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

Analysis of 1983–84 Data Reported Under 1983 Appropriations Acts and Public School Code

Staff Report
General Assembly of the Commonwealth of Pennsylvania
JOINT STATE GOVERNMENT COMMISSION
108 Finance Building
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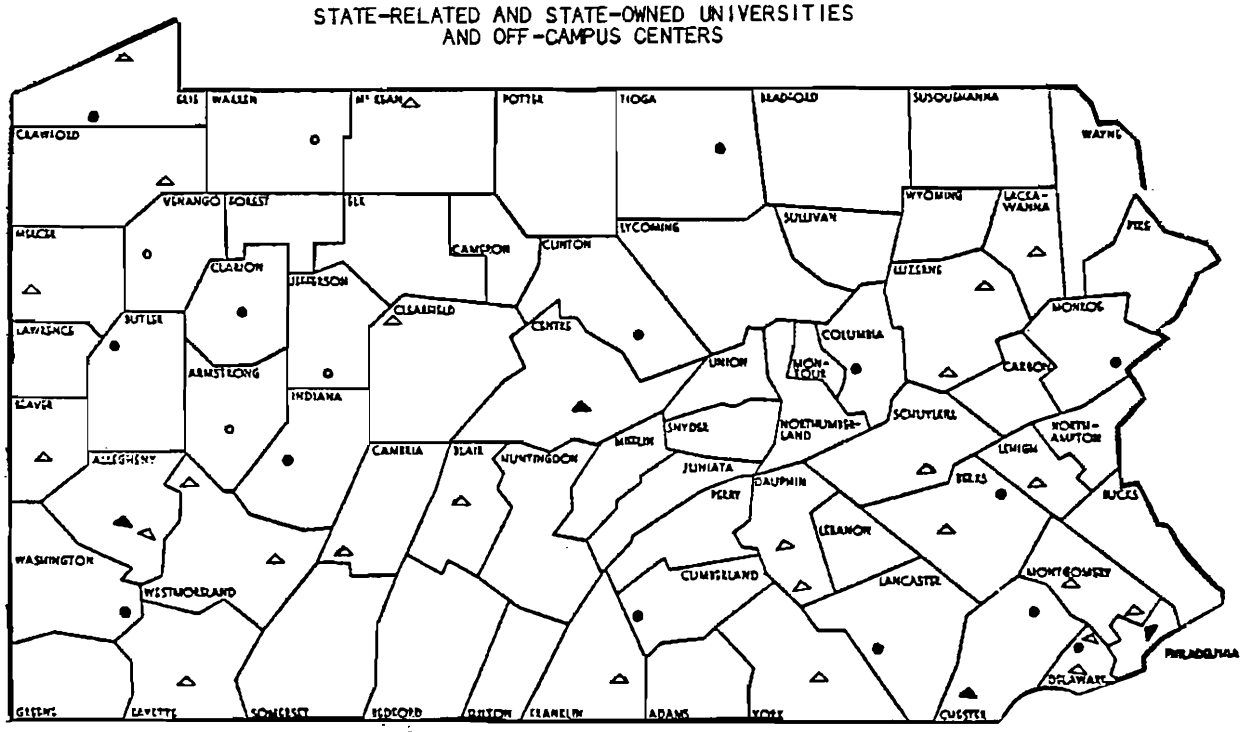
STATE-RELATED AND STATE-OWNED UNIVERSITIES
AND OFF-CAMPUS CENTERS



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

State-Related Universities

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)
- McKeesport Campus (Allegheny)
- Mont Alto (Franklin)
- New Kensington (Westmoreland)
- Ogontz Campus (Montgomery)
- Radnor Center for Graduate Studies (Delaware)
- Schuylkill Campus (Schuylkill)
- Shenango Valley Campus (Mercer)
- University Center at Harrisburg (Dauphin)
- Wilkes-Barre Campus (Luzerne)
- Worthington Scranton Campus (Lackawanna)
- 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)

State-Owned Universities

Bloomsburg (Columbia)
California (Washington)
Cheyney (Delaware)
Clarion (Clarion)
- Venango Campus (Venango)

East Stroudsburg (Monroe)
Edinboro (Erie)
- Warren Campus (Warren)

Indiana University (Indiana)
- Armstrong Campus (Armstrong)
- Punxsutawney Campus (Jefferson)

Kutztown (Berks)
Lock Haven (Clinton)
Mansfield (Tioga)
Millersville (Lancaster)
Shippensburg (Cumberland)
Slippery Rock (Butler)
West Chester (Chester)

Foreword

Since 1972-73 the State-related universities have reported output and salary data under requirements first introduced as amendments to their appropriations acts by Senator Richard A. Snyder; since 1976-77 the State-owned universities have reported the same data under similar requirements contained in the school code. The data are summarized and analyzed by the staff of the Joint State Government Commission and presented in annual reports. Although these reports are specifically intended for use by the appropriations and education committees of the Senate and the House, the analyses should also be of considerable interest to anyone who is concerned with the cost efficiency of public higher education in Pennsylvania.

This 12th annual report contains an analysis of output and salary data for the 1983-84 school year plus trends in output and salaries over the past several years. These trends and the underlying data serve as the basis for insight into the major determinants of instructional salary cost on a per student basis and the impact of changes in the variables which affect this cost.

The current report analyzes the first data from the 14 State-owned universities under their status as members of the State System of Higher Education.

DONALD C. STEELE
Research Director
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Summary

1. In Fall 1983 approximately 38 percent of the total full- and part-time students enrolled in institutions of higher education in Pennsylvania were enrolled in the State's public universities: over 81,500 in the 14 State-owned universities and nearly 129,700 in the 4 State-related universities. During the 1983-84 school year, full-time equivalent (FTE) enrollment (based on student credit hours produced) totaled 78,235 at the State-owned universities and 112,300 at the State-related universities. The total FTE enrollment in the public universities was virtually unchanged from the previous year.

2. During 1983-84, at the State-owned schools, total lower-division student credit hours (SCH) increased, upper-division SCH were nearly unchanged and master's SCH increased from 1982-83. At the State-related schools, the mix of SCH by academic level varied considerably from the previous year. Student credit-hour production by level and program area reflect the differing missions and distribution requirements of the various individual schools.

3. A total of 14,252 undergraduate and graduate degrees (excluding associate and medical degrees) was conferred by the State-owned universities and 20,920 by the State-related universities in 1983-84; these totals represented a small increase in degrees at the former schools and a 7 percent decrease at the latter schools. The State-owned schools granted 50 percent of their undergraduate degrees and 63 percent of their graduate degrees in business and education. The State-related schools granted 45 percent of their undergraduate degrees in business, engineering and health and 56 percent of their graduate degrees in business, education, health and public affairs and protective services. The degrees from individual schools reflect their differing missions as well as the differing nature and sizes of their first professional and graduate programs.

4. Since the mid-70s, total FTE enrollments in the public universities have been nearly constant but the composition of enrollments has changed in several respects; relative increases in the enrollment of undergraduates, full-time students, men and out-of-state students have been observed. Student majors, as reflected in degrees, have also changed; degrees related to vocations have increased, while degrees related to arts and sciences have decreased. The ratios of student credit hours to degrees has continually increased in both groups of schools, implying either increased dropout rates or slower progress by students towards degrees, or both.

5. In Fall 1983, 4,172 full-time faculty were employed by the State-owned universities and 5,419 by the State-related universities. The average workweek of the former faculty was about 55 hours, and of the latter faculty 52 hours. At the State-owned schools, an average of 11.9 hours per week was spent by the faculty in actual contact with students; in the State-related schools, faculty contact hours averaged 9.6 per week.

6. During 1983-84, the total full-time equivalent faculty employed numbered 4,213 in the State-owned universities and 6,508 in the State-related universities. The average salary of the former faculty was $28,100 and of the latter faculty, $24,900. The difference between the average salaries of the two groups is largely attributable to the difference in the percentages of faculty employed in the two highest academic ranks: 70 percent of the faculty in the State-owned schools is either professors or associate professors, whereas in the State-related schools, 42 percent of the faculty is in these ranks. The rank distribution in individual schools varies from the group averages.

7. In general, the average salary of the full-time faculty in Pennsylvania's State-owned universities is higher than the U.S. averages for public institutions, but lower than the U.S. average for private independent institutions. The average salary of the full-time faculty in the larger State-related universities is higher than the U.S. average for public institutions, and also higher than the U.S. average for private independent institutions.

8. Since 1980-81, the total FTE faculty employed by the public universities has changed only slightly. Average instructional faculty salaries have increased by $3,300 and about $3,500 at the State-owned and State-related schools, respectively. While the average salary remains higher at the State-owned schools, the gap is narrowing.

9. In 1983-84, instructional faculty salary cost per student credit hour ("unit cost") averaged $48 for undergraduates at the State-owned schools as a group and $37 at the State-related schools as a group; upper-division unit cost exceeded lower-division unit cost at both groups of schools and graduate unit cost was substantially higher. Across individual schools, unit cost tends to vary inversely with output size. Unit cost also varies considerably by program areas.

10. Unit cost is determined in large part by average faculty salary and average class size. Regression analysis shows that undergraduate unit cost can be expected to <u>increase</u> by over $2 for each $1,000 <u>increase</u> in average salary in the smaller State-owned schools and by about $1 for each $1,000 average salary <u>increase</u> in the larger State-related schools. For each <u>decrease</u> in average class size by one student, unit cost can be expected to <u>increase</u> by amounts ranging from $0.65 to $6.17 depending upon type of school and academic level.

11. Since 1980-81 unit cost has increased by 9.1 and 19 percent at the State-owned and State-related schools, respectively. Changes in faculty salaries and class sizes explain a large part of the unit cost changes.

12. In 1981-82, the total instructional cost per FTE student in all of the publicly controlled institutions in Pennsylvania (including two-year colleges) averaged $4,722, the sixth highest in the nation and $539 more than the U.S. average. Regression analysis shows that differences in this cost among states are largely explained by differences in faculty salaries, institution sizes (as measured by enrollments) and State appropriations for higher education.

13. In 1984-85, main campus tuition and required fees for full-time in-State undergraduate students average $1,741 at the State-owned universities and $2,522 at the State-related universities, representing average increases of 5.8 and 6.5 percent over 1983-84, respectively. Average student charges for full-time, in-State graduate students are higher in both groups of schools, as are student charges for all levels of out-of-state students.

14. In fiscal year 1983-84, direct State appropriations to the public universities totaled $495.5 million, an increase of 2 percent over fiscal year 1982-83; the State-owned schools received $230.8 million (virtually no total increase), and the State-related schools $264.7 million (a 4 percent total increase). The appropriation per FTE

student was $2,950 in the State-owned schools and $2,360 in the State-related schools; per FTE student appropriations tended to vary inversely with institution size. Direct appropriations averaged 66 percent of total revenues from student charges plus direct appropriations in the State-owned universities, and 45 percent in the State-related universities; the percentage for individual schools varied inversely with enrollment.

15. During 1983-84, the Pennsylvania Higher Education Assistance Agency (PHEAA) awarded over $10 million to 20,045 undergraduates at the State-owned universities and nearly $19 million to 25,523 undergraduates at the State-related universities under the State Higher Education Grant Program. An additional $1.4 million went to the public universities and their students under the State Matching Fund Program. PHEAA also administered guaranteed low-interest loans to over 81,500 students at the public universities under various loan guarantee programs. Financial assistance from PHEAA helps students pay their share of public higher education in the State but does not reduce the cost of financing public higher education.

16. From 1978-79 to 1983-84, the average tuition and fees per FTE student increased by about 10.5 percent per year at the State-owned universities and 16.3 percent per year at the State-related universities. During the same time, the average direct State appropriations per FTE student increased by averages of 4.4 and 5.7 percent per year at the two groups of schools, respectively; thus the

student share of costs rose for both groups. Over this interval, at both groups of schools, percentages of average undergraduate student expenses covered by PHEAA grants fell to about 16 percent from about 20 percent, while loans guaranteed by PHEAA increased to about two-fifths from about one-quarter of the FTE students.

17. In fiscal year 1984, the average tuition for students at all public institutions of higher education in Pennsylvania (including two-year colleges, medical schools and research institutions) was $2,209; the U.S. average was $1,048. Total State and local appropriations per student in Pennsylvania were $3,791; the U.S. average was $3,850. Thus the student share of public higher education cost in the State was higher than the national average. At least a part of the higher tuition can be viewed as the price that is paid for the convenience and economy to students of the availability of many geographically diverse campuses in Pennsylvania.

