, on an FTE student basis, total public support to all institutions of higher education in Pennsylvania are considerable lower than, and total instructional costs somewhat higher than, the national averages. Higher-than-average tuition tends to fill the gap.

APPENDIX: MODEL OF SCH COST DETERMINATION

Average instructional faculty salary cost per student credit hour, or SCH cost, at each academic level and in each program area can be expressed by the following model:

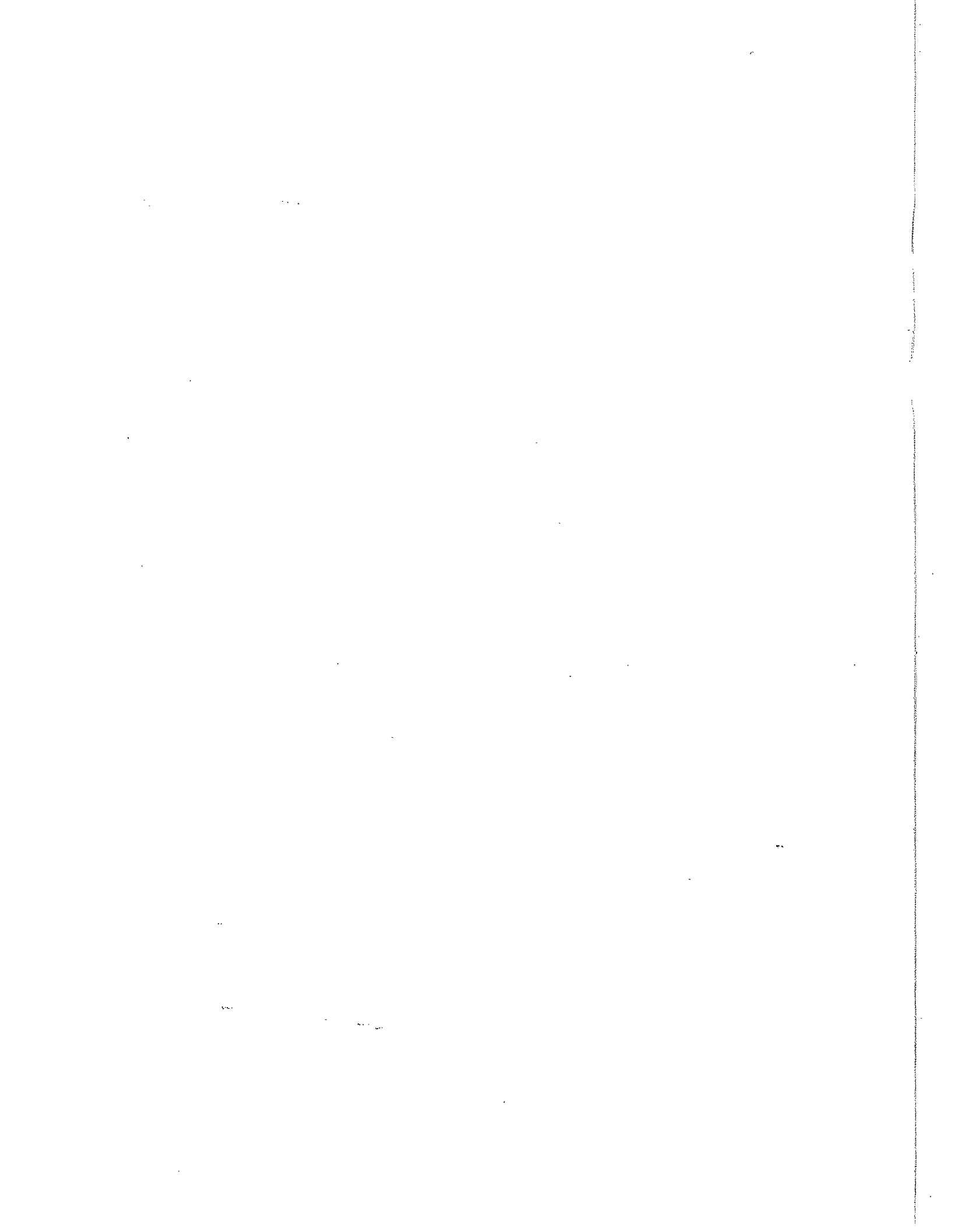
$$\frac{\text{Instructional FTE faculty salaries}}{\text{Student credit hours}} = \left\{ \begin{array}{l} \text{Number of FTE} \\ \text{instructional faculty} \\ \text{Number} \\ \text{of} \\ \text{courses} \end{array} \right\} \times \left\{ \begin{array}{l} \text{Average} \\ \text{course} \\ \text{credit} \\ \text{value} \end{array} \right\} \times \left\{ \begin{array}{l} \text{Average FTE instructional} \\ \text{faculty salary} \\ \text{Number} \\ \text{of classes} \\ \text{Number} \\ \text{of courses} \end{array} \right\} \times \left\{ \begin{array}{l} \text{Average} \\ \text{class size} \end{array} \right\}$$

The two terms on the right-hand side of this equation illustrate the two different kinds of factors which determine SCH cost.

The components of the first term are approximately constants or constant relationships. In the short run, neither the number of faculty per course nor the average assigned credit per course can readily be varied by university administrators to influence SCH cost.