I. Introduction

For the 1983-84 academic year the in-State tuition and required fees for full-time undergraduate students (main campuses) averaged $1,645 at the 14 State-owned universities and $2,368 at the 4 State-related universities. These student charges represented 17 and 24 percent, respectively, of the average per capita disposable income of Pennsylvanians in 1983.[1]

During fiscal year 1983-84 the direct State appropriations to the 18 public universities for educational and general purposes totaled $495.5 million. The appropriation to the Pennsylvania Higher Education Assistance Agency (PHEAA) used for allocations to the public universities and grants to public university students totaled an additional $30.6 million.

Clearly, both Pennsylvania students and taxpayers should be concerned that the State's public universities are producing the best "product" in the most cost-efficient manner. Indeed the dual objective of high quality and lowest possible cost is mandated for the State-owned

[1]In this section, comparisons are based on: 1983 disposable personal income (total), $116,322 million; and 1983 disposable personal income (per capita), $9,779. Figures furnished by the Bureau of Statistics, Research and Planning, Pennsylvania Department of Commerce.

universities by the legislation which created the State System of Higher Education in 1982. This two-faceted goal is no less important for the State-related universities which receive a large part of their operating revenue from State appropriations.

The issue of quality in education is a highly complex matter about which there are many divergent views. This important issue is not addressed in this report; instead it concentrates on an analysis of the instructional output and a principal component of the instructional cost, instructional faculty salaries, of Pennsylvania's public universities. The analysis is made within the framework of cost efficiency. In addition the report examines the sharing of total instructional cost by students and taxpayers. Data on instructional output, salaries and cost shares for the 1983-84 school year are related to data trends for the past several years for a larger perspective.[2]

As Pennsylvania's public universities adjust to projected declines in enrollments in the years ahead, their policy decisions regarding faculty complements and salaries, course offerings, class sizes, etc., will have many quality and cost consequences.

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[2]Unless otherwise noted, the data used in this report were reported by the State-owned universities under the Public School Code (amended) and by the State-related universities under their appropriation acts (various years). For the most part, detailed data are included for only the 1983-84 school year which includes the summer and fall terms for 1983 and the spring term for 1984. Data trends are shown as average percentage changes for a multiyear period. Detailed data for prior years were included as an appendix in last year's report and are available upon request from the Joint State Government Commission.

II. Instructional Output

Instructional output in higher education can be measured in several ways. This report utilizes three alternative output measures: full-time equivalent (FTE) students, student credit hours (SCH) and degrees. The first two measures are related: FTE students are computed by formula from student credit hours. But the two separate measures are useful in different ways. Somewhat analagous to "persons," FTE students are the simpler basis for comparisons of enrollment between institutions and over time. Related to academic levels and instructional program areas, student credit hours are more easily linked to the factors which determine instructional cost, which varies by levels and programs. The third measure, degrees by major fields, is the most important indicator of student interests and career choices. Degree trends can indicate changes in interests and vocational opportunities and thus form the basis for structural changes within institutions of higher education.

FULL-TIME EQUIVALENT STUDENTS

In Fall 1983 about 211,200 total full- and part-time students were enrolled in Pennsylvania's 18 public universities: over 81,500 students

in the 14 State-owned universities and nearly 129,700 in the 4 State-related universities. The combined public university enrollment represented approximately 38 percent of the total enrollment in the nearly 225 total public and private institutions of higher education in the State.

During the 1983-84 school year, total student credit hours produced translated into 78,235 full-time equivalent students at the State-owned universities and 112,300 FTE students at the State-related universities (see table 1).[3] FTE students were less than total students since many students were enrolled on a part-time basis. The three largest State-related universities each reported more than 23,000 FTE students: Penn State (58,369),[4] Pittsburgh (29,329) and Temple (23,288); the four smallest universities each reported fewer than 3,000 FTE students: Mansfield (2,731), Lock Haven (2,585), Cheyney (1,996) and Lincoln (1,314). At Pittsburgh and Temple, about three-quarters of the FTE students were undergraduates; both schools have large first professional programs in law, dentistry and pharmacology. At Penn State,

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[3]FTE students are calculated by dividing total undergraduate student credit hours by 30 and total graduate student credit hours by 24, the standard academic-year workloads for full-time students at the respective levels.

[4]Current year data on FTE students (and student credit hours) for Penn State are affected by two 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) has reduced the average credit hour load per full-time student; and improved data collection procedures have permitted the first-time inclusion of credit hours generated by the school's continuing education program. Both changes make Penn State's 1983-84 FTE student (and student credit hour) data more comparable with data from the other institutions, but noncomparable with previous years' data from Penn State.

Lincoln and the State-owned universities more than 90 percent of the FTE students were undergraduates.

Table 1 shows that in 1983-84, aggregate FTE students in the State-owned schools increased by 2 percent over 1982-83; total undergraduates increased by 1 percent and graduates by 8 percent. California, Cheyney, Clarion, Kutztown, Millersville and Slippery Rock had the largest increases in total FTE enrollment, while West Chester had the largest decrease.

In 1983-84, compared to the previous year, total FTE students increased slightly at Pittsburgh, but decreased by 2 percent at Temple and 3 percent at Lincoln. At Penn State, total FTE students in resident instruction decreased by 4,159 (7 percent).[5] Penn State FTE undergraduates in continuing education were reported for the first time (see footnote 4); in 1983-84 these FTE totaled 4,087. As a group the State-related schools had a total decrease in FTE graduate students.

STUDENT CREDIT HOURS

Academic-Level Production

Instructional output is further detailed in table 2, which presents student credit hours for lower- and upper-division undergraduate, master's and first professional and doctoral students. At the State-owned

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[5]Resident instruction is the credit instruction offered primarily to full-time degree candidates at Penn State campuses. Continuing education instruction is not primarily designed for full-time degree candidates. Credit and noncredit continuing education instruction is offered at Penn State campuses and other locations; only continuing education credit instruction is included in this report.

Table I

FULL-TIME EQUIVALENT STUDENTS BY LEVEL[1]
1983-84, CHANGE FROM 1982-83 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1978-79 to 1983-84)

Institution[2]	Total				Undergraduate level				Graduate level[3]			
			Percentage change				Percentage change				Percentage change	
	FTE students	One-year change	One year	Five-year average	FTE students	One-year change	One year	Five-year average	FTE students	One-year change	One year	Five-year average
State-related												
Penn State	58,369	a	a	a	53,446	a	a	a	4,923	a	a	a
Pittsburgh	29,329	35	b	1%	21,369	217	1%	2%	7,960	-182	-2%	b
Temple	23,288	-505	-2%	-3	17,216	257	2	-1	6,072	-762	-11	-7%
Lincoln	1,314	-37	-3	3	1,113	-15	-1	1	201	-22	-10	16
Total	112,300	a	a	a	93,144	a	a	a	19,156	a	a	a
State-owned												
Indiana	12,960	25	b	1	12,116	-148	-1	1	844	173	26	1
West Chester	8,393	-254	-3	1	7,784	-234	-3	1	609	-20	-3	-4
Millersville	6,263	233	4	3	5,791	248	4	4	472	-15	-3	-6
Bloomsburg	6,191	8	b	0	5,881	42	1	b	310	-34	-10	-6
Slippery Rock	5,932	278	5	2	5,674	265	5	2	258	13	5	-4
Edinboro[4]	5,705	92	2	1	5,350	56	1	1	355	36	11	-4
Clarion	5,635	184	3	2	5,397	160	3	2	238	24	11	b
Kutztown	5,522	227	4	4	5,298	228	4	5	224	-1	b	-6
Shippensburg	5,504	16	b	b	4,994	0	0	1	510	16	3	-4
California	4,630	260	6	2	4,302	216	5	2	328	44	15	-2
East Stroudsburg	4,188	38	1	1	3,853	-38	-1	1	335	76	29	b
Mansfield	2,731	66	2	3	2,630	67	3	3	101	-1	-1	-2
Lock Haven	2,585	18	1	3	2,585	18	1	3	na	na	na	na
Cheyney	1,996	201	11	-3	1,923	166	9	-3	73	35	92	-5
Total	78,235	1,392	2	1	73,578	1,046	1	2	4,657	346	8	-3
All institutions	190,535	a	a	a	166,722	a	a	a	23,813	a	a	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 1983-84.

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.

4. Edinboro student credit-hour data for fiscal year 1978-79 from "State College and University Budgeting System Common Cost Accounting Reports."

a. Penn State's FTE student data are comparable to data from the other institutions, but are not comparable to previous years' data from Penn State, due to a change in their academic calendar and the first-time inclusion of data from their continuing education credit program.

b. Rounds to less than 1 percent.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1978 to 1984.

Table 2

STUDENT CREDIT-HOUR PRODUCTION BY LEVEL[1]
1983-84, CHANGE FROM 1982-83 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1978-79 to 1983-84)
(Credit hours in 000s)

Institution[2]	Undergraduate level						Graduate level					
	Lower division			Upper division			Master's			First professional and doctor's[3]		
		Percentage change			Percentage change			Percentage change			Percentage change	
	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	1,058	a	a	546	a	a	54	a	a	64	a	a
Pittsburgh	426	2%	2%	215	b	b	118	-2%	b	73	-3%	b
Temple	250	-8	-3	267	13%	2%	67	-21	-8%	79	-1	-5%
Lincoln	27	-1	5	6	-5	-7	5	-10	16	na	na	na
Total	1,761	a	a	1,034	a	a	244	a	a	216	a	a
State-owned												
Indiana	246	b	1	118	-3	1	20	26	1	c	c	c
West Chester	169	-3	2	65	-3	-1	15	-3	-4	na	na	na
Millersville	138	4	4	36	6	2	11	-3	-6	na	na	na
Bloomsburg	120	3	3	57	-5	-3	7	-10	-6	na	na	na
Slippery Rock	130	7	4	40	-1	-2	6	5	-4	na	na	na
Edinboro[4]	119	3	3	41	-4	-3	9	11	-4	na	na	na
Clarion	122	5	3	40	-1	-1	6	11	b	na	na	na
Kutztown	106	3	6	53	9	5	5	b	-5	na	na	na
Shippensburg	109	-1	b	41	2	4	12	3	-4	na	na	na
California	97	5	4	32	5	-1	8	15	-2	na	na	na
East Stroudsburg	84	b	2	31	-4	-2	8	29	b	na	na	na
Mansfield	59	2	5	20	5	-2	2	-1	-2	na	na	na
Lock Haven	59	-1	3	19	6	3	na	na	na	na	na	na
Cheyney	45	13	-2	13	-1	-6	2	93	-5	na	na	na
Total	1,603	2	3	606	b	b	111	8	-3	na	na	na
All Institutions	3,364	a	a	1,640	a	a	355	a	a	216	a	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 1983-84.
3. The first professional and doctor's level excludes medical school data at all schools.
4. Edinboro student credit-hour data for fiscal year 1978-79 from "State College and University Budgeting System Common Cost Accounting Reports."

a. Penn State's student credit-hour data are comparable to data from the other institutions, but are not comparable to previous years' data from Penn State, due to a change in their academic calendar and the first-time inclusion of data from their continuing education credit program.
b. Rounds to less than 1 percent.
c. Included in master's level.
na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1978 to 1984.

schools, total lower-division SCH increased by 2 percent, upper-division SCH were nearly unchanged, and master's SCH increased by 8 percent. At the State-related schools, changes in the mix of credit-hour production vary considerably from last year. At Pittsburgh, student credit hours increased by 2 percent in the lower division and remained nearly unchanged in the upper division. At Temple, lower-division SCH decreased by 8 percent but upper division SCH increased by 13 percent. At Lincoln, SCH decreased at the two undergraduate divisions (by 1 percent and 5 percent, respectively). At Penn State (assuming that most continuing education credit hours are produced in the lower division) total resident instruction credit hours in the lower division decreased by about 114,000 (11 percent) and in the upper division by about 19,000 (3 percent). Penn State credit hours in continuing education were reported for the first time (see footnote 4); in 1983-84, these credit hours totaled about 123,000.

Program-Area Production

Table 3 presents 1983-84 student credit-hour production for the public universities by CIP classifications or program areas. The CIP groupings are comparable to academic departments or combinations of departments within individual schools.[6]

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[6] A Classificaton of Instructional Programs was introduced by the National Center for Education Statistics in 1981, replacing the former HEGIS taxonomy. This report utilizes an aggregation of two-digit CIP. The program-area data reflect some minor reporting inconsistencies between schools, e.g., some (smaller) schools report computer science activities under mathematics, while other (larger) schools report these activities under computer and information sciences. Such inconsistencies are not believed to distort the program-area analysis to any large degree.

Table 3

STUDENT CREDIT-HOUR PRODUCTION BY CIP CLASSIFICATION
AND BY TYPE OF INSTITUTION
1983-84
(Credit hours in 000s)

CIP Classification	Total			State-related institutions			State-owned institutions		
	Lower division	Upper division	Graduate[1]	Lower division	Upper division	Graduate[1]	Lower division	Upper division	Graduate[1]
Agriculture	5.1	21.8	3.7	5.1	21.8	3.7	0	0	0
Architecture and environmental design	4.9	10.6	.7	4.9	10.6	.7	0	0	0
Area and ethnic studies	5.3	5.3	.4	5.3	5.3	.4	0	0	0
Business	235.7	316.0	64.7	119.7	185.6	57.3	116.0	130.4	7.4
Communications	40.0	50.1	4.1	14.6	25.8	2.5	25.4	24.3	1.6
Computer and information sciences	127.9	44.5	12.7	80.0	32.7	12.1	47.9	11.8	.6
Education	253.1	235.4	152.5	84.5	69.6	91.8	168.6	165.8	60.7
Engineering	98.1	169.5	36.2	95.6	166.3	36.1	2.5	3.2	.1
Foreign languages	118.1	24.4	5.1	64.9	17.8	4.3	53.2	6.6	.8
Health	25.5	87.0	66.9	19.1	66.9	65.2	6.4	20.1	1.7
Home economics	29.6	23.1	3.9	21.4	14.0	3.3	8.2	9.1	.6
Industrial arts	.5	0	.1	0	0	0	.5	0	.1
Law	.2	.2	51.9	.2	.2	51.9	0	0	0
Letters	437.3	103.9	17.7	214.0	79.0	13.5	223.3	24.9	4.2
Liberal/general studies	3.8	1.5	a	1.5	1.3	a	2.3	.2	0
Library and archival studies	2.4	2.2	5.8	.5	.2	3.5	1.9	2.0	2.3
Life sciences	176.4	51.1	10.6	85.2	30.3	7.1	91.2	20.8	3.5
Mathematics	411.8	55.8	11.7	238.9	34.2	8.4	172.9	21.6	3.3
Military sciences	9.4	5.0	a	2.9	2.2	a	6.5	2.8	0
Multi/interdisciplinary studies	28.3	4.9	1.4	20.4	4.4	1.4	7.9	.5	a
Parks and recreation	8.8	11.4	1.5	2.7	5.6	1.1	6.1	5.8	.4
Personal and social development	0	0	0	0	0	0	0	0	0
Philosophy, religion and theology	73.3	14.0	4.8	39.8	11.3	4.8	33.5	2.7	a
Physical sciences	320.7	52.4	23.9	203.2	38.0	22.4	117.5	14.4	1.5
Psychology	159.2	57.9	16.6	79.4	28.2	7.8	79.8	29.7	8.8
Public affairs and protective services	39.0	50.6	36.4	14.8	36.1	34.3	24.2	14.5	2.1
Social sciences	523.5	165.0	24.0	236.0	99.8	15.3	287.5	65.2	8.7
Trade and industrial	13.1	.8	0	12.9	.1	0	.2	.7	0
Visual and performing arts	207.4	74.6	13.6	94.0	45.6	10.4	113.4	29.0	3.2
Other	3.8	.5	.3	0	.1	.3	3.8	.4	0
Total[2]	3,362.2	1,639.4	571.5	1,761.5	1,032.8	459.7	1,600.7	606.6	111.8

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 100 student credit hours.

SOURCE: Reports provided by the individual institutions, 1984.

As expected, the table shows that the public universities produced relatively large numbers of lower-division undergraduate credit hours in the program areas encompassing distribution courses required of most first- and second-year students: letters, mathematics, life, physical and social sciences and visual and performing arts. In addition, the schools produced large numbers of lower- and upper-division credit hours in areas related to undergraduate majors: business, education and social sciences. The State-owned universities had most of their graduate credit-hour production in business, education and psychology. The larger State-related universities produced the most numbers of graduate credit hours in business, education, engineering, health and law.

DEGREES

Academic-Level Production

As shown in table 4, in 1983-84 the public universities conferred a total of 35,172 undergraduate and graduate degrees (excluding associate and medical degrees): 14,252 degrees (41 percent of the total) were conferred by the State-owned universities and 20,920 (59 percent of the total) by the State-related universities. In total, these degrees from the public universities represented about half of the total degrees conferred by all of the public and private institutions of higher education in Pennsylvania (excluding associate and medical degrees). More than 86 percent (12,316) of the State-owned university degrees and almost 70 percent (14,558) of the State-related degrees were granted to

Table 4

DEGREES CONFERRED BY LEVEL[1]
1983-84, CHANGE FROM 1982-83 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE (1978-79 to 1983-84)

Institution[2]	Total				Undergraduate level				Graduate level			
			Percentage change				Percentage change				Percentage change	
	Degrees	One-year change	One year	Five-year average	Degrees	One-year change	One year	Five-year average	Degrees	One-year change	One year	Five-year average
State-related												
Penn State	9,568	-1,332	-12%	-1%	7,997	-1,157	-13%	-1%	1,571	-175	-10%	-2%
Pittsburgh	6,128	-103	-2	a	3,439	-61	-2	-1	2,689	-42	-2	a
Temple	5,030	-69	-1	-2	2,999	30	1	-1	2,031	-99	-5	-3
Lincoln	194	-55	-22	-2	123	-46	-27	-7	71	-9	-11	22
Total	20,920	-1,559	-7	-1	14,558	-1,234	-8	-1	6,362	-325	-5	-2
State-owned												
Indiana	2,628	-148	-5	a	2,280	-141	-6	a	348	-7	-2	-3
West Chester	1,397	39	3	-2	1,175	52	5	-1	222	-13	-6	-7
Millersville	1,150	26	2	-1	1,038	62	6	1	112	-36	-24	-11
Bloomsburg	1,235	-82	-6	-2	1,084	-57	-5	-1	151	-25	-14	-6
Slippery Rock	961	-27	-3	-1	862	0	0	a	99	-27	-21	-5
Edinboro	929	-8	-1	-5	770	-9	-1	-4	159	1	1	-8
Clarion	987	5	-1	-2	857	5	-1	-3	130	0	0	1
Kutztown	945	120	15	1	838	115	16	2	107	5	5	-5
Shippensburg	1,340	93	7	1	1,029	95	10	5	311	-2	-1	-6
California	725	10	1	-5	614	3	a	-4	111	7	7	-7
East Stroudsburg	763	-4	-1	a	648	-23	-3	-1	115	19	20	9
Mansfield	426	36	9	-4	378	25	7	-5	48	11	30	5
Lock Haven	455	26	6	3	455	26	6	3	na	na	na	na
Cheyney	311	-14	-4	-3	288	-15	-5	-2	23	1	5	-9
Total	14,252	62	a	-1	12,316	128	1	-1	1,936	-66	-3	-5
All institutions	35,172	-1,497	-4	-1	26,874	-1,106	-4	-1	8,298	-391	-4	-3

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 1983-84.

a. Rounds to less than 1 percent.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1979 to 1984.

undergraduates. In the aggregate, total degrees, undergraduate degrees and graduate degrees each decreased by 4 percent from the previous year. Several individual schools had larger-than-average percentage decreases in total degrees granted: Lincoln (22 percent); Penn State (12 percent); Bloomsburg (6 percent); and Indiana (5 percent). Several other schools had larger-than-average percentage increases in total degrees: Kutztown (15 percent); Mansfield (9 percent); Shippensburg (7 percent); and Lock Haven (6 percent).

Program-Area Production

The number and percentage distribution of degrees by academic level and CIP classification for the two groups of public universities are presented in table 5. In the State-owned schools as a group, 50 percent of the undergraduate degrees were conferred in business and education (26 percent and 24 percent, respectively); 63 percent of the graduate degrees were conferred in these two areas (11 percent and 52 percent, respectively). Other areas with significant undergraduate degrees include communications, computer and information sciences and health; significant numbers of graduate degrees were granted in psychology. In the State-related schools as a group, 45 percent of the undergraduate degrees were conferred in business, engineering and health and 56 percent of the graduate degrees in business, education, health and public affairs and protective services. Significant numbers of undergraduate degrees were conferred in computer and information sciences, home economics, liberal/general studies and social sciences.

Table 5

NUMBER AND PERCENTAGE DISTRIBUTION OF DEGREES CONFERRED BY LEVEL AND BY CIP CLASSIFICATION[1]
1983-84

CIP classification	Total				State-related institutions				State-owned institutions			
	Undergraduate		Graduate		Undergraduate		Graduate		Undergraduate		Graduate	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Agriculture	500	2%	82	1%	500	3%	82	1%	--	--	--	--
Architecture and environmental design	133	a	11	a	117	1	11	a	16	a	--	--
Area and ethnic studies	22	a	7	a	16	a	7	a	6	a	--	--
Business	6,027	22	1,098	13	2,875	20	894	14	3,152	26%	204	11%
Communications	1,269	5	114	1	611	4	64	1	658	5	50	3
Computer and information sciences	1,438	5	262	3	766	5	233	4	672	5	29	1
Education	3,862	14	2,388	29	900	6	1,380	22	2,962	24	1,008	52
Engineering	2,717	10	576	7	2,588	18	576	9	129	1	--	--
Foreign languages	198	1	55	1	106	1	45	1	92	1	10	1
Health	1,670	6	711	9	1,017	7	631	10	653	5	80	4
Home economics	459	2	34	a	252	2	33	1	207	2	1	a
Industrial arts	--	--	--	--	--	--	--	--	--	--	--	--
Law	66	a	534	7	66	a	534	9	--	--	--	--
Letters	1,034	4	185	2	660	5	116	2	374	3	69	4
Liberal/general studies	209	1	9	a	153	1	9	a	56	a	--	--
Library and archival studies	41	a	139	2	--	--	78	1	41	a	61	3
Life sciences	870	3	143	2	512	4	91	1	358	3	52	3
Mathematics	316	1	71	1	160	1	47	1	156	1	24	1
Military sciences	--	--	--	--	--	--	--	--	--	--	--	--
Multi/interdisciplinary studies	318	1	49	1	210	1	32	1	108	1	17	1
Parks and recreation	284	1	33	a	129	1	31	a	155	1	2	a
Personal and social development	--	--	--	--	--	--	--	--	--	--	--	--
Philosophy, religion and theology	63	a	54	1	40	a	54	1	23	a	--	--
Physical sciences	714	3	271	3	389	3	244	4	325	3	27	1
Psychology	971	4	230	3	525	4	105	2	446	4	125	6
Public affairs and protective services	1,128	4	657	8	652	4	590	10	476	4	67	3
Social sciences	1,720	6	244	3	882	6	166	3	838	7	78	4
Trade and industrial	15	a	--	--	--	--	--	--	15	a	--	--
Visual and performing arts	857	3	184	2	435	3	153	2	422	3	31	2
Total[2]	26,901	100	8,141	100	14,561	100	6,206	100	12,340	100	1,935	100

1. Undergraduate degrees include only bachelor's at all institutions. 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. Because of rounding, totals may not equal 100.
a. Rounds to less than 1 percent.

SOURCE: Preliminary data furnished by Pennsylvania Department of Education, Division of Data Services, January 1985; data gathered using U.S. Department of Education ED (NCES) Form 2300-2.1A1-1, 4/83.

OUTPUT TRENDS

Enrollment Levels and Composition

As the postwar "baby boom" generation has advanced beyond the "traditional" college age, some gloomy forecasts have foretold of major declines in the levels of higher education enrollment. More optimistic predictions have noted that changes in the composition of enrollment might yield unchanged levels of enrollment (or smaller decreases), especially if older persons enrolled in larger numbers and compensated for the decline in the college-age population. In addition, enrollment would not decline if the proportion of college-age persons choosing higher education increased.

Total enrollment in Pennsylvania's public universities may yet decline. But since about 1975-76, overall FTE students have increased slightly. The forecasted enrollment decline has not occurred possibly due in part to unpredicted changes in the composition of enrollment. Tables 1 and 2 show one such change: a decrease in total graduate FTE students has been (roughly) offset by an increase in total undergraduate FTE students. This shift is probably related to a shift in the relative economic values of degrees at the two academic levels.