The second term in the equation contains control variables: average instructional faculty salary, average class (section) size, and the number of classes (sections) per course. To at least some degree, each of these variables can be controlled by administrators to affect SCH cost. Adjustments in the number of classes (sections) per course are an alternative to permitting average class size to change with changes in enrollment.

This model is the basis for the multiple regression analysis of SCH cost in the text.



FOOTNOTES

¹Pennsylvania Department of Education, Higher Education Fall Enrollments, 1986.

²Unless otherwise indicated, all data in this report apply to the indicated school year, which includes the summer term preceding an academic year, plus the fall and spring terms of the same academic year; e.g., the 1986-87 school year includes the summer and fall terms of 1986 plus the spring term of 1987.

³Full-time equivalent students are calculated by dividing undergraduate student credit hours by 30 and graduate student credit hours by 24. See table 2.

⁴See footnote 1.

⁵The CIP taxonomy of academic program areas, introduced by the U.S. Department of Education's Center for Statistics (formerly the National Center for Education Statistics) in 1981, replaces the HEGIS taxonomy. This report utilizes an aggregation of two-digit CIP, each of which corresponds to one or more academic departments or program areas within individual institutions. The CIP groupings are employed to facilitate comparisons between institutions, given the large array of departments and programs which exist in the Commonwealth's public universities.

⁶Data for individual institutions are available from the staff of the Joint State Government Commission.

⁷This ratio is an approximation, based on data from several prior years, as current-year degree data for the community colleges, private State-aided institutions, and private independent institutions in the Commonwealth are not available at this time.

⁸In 1983-84, Penn State's data on FTE students (or student credit hours), FTE faculty and faculty salaries were affected by two major reporting changes: a change in the university's academic calendar (to two semesters from three terms in the academic year and to a shorter summer term); and improved data collection procedures which permitted the first-time inclusion of activities related to the university's continuing education credit program. Since then Penn State's data are comparable to current year data from the other institutions, but are noncomparable to prior years' data from Penn State and the other institutions. Therefore, output, input and cost trends for Penn State are not included in this report.

⁹U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 1010, State Population and Household Estimates, With Age, Sex, and Components of Change: 1981-86, U.S. Government Printing Office, Washington, D.C., 1987.

¹⁰Faculty members who are employed by the universities full time, and who are engaged in teaching, research or both, comprise the set of faculty whose workweek activities are gathered and reported by the institutions, and summarized in table 5. Note that this is not the same set of faculty for whom instructional faculty salary data are included in table 6. See also footnote 12.

¹¹Instructional support is synonymous with course preparation and evaluation. Other university service includes public service, institutional support and student support.

¹²Full-time instructional faculty members, plus the full-time equivalency of part-time instructional faculty members, who were employed by the universities during the 1986-87 school year, comprise the set of faculty whose instructional salaries are reported by the institutions and summarized in table 6. Note that this is not the same set of faculty from whom workweek activity data are included in table 5. See also footnote 10.

¹³In 1986-87, Temple's data on FTE faculty, faculty salaries, workweek activities, SCH cost and class sizes are affected by two minor reporting changes: a transfer of basic science faculty to the School of Medicine; and a change in the calculation of full-time instructional FTE faculty, with regards to cross-listed courses. Temple estimates that the changes result in an approximate four percent decrease in overall instructional FTE faculty (table 6). In addition, the changes also affect in a small way workweek activities (table 5), average instructional salaries (table 6), SCH cost (table 7) and average class sizes (table 9).

¹⁴In Caveat: Average instructional salaries are computed by dividing each institution's total instructional salary for each academic rank by the respective number of FTE faculty. Therefore, changes in average salaries do not necessarily correspond to general salary changes for all faculty members in a given institution. Average salary changes also reflect changes in the rank distributions of faculty.

¹⁵See footnote 6.

¹⁶Administrators can change the number of classes (sections) per course as an alternative to permitting changes in class size to occur as student demands vary. Therefore, class (section) size and the number of classes (sections) per course are negatively correlated.

¹⁷This regression equation is actually a logarithmic transformation of a multiplicative version of the linear SCH cost equation derived in the appendix; the transformed equation is used to account for nonlinearities between the X's and the Y. Notice that the regression equation does not include the number of classes (sections) as an explanatory variable. As noted above, variations in the number of classes and average class size are alternative policy actions. Therefore, inclusion of both variables in the regression would be conceptually and statistically incorrect.

¹⁸The actual regression data are not included in this report. These data and all other regression details are available from the staff of the Joint State Government Commission.

¹⁹The X_3 variable, state government appropriations per state population, is a proxy for state "preference for higher education," which might be expected to vary among states. Obviously, this variable would not be applicable to intra-state models of cost efficiency.

²⁰See footnote 18.

²¹See table 12 for source.

²²The Commonwealth appropriation to the State System of Higher Education included here does not include amounts appropriated for either the Board of Governors/Chancellor's Office or the System Reserve. Over the years, "educational and general" appropriations have been expanded to include appropriation categories which had previously been separate line items in the General Fund Budget. In this report, total educational and general appropriations are regarded as "instructional" and used for comparisons, because these appropriations are available to the public institutions for general instructional purposes.

²³Data provided by the Pennsylvania Higher Education Assistance Agency.

²⁴See table 16 for source.