Disaggregated enrollment data from the Department of Education and the Pennsylvania Higher Education Assistance Agency are useful in pinpointing several other changes in the composition of enrollment in

the public universities during the past five years.[7] These data show that for the public universities as a group: (1) the ratio of full-time to total students enrolled has increased; (2) the ratio of men to total persons enrolled has increased (especially in the State-owned universities, although the total enrollment of women is still larger in these schools as a group); and (3) the ratio of out-of-state to total students enrolled has increased. The relative increases in total full-time students and men enrolled may be more closely related to short-run economic conditions than to demographic conditions. These trends may be reversed as economic conditions change. The inflow of out-of-state students occurred even though tuitions for nonresidents at Pennsylvania's public universities are generally much higher than tuitions for in-state students at the public universities of surrounding states (see section V). This inflow is an indication that the instruction offered by the public universities of Pennsylvania is highly regarded despite its higher price.

Student Majors

Since 1978-79, undergraduate degrees in business have increased to 26 percent from 15 percent of the total undergraduate degrees conferred by the State-owned universities and to 20 percent from 16 percent of the

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[7]See Pennsylvania Department of Education, Higher Education Summer and Fall Enrollments, 1983 and Kenneth R. Reeher, Trends in Pennsylvania Students' Enrollments, Costs, Incomes and Financial Aid: A Report to the Governor's Commission on Financing Postsecondary Education, PHEAA, April 19, 1984. The trends noted apply to the public universities as a group and not to individual universities.

total undergraduate degrees conferred by the State-related universities. Undergraduate degrees in engineering have increased to 18 percent from 13 percent of the total undergraduate degrees from the latter schools. Conversely, undergraduate degrees in education have decreased at both groups of schools: to 24 percent from 37 percent of the total at the State-owned universities and to 6 percent from 11 percent of the total at the State-related schools. Undergraduate degrees in social sciences have also decreased at both types of schools: to 7 percent from 11 percent of the total at the State-owned schools and to 6 percent from 9 percent at the State-related schools. These changes in degrees mirror the changes observed at the national level: increases in areas related to vocations and decreases in areas related to education and arts and sciences.

Relationship of Student Credit Hours to Degrees

At both the State-owned universities and the State-related universities and at both the undergraduate and graduate levels, total degree output has decreased slightly during the past five years (see table 4). During the same interval, total FTE student (or student credit-hour) production has remained largely unchanged (see tables 1 and 2).

Table 6 details the changing relationship between student credit hours and degrees for undergraduates and graduates and for the two groups of public universities for the years 1978-79 to 1983-84. Deducting continuing education credit hours produced by Penn State in 1983-84 to make the current year data comparable with the historical series (see footnote 4), the undergraduate ratio of credit hours to degrees for the

Table 6

RELATIONSHIP OF STUDENT CREDIT-HOUR PRODUCTION TO DEGREES[1]
1978-79 to 1983-84

Year and level	Total			State-related institutions			State-owned institutions		
	Student credit hours (000s)	Degrees	Ratio	Student credit hours (000s)	Degrees	Ratio	Student credit hours (000s)	Degrees	Ratio
1983-84[a]									
Undergraduate	5,001	26,874	186.1	2,794	14,558	191.9	2,207	12,316	179.2
Graduate	572	8,298	68.9	460	6,362	72.3	112	1,936	57.7
1982-83									
Undergraduate	4,967	27,980	177.5	2,791	15,792	176.8	2,176	12,188	178.5
Graduate	580	8,689	66.8	477	6,687	71.3	103	2,002	51.4
1981-82									
Undergraduate	4,920	27,079	181.7	2,775	15,017	184.8	2,145	12,062	177.8
Graduate	632	9,135	69.2	515	6,816	75.6	117	2,319	50.5
1980-81									
Undergraduate	4,817	26,839	179.5	2,730	14,758	185.0	2,087	12,081	172.8
Graduate	663	9,235	71.8	533	6,808	78.3	130	2,427	53.6
1979-80									
Undergraduate	4,743	b	b	2,678	15,206	176.1	2,065	b	b
Graduate	649	9,051	71.7	517	6,592	78.4	132	2,459	53.7
1978-79									
Undergraduate	4,681	28,193	166.0	2,645	15,465	171.0	2,036	12,728	160.0
Graduate	650	9,571	67.9	518	6,922	74.8	132	2,649	49.8

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.

a. The total and State-related ratios are not comparable with previous years' ratios, due to a change in Penn State's academic calendar and the first-time inclusion of student credit hours from Penn State's continuing education credit program.

b. Data not available for all institutions.

SOURCE: Reports provided by the individual institutions, 1979 to 1984.

State-related group is 183.5. The credit hours to degrees ratio for the combined State-related universities has generally been higher than this ratio for the combined State-owned universities at both academic levels, even though minimum credit requirements for undergraduate and graduate degrees have generally been lower at the State-related schools. The ratios have increased at both types of institutions during the five-year period. In 1983-84, in the State-related universities, average credit hours per undergraduate degree and average credit hours per graduate degree exceed minimum required credits by 60 percent and 141 percent, respectively. At the State-owned universities, average actual credit hours exceed average required credit hours for the two degrees by 40 percent and 92 percent, respectively.

Since in the aggregate the proportion of part-time students has slightly decreased (see above), the increase in the ratio of credit hours to degrees implies either increased dropout rates or slower progress by students towards degrees or both.

III. Instructional Faculty Input

Instructional faculty is only one input in the production of FTE students, student credit hours and degrees. Other inputs such as administrative faculty, buildings, equipment, books, etc., are all necessary to produce instructional outputs, however measured. Nevertheless, instructional faculty is a primary input and is the input of interest in this report.

INSTRUCTIONAL FACULTY HEAD COUNT AND WORKLOAD

Table 7 presents the head count of the full-time faculty in Pennsylvania's public universities for fall 1983, plus the average hours the faculty report spending in work-related activities. The table shows that a total of 4,172 full-time faculty members were employed by the State-owned universities and 5,419 by the State-related universities. These totals represent only small changes in both groups of schools from the full-time faculty head counts of the previous year.

The average workweek of the reported faculty in all schools combined was 53.1 hours, making the 1983-84 average workweek nearly identical to the 53.0 hour workweek in 1982-83.

Table 7

FULL-TIME FACULTY WORKWEEK ACTIVITIES
1983-84, AND PERCENTAGE CHANGE FROM 1982-83

Institution[1]	Full-time[2] faculty head count	Average weekly hours per full-time faculty member[3]											
		Contact hours											
		Total	Percentage change	Undergraduate	Graduate	Instructional support	Percentage change	Research	Percentage change	Other university service	Percentage change	Total workweek	Percentage change
State-related													
Penn State[4]	2,690	9.3	-9%	7.5	1.8	20.3	1%	10.1	3%	11.8	0	51.5	-1%
Pittsburgh	1,542	9.2	0	5.1	4.1	17.3	-2	14.4	-3	11.1	3%	52.0	-1
Temple	1,117	10.2	-2	6.0	4.2	15.9	3	8.2	-6	16.3	4	50.6	1
Lincoln	70	11.5	-4	10.5	1.0	18.4	3	10.1	12	10.6	-9	50.6	a
Total	5,419	9.6	-3	6.6	3.0	18.5	1	10.9	-2	12.5	2	51.5	a
State-owned													
Indiana	630	12.7	3	11.5	1.2	18.5	-1	10.8	5	17.8	-2	59.8	1
West Chester	468	11.7	3	10.7	1.0	18.2	-2	9.1	1	20.4	a	59.4	a
Millersville	292	11.5	0	10.9	.6	16.0	3	9.0	3	16.6	-1	53.1	1
Bloomsburg	323	11.4	2	10.8	.6	16.8	2	7.5	-1	16.1	-1	51.8	1
Slippery Rock	318	11.9	-1	11.4	.5	18.6	2	8.4	-1	17.2	2	56.1	1
Edinboro	314	12.6	5	11.7	.9	19.3	2	7.9	4	14.5	-3	54.3	1
Clarion	302	11.4	5	10.8	.6	18.3	5	8.0	14	13.6	-12	51.3	1
Kutztown	287	12.4	2	12.0	.4	17.0	-1	8.8	13	16.9	1	55.1	2
Shippensburg	295	10.8	9	9.8	1.0	18.3	7	8.3	8	14.9	-8	52.3	3
California	243	10.5	-10	9.8	.7	15.7	-7	7.5	10	17.9	8	51.6	-1
East Stroudsburg	227	12.2	9	11.5	.7	19.6	9	9.0	-6	16.0	-14	56.8	-1
Mansfield	158	12.5	1	12.0	.5	23.3	6	10.6	-3	14.2	13	60.6	5
Lock Haven	171	11.7	4	11.7	na	16.8	-5	7.6	10	18.0	3	54.1	1
Cheyney	144	11.1	8	10.3	.8	12.1	-15	6.8	11	18.3	18	48.3	5
Total	4,172	11.9	3	11.1	.8	17.9	1	8.7	4	16.8	-1	55.3	1
All Institutions	9,591	10.5	-2	8.5	2.0	18.3	1	10.0	1	14.3	0	53.1	a

1. Arranged in descending order with respect to total full-time equivalent students for 1983-84.
2. The number of full-time faculty for 1983-84 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.
4. Penn State's workweek activities reflect the change in the school's academic calendar for 1983-84.

a. Rounds to less than 1 percent.
na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1983 and 1984.

Total faculty hours spent in actual contact with students averaged 11.9 at the State-owned universities and 9.6 at the State-related universities representing increases and decreases of 3 percent, respectively, in the two groups of schools. Individual schools reporting increases of 3 percent or more in contact hours were: Cheyney, Clarion, East Stroudsburg, Edinboro, Indiana, Lock Haven, Shippensburg and West Chester. Those with decreases of 3 percent or more in contact hours were: California, Lincoln and Penn State. The Penn State decrease is primarily a result of the change in the university's academic calendar for 1983-84 (see footnote 4). Accompanying Penn State's switch to a semester calendar was a reduction in the average number of sections taught per full-time faculty member (to 6.1 in 1983-84 from 7.2 in 1982-83), resulting in a reduction in the average weekly contact hours per faculty member. In the aggregate, faculty time spent in other activities--instructional support, research and other university service--changed little from last year. Except for Cheyney, Mansfield and Shippensburg, with increases in their total workweeks of 3 percent or more, faculty hours were merely reallocated between the various workweek categories in most schools.

INSTRUCTIONAL FACULTY SALARIES

Average Salaries by Academic Rank

The number, rank distribution and average salary by rank of the FTE instructional faculty at the public universities are presented in table 8. Changes in average salaries shown in this table do not

Table 8

AVERAGE INSTRUCTIONAL SALARIES OF FULL-TIME EQUIVALENT INSTRUCTIONAL FACULTY AND PERCENTAGE DISTRIBUTION BY RANK[1]
1983-84
(Dollar amounts in 000s)

Institution[2]	FTE Instructional faculty		Average Instructional salary		Professor		Associate professor		Assistant professor		Instructor		Non-ranked[3]	
	Number	Percentage change 1982-83 to 1983-84	Amount	Percentage increase 1982-83 to 1983-84	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	3,056	a	$25.0	a	$38.5	16%	$29.3	18%	$23.5	28%	$17.2	15%	$18.9	23%
Pittsburgh	1,831	-1%	25.3	5%	37.9	19	26.8	27	21.5	19	14.2	12	22.0	23
Temple	1,522	-6	24.7	7	34.9	28	26.3	26	20.4	17	12.5	12	18.7	17
Lincoln	99	6	18.2	-1	23.9	14	21.7	16	17.4	39	14.5	24	15.8	7
Total	6,508	a	24.9	a	37.0	19	27.5	23	22.3	23	15.4	13	19.8	22
State-owned														
Indiana	661	2	26.9	-2	32.4	37	27.0	30	22.5	24	15.9	9	19.2	b
West Chester	465	1	27.7	2	35.0	29	28.5	36	22.9	23	16.6	11	32.4	1
Millersville	324	1	27.0	1	32.6	32	27.2	37	22.0	22	17.4	9	30.9	b
Bloomsburg	347	3	27.2	4	34.1	30	27.6	35	21.8	26	18.1	9	na	0
Slippery Rock	315	5	28.2	-3	33.7	41	27.5	27	22.4	22	19.7	9	24.9	1
Edinboro	317	-2	29.3	b	34.0	40	28.3	34	23.5	25	18.7	1	21.2	b
Clarion	298	2	27.7	3	34.5	32	28.1	30	22.6	28	17.8	9	33.6	1
Kutztown	283	5	29.0	0	34.7	37	28.2	35	23.3	21	19.4	6	25.9	1
Shippensburg	286	0	29.2	2	34.9	40	28.1	33	23.0	23	17.8	4	35.9	b
California	240	0	30.0	1	34.7	43	28.6	40	23.8	11	16.5	6	32.8	b
East Stroudsburg	232	3	28.2	2	32.8	43	27.1	36	21.8	18	13.1	3	25.4	b
Mansfield	155	-5	28.2	3	35.2	26	29.4	36	23.2	27	19.1	11	na	0
Lock Haven	153	3	30.2	1	35.3	37	30.0	42	24.4	18	20.5	3	28.0	b
Cheyney	137	1	29.3	b	33.5	35	28.6	42	26.2	10	22.5	10	21.7	2
Total	4,213	1	28.1	1	32.9	36	27.9	34	22.8	22	17.7	8	26.7	b
All Institutions	10,721	a	26.2	a	34.8	26	27.7	27	22.5	23	16.0	11	19.9	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 1983-84.

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

a. Penn State's FTE faculty and faculty salary data are comparable to data from the other institutions, but are not comparable to previous years' data from Penn State, due to the first-time inclusion of data from their continuing education credit program and supplemental faculty appointments.

b. Rounds to less than 1 percent.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1983 and 1984.

necessarily correspond to salary changes for individual faculty members or to general salary changes for all faculty members. The average salary changes also reflect changes in the rank compositions of faculties, which by themselves affect the averages independent of overall salary changes.[8]

This table shows that the number of FTE instructional faculty totaled 4,213 at the State-owned universities and 6,508 at the State-related universities during 1983-84. At the State-owned schools as a group, the total FTE faculty increased by 1 percent over 1982-83. Individual institutions with increases exceeding 1 percent were Bloomsburg, Clarion, East Stroudsburg, Indiana, Kutztown, Lock Haven and Slippery Rock; those with decreases were Edinboro and Mansfield. At Pittsburgh and Temple, the FTE faculty decreased by 1 percent and 6 percent, respectively. At Lincoln the FTE faculty increased by 6 percent. At Penn State, the FTE faculty engaged in resident instruction increased by 51 persons (2 percent). Penn State FTE faculty members involved in continuing education were reported for the first time; in 1983-84 this faculty totaled 267.[9]

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[8]Average instructional salaries are calculated by dividing total instructional salaries for each rank by the respective number of FTE instructional faculty.

[9]As noted in footnote 4, Penn State reported continuing education credit hours for the first time this year. In addition to credit hours, this reporting change also affects FTE faculty and faculty salaries; continuing education salaries are included in addition to resident instruction salaries. At Penn State, continuing education credit instruction is provided by many full-time faculty members beyond their regular contracts. Supplemental appointments for continuing education and other instruction are reported for the first time.

The average salary for FTE instructional faculty in the State-owned universities was $28,100, and in the State-related universities $24,900; overall the average was $26,200. At the State-owned schools as a group, the average faculty salary increased by 1 percent over last year. Three schools report increases in average salaries of 3 percent or more: Bloomsburg, Clarion and Mansfield. Three schools report decreases in average salaries: Cheyney, Indiana and Slippery Rock. At Pittsburgh and Temple, the average salary increased by 5 and 7 percent, respectively. At Lincoln, the average salary decreased by 1 percent. At Penn State, the average salary for faculty related to resident instruction increased by $800 (3 percent) (see footnote 9).

As emphasized above, average faculty salaries are determined in large part by faculty rank mixes. As a group the State-owned universities have much larger percentages of faculty in the two highest ranks than the State-related universities (70 percent versus 42 percent), but lower average salaries for these higher ranks. The opposite is true at the two lowest ranks plus nonranked faculty. Therefore, rank mix is the main contributor to the higher total average instructional faculty salaries in the State-owned universities.

Average Salaries by Program Area

Average instructional salaries of FTE faculty by CIP classification for 1983-84 are shown in table 9. In the State-owned universities, program areas with generally higher-than-average salaries include education, foreign languages, life sciences, physical sciences, psychology and social sciences; program areas with generally

AVERAGE INSTRUCTIONAL SALARIES OF FULL-TIME EQUIVALENT INSTRUCTIONAL FACULTY[1] BY INSTITUTION[2] AND BY CIP CLASSIFICATION, 1983-84
(Dollar amounts in 000s)

CIP classification	State-related				State-owned													
	Penn State	Pittsburgh	Temple	Lincoln	Indiana	West Chester	Millersville	Bloomsburg	Slippery Rock	Edinboro	Clarion	Kutztown	Shippensburg	California	East Stroudsburg	Mansfield	Lock Haven	Cheyney
Agriculture	$25.2	--	$21.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Architecture & environmental design	29.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Area & ethnic studies	26.0	$26.0	24.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Business	28.1	27.3	24.8	$15.3	$23.8	$24.0	$21.4	$26.4	$22.2	$24.4	$24.5	$24.9	$28.8	$24.5	$23.2	$22.9	--	$27.5
Communications	24.3	23.9	22.6	--	24.8	--	23.7	27.6	24.9	29.0	26.9	26.0	25.5	--	26.5	--	--	--
Computer & information sciences	22.3	21.7	25.9	--	24.6	--	26.0	26.0	25.9	28.9	23.1	--	--	--	26.8	--	--	27.1
Education	23.2	24.5	24.0	17.6	27.6	28.3	26.9	28.4	27.6	30.9	28.3	31.1	29.9	30.6	27.9	28.3	$30.4	31.6
Engineering	30.1	30.3	25.3	--	31.7	--	--	--	--	22.8	--	--	--	27.3	--	--	--	34.5
Foreign languages	21.2	25.6	23.1	20.0	28.0	25.1	27.3	27.7	30.6	28.3	30.3	29.8	30.4	31.2	31.3	24.0	31.6	29.9
Health	20.8	22.7	22.9	--	33.2	22.8	19.9	22.3	28.2	24.2	22.9	26.3	--	25.0	22.9	--	--	--
Home economics	24.9	21.0	19.6	--	26.0	--	--	--	--	32.3	--	--	--	--	--	25.8	--	25.6
Industrial arts	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	29.6
Law	--	43.2	39.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Letters	19.8	22.7	21.4	19.7	27.3	28.3	24.9	23.7	28.5	27.6	26.2	28.9	29.8	29.3	26.0	27.9	30.8	28.0
Liberal/general studies	23.3	--	24.9	--	--	--	--	--	--	--	--	--	--	29.0	--	--	--	--
Library & archival sciences	26.0	24.3	--	--	--	--	24.0	--	--	25.7	29.3	25.9	24.9	--	--	--	--	--
Life sciences	25.1	24.6	35.7	20.5	28.2	28.8	28.0	28.5	32.4	32.8	30.8	30.9	30.1	32.8	31.8	28.8	33.3	29.7
Mathematics	22.9	25.5	24.5	16.5	29.5	25.6	27.3	26.4	30.7	26.3	28.3	28.7	26.8	26.3	28.0	31.3	28.9	28.0
Military sciences	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Multi/interdisciplinary studies	22.8	21.5	--	19.6	--	--	--	31.5	27.5	--	31.2	--	--	--	20.7	--	--	29.0
Parks & recreation	27.2	--	16.5	--	--	--	--	--	25.4	--	--	--	--	--	25.5	--	--	29.7
Personal & social development	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Philosophy, religion & theology	25.0	28.3	27.5	20.9	33.0	--	26.0	31.8	28.7	30.6	--	--	--	31.9	33.2	--	--	29.8
Physical sciences	27.7	25.9	32.5	17.8	27.9	27.1	28.6	27.3	31.7	30.9	33.1	27.8	31.6	34.1	29.2	32.2	29.6	30.6
Psychology	25.5	23.1	25.7	22.7	28.8	30.0	28.1	28.9	31.0	32.2	29.0	31.9	30.6	32.8	29.6	31.7	29.3	27.2
Public affairs & protective services	26.6	26.8	24.2	16.8	--	27.1	27.8	--	29.7	29.4	--	--	27.0	28.2	--	16.1	--	--
Social sciences	25.7	28.2	26.5	19.2	28.8	29.7	28.9	28.7	29.4	29.7	30.2	29.8	30.1	31.3	29.7	28.1	29.1	31.9
Trade & industrial	25.7	--	--	--	--	--	--	--	--	--	--	--	--	29.2	--	--	--	--
Visual & performing arts	21.7	23.4	23.1	a	21.5	29.4	27.7	26.1	27.4	28.7	28.3	26.6	27.8	27.1	27.5	--	30.1	24.9
Other	33.3	--	--	--	16.5	36.5	--	20.0	--	17.2	--	--	--	24.6	--	--	--	34.6
Total	25.0	25.3	24.7	18.2	26.9	27.7	27.0	27.2	28.2	29.3	27.7	29.0	29.2	30.0	28.2	28.2	30.2	29.3

1. 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. Average instructional salary is calculated by dividing the total instructional salary paid to all staff members in the respective CIP classifications by their total full-time equivalency in the instructional function.

2. Arranged in descending order with respect to total full-time equivalent students for 1983-84.

a. Included in education.

SOURCE: Reports provided by the individual institutions, 1984.

lower-than-average salaries include business, communications, computer and information sciences, health, letters, mathematics and visual and performing arts. In the State-related institutions, the higher cost category also includes engineering and law while the lower cost category also includes multi/interdisciplinary studies. Varying average salaries by program area are due both to differing salaries by rank and differing rank mixes.

Comparison with Other Institutions

For comparison purposes, table 10 presents 1983-84 average instructional salaries and percentages of faculty by rank for the full-time faculty in Pennsylvania's public universities and for the full-time faculty in selected Pennsylvania private and other state public institutions of higher education. The source of these salary data is the American Association of University Professors', "Annual Report of the Economic Status of the Profession, 1983-84," published in Academe. Unlike those in table 8, the average salaries and rank distributions in table 10 do not include entries for part-time, nonranked and summer faculty; in addition, only the main campuses of multicampus institutions are represented. The schools are grouped by degree-granting status to enhance comparability.

Compared to the other individual institutions included in this sample, the average salaries of the full-time faculty in Pennsylvania's State-owned universities are seen to be higher than the average salaries of the full-time faculty in those public institutions which award bachelor's degrees only, but lower than the average salaries of the

Table 10

AVERAGE INSTRUCTIONAL FACULTY SALARIES[1] BY TYPE[2] AND BY RANK
PERCENTAGE OF FULL-TIME FACULTY IN EACH RANK
SELECTED PUBLIC AND PRIVATE INSTITUTIONS OF HIGHER EDUCATION
ACADEMIC YEAR, 1983-84

Group	Institution	Average salary (000s) All ranks[3]	Prof.	Assoc. prof.	Asst. prof.	Instr.	Total ranked instructional faculty	Percentage of ranked faculty Prof.	Assoc. prof.	Asst. prof.	Instr.
I.	INSTITUTIONS AWARDING ONLY BACHELOR'S DEGREES										
	State-owned (Pennsylvania)										
	Lock Haven[4]	$30.0	$35.9	$29.5	$24.3	$18.8	167	35%	39%	20%	6%
	Private (Pennsylvania)										
	Dickinson College	27.9	37.0	28.4	22.0	20.3	115	26	35	28	11
	Franklin & Marshall College	30.1	40.8	31.3	21.5	17.8	139	31	29	36	4
	Gettysburg College	27.8	37.3	28.6	21.9	21.0	133	23	39	28	10
	Lebanon Valley College	23.0	28.3	22.4	20.1	nd	71	27	34	32	7
	Swarthmore College	35.4	44.4	32.6	24.3	nd	137	47	21	29	3
	Wilson College	21.8	26.5	22.1	16.8	na	32	31	41	28	na
	Public (other states)										
	Lake Superior St. College (MI)	23.0	27.8	24.3	20.1	16.7	103	20	43	24	13
	Mary Washington College (VA)	24.5	29.0	25.4	20.3	18.1	142	32	32	30	6
	University of N.C. at Asheville (NC)	25.4	32.4	26.1	22.6	nd	81	25	32	38	5
II.	INSTITUTIONS AWARDING BACHELOR'S AND ADVANCED DEGREES										
	State-related and State-owned										
	Penn State[5]	31.5	41.3	30.6	25.2	16.9	1,422	37	27	25	10
	Pittsburgh[5]	32.6	43.6	30.9	24.4	17.2	1,203	35	36	23	6
	Temple	32.8	40.0	30.5	24.6	19.1	1,137	41	35	20	3
	Lincoln[4]	20.4	28.4	22.9	18.6	15.4	77	16	21	45	18
	Bloomsburg[4]	28.7	35.6	29.5	22.7	18.5	315	31	34	27	8
	California	30.8	35.5	29.4	24.1	17.7	269	43	39	14	4
	Cheyney[4]	30.7	35.7	29.7	24.4	19.8	131	37	46	11	6
	Clarion[5]	29.9	35.9	29.6	23.6	19.4	250	37	34	22	7
	East Stroudsburg	30.1	35.5	28.9	23.7	nd	227	39	37	22	2
	Edinboro	30.6	35.5	29.5	24.1	na	302	41	33	25	na
	Indiana	29.2	35.5	29.1	23.3	17.3	639	37	30	27	6
	Kutztown[4]	30.2	35.9	29.0	23.4	19.5	271	39	37	20	4
	Mansfield	29.0	35.7	29.1	23.0	18.6	161	30	40	26	4
	Millersville	28.6	33.7	29.1	23.5	19.1	302	32	38	23	7
	Shippensburg	30.3	35.5	28.8	23.5	nd	275	43	33	24	1
	Slippery Rock	29.6	35.6	29.1	23.4	18.6	315	41	27	24	8
	West Chester	29.4	35.6	29.2	23.6	19.7	457	31	40	25	4
	Private (Pennsylvania)										
	Bryn Mawr College	32.1	38.9	30.4	24.0	nd	122	47	32	20	1
	Carnegie-Mellon University	38.0	48.2	32.7	28.2	22.3	440	44	26	29	2
	Lehigh University	36.9	43.7	32.1	26.0	nd	349	53	26	21	a
	University of Pennsylvania	39.6	49.1	34.5	28.5	na	1,005	47	24	29	na
	Public (other states)										
	Eastern New Mexico U.-Main (NM)	27.0	33.4	28.3	24.4	19.2	138	22	29	41	8
	Rutgers University-Camden (NJ)	32.4	48.8	34.1	24.3	20.6	202	20	42	27	12
	SUNY at Stony Brook (NY)	37.5	49.4	34.7	25.3	nd	614	42	29	28	1
	University of Maryland at College Park (MD)	30.6	41.3	30.0	24.2	17.9	1,252	33	33	25	9
	University of Michigan at Ann Arbor (MI)	37.0	45.1	33.3	27.2	19.1	1,581	54	22	23	2
	University of North Carolina at Chapel Hill (NC)	33.9	42.5	31.2	25.1	22.8	1,021	48	27	23	2
	University of Texas at Austin (TX)	34.3	44.0	30.6	26.2	18.4	1,814	43	27	28	2
	PENNSYLVANIA AVERAGES[4]										
	State-related institutions	29.3	41.0	29.7	23.6	17.9	3,753	27	30	32	11
	State-owned institutions	29.7	35.5	29.2	23.5	18.7	4,097	37	35	23	5
	U.S. AVERAGES[6]										
	Public institutions	29.3	37.1	28.4	23.5	19.1	nd	35	30	27	8
	Private independent institutions	31.1	41.5	29.4	23.7	18.4	nd	37	28	28	7

1. All data include only full-time ranked faculty whose major assignment is instruction--including those with release time for research--and excludes part-time and administrative faculty and faculty for preclinical and clinical medicine. Average salaries are based on contracted salaries (adjusted to a standard academic year basis, when necessary), excluding summer teaching, extra loads, etc.
2. Institutions in group I award only the bachelor's degree or equivalent. Institutions in group II also award advanced degrees. Group I corresponds to Academe category IIB, and group II corresponds to Academe categories I plus IIA (See source below).
3. The all ranks average includes lecturers, not separately shown here.
4. Data from Pennsylvania Department of Education, Bureau of Information Systems Division of Data Services.
5. Main Campus data.
6. Data from Maryse Eymonerie Associates (MEA), McLean, Virginia.

a. Less than 1 percent.
na. Not applicable.
nd. No data.

SOURCE: "Annual Report on the Economic Status of the Profession, 1983-84," Academe 70, Bulletin of the American Association of University Professors (Washington, D.C.: July-August 1984), pp. 20-61.

full-time faculty in many of those public institutions which award both bachelor's and advanced degrees, especially in the main campuses of the larger multicampus institutions. Compared to the U.S. averages, the State-owned university average full-time faculty salary is higher than the average for all public institutions, but lower than the average for all private independent institutions. It would appear that these general results are highly influenced by the faculty rank mixes in the respective schools.

The average salaries of the full-time faculty in the larger State-related institutions are generally lower than the average salary for the included private institutions of similar status but higher than the U.S. average salary for public institutions and higher than the U.S. average salary for private independent institutions.

INPUT TRENDS

Since 1980, the total fall full-time faculty has decreased by 20 persons (0.5 percent) in the State-owned universities. Institutions with net additions of 10 or more full-time faculty members were: Bloomsburg, Indiana and Lock Haven; those with net losses of 10 or more were: California, Cheyney and Edinboro. Pittsburgh had a net addition of 12 full-time faculty members while Temple and Lincoln had net losses of 131 and 6, respectively. Penn State's reported full-time faculty for fall 1983 is noncomparable with the reported faculty for fall 1980 (see footnote 9).

Since 1980, total reported workweek hours per faculty member have remained nearly constant at the two groups of public universities: the total workweek has been about 55 hours at the State-owned universities and about 52 hours at the State-related universities. Undergraduate student contact hours per faculty member have increased by an average of 0.2 hour per week at the State-owned schools, but decreased by an average of one-half hour per week at the State-related schools. The decrease at the latter group of schools is undoubtedly influenced by Penn State's change in academic calendar (see p. 29). Average graduate contact hours at both groups of schools have not changed.

During the same interval the total FTE instructional faculty has increased at the State-owned schools by 28 persons (0.7 percent). Institutions with net additions of 10 or more FTE faculty, but not listed above, were: Clarion, East Stroudsburg, Kutztown and Slippery Rock. Lincoln's FTE faculty had a net addition of 4 persons, while Pittsburgh and Temple's FTE faculty had net losses of 1 and 219 persons, respectively. Penn State's FTE faculty in resident instruction had a net increase of 88 persons.

The relationship of FTE students for 1982-83 and 1983-84 is shown in table 11. Individual schools had changes in their student-to-faculty ratios ranging from an 8 percent decrease to an 11 percent increase.

Since 1980-81, average instructional salaries have increased by $3,300 (13.3 percent) in the State-owned universities as a group. The average instructional salaries at Pittsburgh, Temple and Lincoln increased by $4,500, $3,400 and $900, respectively. At Penn State, the

Table 11

RELATIONSHIP OF TOTAL FTE STUDENTS
TO TOTAL FTE INSTRUCTIONAL FACULTY
1983-84, 1982-83 AND PERCENTAGE CHANGE

Institution[1]	Ratio 1983-84	Ratio 1982-83	Percentage change
State-related			
Penn State	19.1	a	a
Pittsburgh	16.0	15.8	1%
Temple	15.3	14.7	4
Lincoln	13.3	14.5	-8
Total	17.3	a	a
State-owned			
Indiana	19.6	19.9	-2
West Chester	18.0	18.8	-4
Millersville	19.3	18.8	3
Bloomsburg	17.8	18.3	-3
Slippery Rock	18.8	18.8	0
Edinboro	18.0	17.4	3
Clarion	18.9	18.6	2
Kutztown	19.5	19.7	-1
Shippensburg	19.2	19.2	0
California	19.3	18.2	6
East Stroudsburg	18.1	18.4	-2
Mansfield	17.6	16.3	8
Lock Haven	16.9	17.2	-2
Cheyney	14.6	13.2	11
Total	18.6	18.5	1
All institutions	17.8	a	a

1. Arranged in descending order with respect to total full-time equivalent students for 1983-84.

a. Penn State's FTE student and FTE faculty data are comparable to data from the other institutions, but are not comparable to previous years' data from Penn State, due to a change in their academic calendar, the first-time inclusion of data from their continuing education credit program and supplemental faculty appointments.

SOURCE: Reports provided by the individual institutions 1983 and 1984.

average instructional salary related to resident instruction increased by $4,300. While the average instructional faculty salary remains higher at the State-owned schools as a group, the gap has narrowed somewhat over the past three years.

IV. Cost Efficiency

In this report, cost efficiency in instruction is measured by average instructional faculty salary cost per student credit hour produced ("unit cost"). As emphasized above, instructional faculty is a principal input into the production of higher educational output, but not the only input. The other inputs and their costs must of necessity, however, be allocated to instruction in some fairly arbitrary manner. A not unreasonable assumption of proportionality between instructional faculty salaries and other instructional costs permits a focus on salaries as the primary cost element. Student credit hours are the appropriate output measure since they permit cost comparisons by academic levels and program areas by which unit costs vary.

INSTRUCTIONAL FACULTY SALARY COST PER STUDENT CREDIT HOUR (UNIT COST)

Unit Cost by Academic Level

Instructional faculty salary cost per student credit hour by academic level for 1983-84 is presented in table 12.[10] On average,

[10]Data on average faculty salaries by academic levels are not reported by the individual institutions. To compute these averages, it is necessary to allocate salaries to levels within program areas and ranks. These allocations are made on the basis of faculty teaching assignments.

Table 12

AVERAGE INSTRUCTIONAL FACULTY SALARY COST
PER STUDENT CREDIT HOUR BY LEVEL
1983-84

Institution[1]	Instructional faculty salary cost per student credit hour[2]				
	Undergraduate level			Graduate level	
	Total Undergraduate level	Lower division	Upper division	Master's	First professional[3] and doctor's
State-related					
Penn State	$34	$28	$45	$90	$269
Pittsburgh	38	29	57	114	112
Temple	43	36	51	90	116
Lincoln	46	39	79	55	na
Total	37	30	49	101	160
State-owned					
Indiana	42	31	63	127	a
West Chester	48	39	71	111	na
Millersville	45	37	74	81	na
Bloomsburg	49	41	66	106	na
Slippery Rock	48	39	76	115	na
Edinboro	52	45	72	117	na
Clarion	46	38	69	139	na
Kutztown	48	35	74	99	na
Shippensburg	47	42	61	102	na
California	48	39	74	131	na
East Stroudsburg	52	41	79	69	na
Mansfield	52	36	97	120	na
Lock Haven	60	50	89	na	na
Cheyney	64	54	100	180	na
Total	48	39	72	111	na
All institutions	42	34	57	104	160

1. Arranged in descending order with respect to total full-time equivalent students for 1983-84.

2. 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.

3. Excludes medical.

a. Included at the master's level.

na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1984.

total undergraduate unit cost is lower in the larger State-related universities than in the smaller State-owned universities. As a group, the State-owned schools had a unit cost of $48 at the undergraduate level, whereas as a group, the State-related schools have an undergraduate unit cost of $37. Upper-division undergraduate unit cost substantially exceeds lower-division undergraduate unit cost in both groups of schools ($72 versus $39 in the State-owned group and $49 versus $30 in the State-related group), and graduate level unit cost is substantially higher in both groups of schools. At the graduate level, unit cost is obviously influenced by the proportions of credit hours produced in master's, first professional and doctoral programs at the various schools.

The unit cost data illustrate two important relationships. First, unit cost tends to vary inversely with size ("scale") of output (credit hours or FTE students): at all levels of instruction, average instructional faculty salary per student credit hour tends to increase as the output produced decreases. Second, unit cost varies directly with academic levels: at all quantities of output, unit cost increases at higher academic levels.

Unit Cost by Program Area

Table 13 details unit cost by CIP classifications or instructional program areas. Unit cost is seen to vary widely by program area as well as by academic level. In the State-owned universities as a group, CIP with a unit cost which is substantially higher than average at the undergraduate level include education, foreign languages, health,

Table 13

AVERAGE INSTRUCTIONAL FACULTY SALARY COST PER STUDENT CREDIT HOUR[1] BY CIP CLASSIFICATION
BY TYPE OF INSTITUTION
1983-84

CIP classification	State-related					State-owned				
	Undergraduate			Graduate		Undergraduate			Graduate	
	Total undergraduate level	Lower division	Upper division	Master's	First professional and doctor's	Total undergraduate level	Lower division	Upper division	Master's	First professional and doctor's
Agriculture	$49	$52	$49	$119	$299	--	--	--	--	--
Architecture and environmental design	61	51	66	204	380	--	--	--	--	--
Area and ethnic studies	58	41	76	164	400	--	--	--	--	--
Business	31	28	34	56	239	$32	$26	$37	$81	--
Communications	36	22	44	145	202	44	35	53	110	--
Computer and information sciences	31	27	39	51	203	38	34	53	58	--
Education	50	34	70	72	151	65	48	82	96	--
Engineering	42	47	39	92	260	59	36	77	76	--
Foreign languages	44	37	69	153	175	62	54	125	102	--
Health	67	49	72	247	209	88	83	89	133	--
Home economics	33	18	55	117	263	55	34	74	147	--
Industrial arts	--	--	--	--	--	67	67	--	275	--
Law	91	77	107	44	55	--	--	--	--	--
Letters	37	33	45	120	247	47	43	88	165	--
Liberal/general studies	64	37	96	33	46	7	7	7	--	--
Library and archival sciences	57	51	120	87	184	61	56	66	94	--
Life sciences	29	22	48	212	282	53	41	105	233	--
Mathematics	30	27	53	88	323	38	34	65	105	--
Military sciences	--	--	--	--	--	--	--	--	--	--
Multi/interdisciplinary studies	34	30	54	160	246	35	34	53	69	--
Parks and recreation	53	33	58	89	270	46	34	59	171	--
Personal and social development	--	--	--	--	--	--	--	--	--	--
Philosophy, religion and theology	37	30	60	146	238	39	36	81	255	--
Physical sciences	32	28	50	152	301	60	48	155	265	--
Psychology	25	17	49	152	214	41	32	63	99	--
Public affairs and protective services	45	32	50	84	174	48	33	72	68	--
Social sciences	33	26	50	150	266	41	33	73	111	--
Trade and industrial	58	58	107	--	--	87	76	90	--	--
Visual and performing arts	42	29	70	152	288	60	49	107	245	--
Other	41	--	41	30	275	38	35	66	--	--
Total	37	30	49	101	160	48	39	72	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, 1984.

industrial arts, library and archival sciences, physical sciences, trade and industrial and visual and performing arts. Conversely, CIP with much lower-than-average unit cost at this level include business, computer and information sciences, liberal/general studies, mathematics, multi/interdisciplinary studies and philosophy, religion and theology. In the State-related universities, at the undergraduate level, architecture and environmental design and law are additional high cost areas, while life sciences and psychology are additional low cost areas. At the graduate level, in both groups of schools, health, life sciences, philosophy, religion and theology, physical sciences and visual and performing arts tend to have high unit cost, while computer and information sciences and public affairs and protective services tend to have low unit cost.

DETERMINANTS OF UNIT COST

The average instructional faculty salary cost per student credit hour at each academic level and in each program area can be expressed by the following equation:

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

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

The components of the first term are approximately constants or constant relationships. The number of FTE faculty per course is approximately 0.5 in the State-owned universities and approximately 0.8 in the State-related universities (see last year's report, p. 47). The assigned credit per course averages very close to three in all of Pennsylvania's public universities. In the short run, these components of total unit cost cannot readily be varied by university administrators to influence unit cost.

The second term in the equation contains control variables. To at least some degree, these variables can be controlled by administrators to affect unit cost. The control variables are instructional faculty salaries, class sizes and classes (sections) per course.

Average Salary Level

Data on faculty salaries have already been presented and discussed above. Since both salaries by rank and rank mixes can differ by program area, unit cost can vary by program area. But since average salaries tend to vary directly with faculty ranks (higher ranked faculty usually have higher average salaries), and faculty ranks tend to correlate positively with academic levels, unit cost tends to vary directly with academic levels in all program areas. In any case, unit cost varies directly with average salary.

Average Class Size

Average class size is presented in table 14 by academic level. The average undergraduate class has 30 students at Penn State (the largest school), while undergraduate classes average 23 students at Lock Haven, 19 students at both Cheyney and Mansfield and 16 students at Lincoln (four of the smallest institutions). Overall, undergraduate classes average 28 students in the larger State-related universities and 23 students in the smaller State-owned universities; master's level courses average 14 and 10 students, respectively, in the two groups of schools. Class size also varies by program area, as shown in tables 15 and 16. In general, however, since class size tends to vary inversely with academic levels (higher levels usually have smaller classes), unit cost also varies inversely with class size.

Administrators can make changes in the number of classes (sections) per course as an alternative to permitting changes in class size to occur. Data on sections per course by CIP classifications are not reported by the individual institutions. Average number of sections in the various program areas can be estimated, however, by dividing total assigned credits by three, the standard course credit value. Further division by courses then gives sections per course by CIP. The average number of sections per undergraduate course for 1983-84 is given in table 17 for each university.

Table 14

AVERAGE CLASS SIZE IN CLASSROOM INSTRUCTION BY LEVEL[1]
TOTAL YEAR 1983-84
PERCENTAGE CHANGE 1982-83 to 1983-84

Institution[2]	Undergraduate level									Master's		
	Total undergraduate			Lower division			Upper division					
	Class size	One-year change	Percentage change	Class size	One-year change	Percentage change	Class size	One-year change	Percentage change	Class size	One-year change	Percentage change
State-related												
Penn State	30	-1	-3%	30	-3	-9%	30	0	0	11	-3	-21%
Pittsburgh	27	0	0	29	-1	-3	24	0	0	17	0	0
Temple	24	2	9	26	2	8	22	3	16%	13	1	8
Lincoln	16	-1	-6	18	-3	-14	10	1	11	12	-2	-14
Total	28	0	0	29	-1	-3	26	1	4	14	0	0
State-owned												
Indiana	25	0	0	31	0	0	17	-1	-6	8	2	33
West Chester	21	1	5	25	-2	-7	15	3	25	10	3	43
Millersville	23	-1	-4	27	0	0	14	-2	-12	11	-2	-15
Bloomsburg	23	1	5	26	1	4	18	0	0	11	-1	-8
Slippery Rock	24	0	0	30	1	3	15	-1	-6	11	1	10
Edinboro	22	0	0	25	0	0	16	0	0	8	0	0
Clarion	28	0	0	34	0	0	18	-1	-5	9	0	0
Kutztown	25	0	0	33	-1	-3	17	1	6	11	-2	-15
Shippensburg	25	0	0	27	-1	-4	21	0	0	13	2	18
California	24	1	4	28	1	4	16	1	7	8	0	0
East Stroudsburg	24	-1	-4	29	0	0	17	-1	-6	15	3	25
Mansfield	19	1	6	27	1	4	10	1	11	7	0	0
Lock Haven	23	0	0	26	0	0	16	-1	-6	na	na	na
Cheyney	19	1	6	22	1	5	12	-1	-8	8	2	33
Total	23	0	0	28	0	0	16	0	0	10	1	11
All Institutions	26	0	0	29	0	0	21	1	5	12	0	0

1. Average class size for each level is calculated by dividing the total classroom student credit hours by the total classroom assigned credits.
2. Arranged in descending order with respect to total full-time equivalent students for 1983-84.
na. Not applicable.

SOURCE: Reports provided by the individual institutions, 1983 and 1984.

Table 15

LOWER-DIVISION AVERAGE CLASS SIZE[1]
BY INSTITUTION[2] AND BY CIP CLASSIFICATION
TOTAL YEAR 1983-84

	State-related				State-owned													
CIP classification	Penn State	Pittsburgh	Temple	Lincoln	Indiana	West Chester	Millersville	Bloomsburg	Slippery Rock	Edinboro	Clarion	Kutztown	Shippensburg	California	East Stroudsburg	Mansfield	Lock Haven	Cheyney
Agriculture	16	--	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Architecture and environmental design	21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Area and ethnic studies	37	13	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Business	38	18	31	22	40	--	29	30	34	31	37	41	34	46	45	33	--	32
Communications	44	26	35	--	25	30	26	24	26	25	45	33	20	--	22	--	--	22
Computer and information sciences	33	32	28	--	36	--	27	30	31	31	32	--	--	--	26	--	--	--
Education	20	18	23	14	24	21	23	21	26	23	36	27	23	21	23	20	26	15
Engineering	22	30	26	--	17	--	--	--	--	17	--	--	--	24	--	--	--	14
Foreign languages	18	12	18	12	24	14	24	18	24	21	19	22	20	15	15	21	19	14
Health	17	43	45	--	8	19	--	15	--	15	38	70	--	--	20	--	--	--
Home economics	36	--	16	--	29	--	--	--	--	21	--	--	--	--	--	23	--	14
Industrial arts	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15
Law	--	21	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Letters	23	21	23	25	26	26	23	24	25	23	28	27	26	22	25	25	22	23
Liberal/general studies	20	--	19	--	--	--	--	--	--	--	--	--	--	74	--	--	--	--
Library and archival sciences	10	16	--	--	--	--	27	--	--	14	11	25	29	--	--	--	--	--
Life sciences	37	45	107	17	47	61	19	30	38	27	46	66	22	42	54	54	34	18
Mathematics	28	33	28	25	31	27	33	30	34	34	30	29	28	41	26	27	27	26
Military sciences	15	10	9	--	30	--	--	7	9	9	30	--	16	36	--	--	12	--
Multi/interdisciplinary studies	27	23	--	12	--	--	--	16	21	--	36	--	--	--	--	--	--	48
Parks and recreation	36	--	20	--	--	--	--	--	29	--	--	--	--	--	21	--	--	26
Personal and social development	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Philosophy, religion and theology	45	26	23	20	44	--	34	31	35	34	--	--	--	26	37	--	--	20
Physical sciences	33	51	42	14	34	27	38	24	38	24	26	50	23	26	33	38	26	20
Psychology	51	46	42	31	43	31	32	33	37	34	51	41	35	41	30	33	30	21
Public affairs and protective services	30	21	19	--	--	34	27	--	36	28	--	--	23	12	--	--	--	--
Social sciences	48	37	25	18	41	35	29	32	35	32	43	33	29	28	37	33	31	19
Trade and industrial	23	--	--	--	--	--	--	--	--	--	--	--	--	18	--	--	--	--
Visual and performing arts	40	26	18	--	19	14	27	22	27	16	29	37	26	18	24	--	21	14
Other	--	--	--	--	--	--	--	25	--	--	--	--	--	10	--	--	--	26
Total	30	29	26	18	31	25	27	26	30	26	34	33	27	29	29	27	26	22

1. Average class size is calculated by dividing classroom student credit hours by classroom assigned credits.
2. Arranged in descending order with respect to total full-time equivalent students for 1983-84.

SOURCE: Reports provided by the individual institutions, 1984.

Table 16

UPPER-DIVISION AVERAGE CLASS SIZE[1]
BY INSTITUTION[2] AND BY CIP CLASSIFICATION
TOTAL YEAR 1983-84

CIP classification	State-related				State-owned													
	Penn State	Pittsburgh	Temple	Lincoln	Indiana	West Chester	Millersville	Bloomsburg	Slippery Rock	Edinboro	Clarion	Kutztown	Shippensburg	California	East Stroudsburg	Mansfield	Lock Haven	Cheyney
Agriculture	32	--	18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Architecture and environmental design	23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Area and ethnic studies	20	11	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Business	43	29	28	22	32	29	19	28	26	10	32	31	28	30	27	22	--	25
Communications	23	16	22	--	19	--	16	21	14	24	25	23	16	--	26	--	--	--
Computer and information sciences	46	32	25	--	24	--	18	23	21	20	35	--	--	--	24	--	--	7
Education	18	17	18	8	11	12	13	18	16	14	12	14	24	15	17	8	16	11
Engineering	36	35	21	--	18	--	--	--	--	--	--	--	--	9	--	--	--	14
Foreign languages	12	10	15	4	7	9	12	6	10	7	8	8	7	3	10	5	9	--
Health	18	50	30	--	15	22	13	8	12	21	9	8	--	10	12	--	--	--
Home economics	26	23	14	--	17	--	--	--	--	5	--	--	--	--	--	9	--	10
Industrial arts	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Law	--	--	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Letters	24	20	21	5	13	14	15	15	12	17	10	16	16	14	19	12	16	9
Liberal/general studies	25	--	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Library and archival sciences	14	11	--	--	--	--	--	--	--	--	8	9	8	102	--	--	--	--
Life sciences	39	25	45	10	17	33	25	16	8	14	15	26	10	20	18	12	14	8
Mathematics	30	21	23	9	10	16	14	23	26	19	17	19	25	27	16	6	21	7
Military sciences	15	14	7	--	14	--	17	11	12	8	--	--	15	14	--	8	10	--
Multi/interdisciplinary studies	21	19	--	--	--	--	--	--	15	--	--	2	--	--	--	--	--	--
Parks and recreation	27	--	18	--	--	--	--	--	12	--	--	--	--	--	17	--	--	12
Personal and social development	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Philosophy, religion and theology	34	10	17	6	11	--	28	8	14	19	--	--	--	5	12	--	--	--
Physical sciences	26	21	31	7	15	10	9	11	12	16	11	15	14	9	8	6	5	6
Psychology	30	25	21	12	17	21	19	16	15	28	22	23	20	27	16	10	20	15
Public affairs and protective services	27	20	16	--	--	16	14	--	9	14	--	--	15	10	--	32	--	--
Social sciences	37	20	19	9	20	20	14	17	17	23	15	15	17	13	22	11	18	11
Trade and industrial	15	--	--	--	--	--	--	--	--	--	--	--	--	12	--	--	--	--
Visual and performing arts	20	13	16	--	5	8	10	9	5	9	8	20	12	3	8	--	15	8
Other	20	--	--	--	--	8	--	--	--	--	--	--	--	--	--	8	--	--
Total	30	24	22	10	17	15	14	18	15	16	18	17	21	16	17	10	16	12

1. Average class size is calculated by dividing classroom student credit hours by classroom assigned credits.
2. Arranged in descending order with respect to total full-time equivalent students for 1983-84.

SOURCE: Reports provided by the individual institutions, 1984.

Table 17

AVERAGE NUMBER OF SECTIONS PER UNDERGRADUATE COURSE[1]
1983-84

Institution[2]	Undergraduate	
	Lower division	Upper division
State-related		
Penn State	7.70	1.74
Pittsburgh	2.69	1.41
Temple	1.38	2.05
Lincoln	1.51	.97
Total	3.39	1.71
State-owned		
Indiana	3.01	1.64
West Chester	1.87	1.36
Millersville	2.27	1.87
Bloomsburg	2.35	1.55
Slippery Rock	2.07	1.51
Edinboro	2.31	1.51
Clarion	1.79	1.31
Kutztown	2.64	1.71
Shippensburg	2.56	1.39
California	1.91	1.42
East Stroudsburg	1.50	1.20
Mansfield	1.48	1.55
Lock Haven	1.82	1.28
Cheyney	2.10	1.17
Total	2.13	1.49
All Institutions	2.63	1.59

1. Average sections per undergraduate course are computed as: total classroom course credit hours ÷ 3 = number of sections; number of sections ÷ total number of courses = average sections per course.

2. Arranged in descending order with respect to total full-time equivalent students for 1983-84.

SOURCE: Reports provided by the individual institutions, 1984.

QUANTITATIVE ANALYSIS OF UNIT COST

To estimate the quantitative importance of the control variables, data for the various academic levels and program areas were used to estimate this regression equation:

$$Y = b_0 + b_1X_1 + b_2X_2$$

where:

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

X_1 = average instructional faculty salary ($000)

X_2 = average class size (persons)

b_0, b_1 and b_2 are regression coefficients

In separate regressions for the lower and upper divisions of the two groups of institutions, the following regression coefficients were obtained:[11]

	State-owned universities		State-related universities	
Variable	Lower division	Upper division	Lower division	Upper division
Constant	$21.30	$123.00	$26.00	$90.50
X_1	2.08	2.60	1.26	.62
X_2	-1.21	-6.17	-0.65	-1.91

The coefficients have the expected signs and nearly all are statistically significant. The values of the coefficients indicate, for example, that in the lower division of the State-owned universities, a

[11]The regression details are available from the Joint State Government Commission.

$1,000 increase in the average salary of instructional faculty could be expected to increase unit cost by an average of $2.08 and an increase of one student per class could be expected to decrease unit cost by $1.21. The other regression coefficients have similar interpretations. The regression equations explain from 37 to 48 percent of the variation in unit cost, depending on academic level and type of school. These results can be used to indicate the overall cost savings which could be expected to result from changes in the control variables by all of the institutions in the two groups of public universities:

	State-owned universities ($000)		State-related universities ($000)		
Policy action	Lower division	Upper division	Lower division	Upper division	Total ($000)
Decrease average faculty salary by $1,000	$3,362	$1,577	$2,290	$640	$7,869
Increase class sizes by one student	1,921	3,761	1,145	1,962	8,789

COST EFFICIENCY TRENDS

From 1980-81 to 1983-84, average undergraduate unit cost increased to $48 from $44 at the State-owned universities (excluding Cheyney for which no base year data are available) and to $37 from $31 at the State-related universities--increases of 9.1 and 19 percent, respectively. During this time average instructional salaries increased by 13.3 and 17 percent and average class sizes by 4.5 and 4 percent at the two groups of schools, respectively. At both groups of public

universities, the percentage increase in faculty salaries minus the percentage increase in average class size largely explains the percentage increase in unit cost.

INTERSTATE COMPARISON OF TOTAL INSTRUCTIONAL COST PER FTE STUDENT

Table 18 presents the total instructional cost per FTE student for all publicly controlled institutions of higher education (including two-year colleges) in all states for fiscal year 1982. In this table, several nonsalary costs are allocated to instruction. The 1982 cost per FTE student is not comparable with the 1980 and 1981 costs shown in last year's report (table 18): the 1980 and 1981 costs pertain to students weighted by academic level, whereas the 1982 costs pertain to all students without regard to academic level.

In 1982, Pennsylvania's total instructional cost per FTE student in the public universities was $4,722, the sixth highest in the nation. The U.S. average (mean) cost was $4,183 per student in the publicly controlled institutions. Eighteen of the states had a per FTE student instructional cost which exceeded the U.S. average.

Interstate differences in per student instructional cost are caused by many factors. Some researchers have concluded that differences in enrollment per institution are central in explaining differences in

Table 18

TOTAL INSTRUCTIONAL COST[1] PER FTE STUDENT
ALL PUBLICLY CONTROLLED INSTITUTIONS OF HIGHER EDUCATION
FISCAL YEAR 1982

State	Rank	Instructional cost per FTE student
Alaska	1	$9,435
Wyoming	2	6,398
Vermont	3	5,350
Delaware	4	5,207
New York	5	5,064
PENNSYLVANIA	6	4,722
Wisconsin	7	4,608
Iowa	8	4,579
Texas	9	4,537
Kentucky	10	4,483
Indiana	11	4,420
Utah	12	4,405
Rhode Island	13	4,375
Maryland	14	4,289
North Dakota	15	4,283
Michigan	16	4,269
Minnesota	17	4,259
Florida	18	4,204
Tennessee	19	4,165
Idaho	20	4,157
Mississippi	21	4,152
North Carolina	22	4,150
South Carolina	23	4,140
California	24	4,134
Kansas	25	4,113
Maine	26	4,079
Oregon	27	4,051
Colorado	28	4,046
Arkansas	29	4,046
New Jersey	30	4,003
New Mexico	31	4,000
Hawaii	32	3,998
Ohio	33	3,994
Nebraska	34	3,981
Georgia	35	3,957
Washington	36	3,951
Arizona	37	3,930
Nevada	38	3,912
Alabama	39	3,853
Illinois	40	3,760
Virginia	41	3,758
West Virginia	42	3,735
Montana	43	3,699
New Hampshire	44	3,600
Connecticut	45	3,551
Louisiana	46	3,545
Missouri	47	3,487
Oklahoma	48	3,475
South Dakota	49	3,444
Massachusetts	50	3,201
U.S. average		4,183

1. Instructional costs for each state include Instruction, Student Services, and Scholarships and Fellowships, plus a portion of Academic Support, Instructional Support, Plant Operation and Mandatory; 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 the direct instructional costs plus noninstructional Public Service and Research.

SOURCE: FTE Students - National Center for Education Statistics, worksheets (Washington, D.C.: June 1984); Instructional Costs - National Center for Education Statistics, worksheets (Washington, D.C.: November 1984).

instructional cost on a per student basis.[12] If enrollment and class size tend to be positively correlated, then this explanation of interstate cost differences is approximately equivalent to the explanation of intrastate cost differences given above. Both explanations are grounded on the principal of "economies of large scale."

To test whether or not enrollment size and several other variables largely explain state variations in instructional cost per FTE student, the following regression equation was estimated using data for all publicly controlled institutions of higher education in each state for fiscal year 1982:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3$$

where:

Y = total instructional cost per FTE student ($)

X_1 = average instructional faculty salary ($)

X_2 = average enrollment per campus (number)

X_3 = state government appropriations per capita ($)

b_0, b_1, b_2 and b_3 are regression coefficients

The coefficient estimates are: $b_0 = 20.3$, $b_1 = 0.154$, $b_2 = -0.0932$ and $b_3 = 8.47$. The regression equation explains about 67 percent of the variation in instructional cost per FTE student among states.

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[12]For example see James Maynard, Some Microeconomics of Higher Education: Economies of Scale (Lincoln, NB: University of Nebraska Press, 1971). Maynard argues that student-to-faculty ratios are increased as institutions grow towards optimum size, thereby causing instructional cost per student to decrease.

These regression results show that per FTE student instructional cost is positively correlated with average instructional salary and state appropriations, but negatively correlated with institution size as measured by average enrollment per campus. The values of the coefficients indicate that a $1,000 increase in average instructional faculty salary could be expected to increase total instructional cost per FTE student by an average of $154, and that a 1,000 increase in average enrollment per campus could be expected to decrease per FTE student cost by an average of $93.

Pennsylvania's average instructional salary is slightly--about 5 percent--above the all-states average but total instructional cost per FTE student exceeds the national average by 13 percent. Part of the difference is attributable to a much smaller average enrollment per campus: 4,810 in Pennsylvania and 6,446 in the nation.

V. Cost Sharing

For the most part, instructional costs in Pennsylvania's public universities are covered by student tuition and fees (the student share) plus State appropriations (the public share). Of course, tuition and fees are not necessarily borne totally by students. Some students receive grants under the State Higher Education Grant Program, or are recipients of private lender loans guaranteed under the State Guaranteed Student Loan, PLUS or ALAS programs. These grant and loan programs are administered by the Pennsylvania Higher Education Assistance Agency (PHEAA). Some students receive loans directly from or are employed by schools, which are financed in part by matching funds from PHEAA. Some receive other types of financial aid from various federal or private sources.

STUDENT SHARE: TUITION AND FEES

The tuition and required fees for students enrolled full time during the academic year 1984-85 in Pennsylvania's public universities (main campuses) are given in table 19. For purposes of comparisons, the table also shows full-time student charges for selected private colleges and universities in Pennsylvania and public institutions in other states;

Table 19

ACADEMIC YEAR TUITION AND REQUIRED FEES[1] BY LEVEL
MAIN CAMPUSES OF SELECTED PUBLIC AND PRIVATE INSTITUTIONS
1984-85

Group	Institution	Undergraduate level			Graduate level		
		Public			Public		
		In-state	Out-of-state	Private	In-state	Out-of-state	Private
I.	INSTITUTIONS AWARDING ONLY BACHELOR'S DEGREES						
	State-owned (Pennsylvania)						
	Lock Haven	$1,675	$2,853		—	—	
	Private (Pennsylvania)						
	Dickinson College			$8,323			—
	Franklin & Marshall College			8,160			—
	Gettysburg College			7,740			—
	Lebanon Valley College			6,050			—
	Swarthmore College			9,175			—
	Wilson College			6,676			—
	Public (other states)						
	Lake Superior St. College (MI)	1,455	2,760		$1,080	$1,080	
	Mary Washington College (VA)	1,326	2,896		—	—	
	University of N.C. at Asheville (NC)	712	2,962		—	—	
II.	INSTITUTIONS AWARDING BACHELOR'S AND ADVANCED DEGREES						
	State-related and State-owned						
	Penn State	2,562	5,146		2,730	5,458	
	Pittsburgh	2,758	5,408		3,240	6,410	
	Temple	2,940	5,124		3,242	4,058	
	Lincoln	1,830	2,830		2,325	4,025	
	Bloomsburg	1,714	2,892		1,624	1,714	
	California	1,830	3,008		1,752	1,842	
	Cheyney	1,730	2,908		1,710	1,800	
	Clarion	1,758	2,936		1,710	1,800	
	East Stroudsburg	1,744	2,922		1,688	1,778	
	Edinboro	1,758	2,936		1,758	1,848	
	Indiana	1,778	2,956		1,710	1,800	
	Kutztown	1,708	2,886		1,570	1,660	
	Mansfield	1,755	2,933		1,650	1,740	
	Millersville	1,686	2,864		1,590	1,680	
	Shippensburg	1,782	2,960		1,690	1,780	
	Slippery Rock	1,766	2,944		1,766	1,856	
	West Chester	1,694	2,872		1,694	1,784	
	Private (Pennsylvania)						
	Bryn Mawr College			9,010			$8,475
	Carnegie-Mellon University			8,450			9,130
	Lehigh University			8,750			8,750
	University of Pennsylvania			9,600			10,160
	Public (other states)						
	Eastern New Mexico U.-Main (NM)	752	2,308		752	2,308	
	Rutgers University-Camden (NJ)	1,776	3,296		2,356	3,308	
	SUNY at Stony Brook (NY)	1,455	3,305		2,325	3,900	
	University of Maryland at College Park (MD)	1,410	3,962		2,032	3,544	
	University of Michigan at Ann Arbor (MI)	2,172	6,732		3,416	7,332	
	University of North Carolina at Chapel Hill (NC)	765	3,125		773	3,393	
	University of Texas at Austin (TX)	475	1,555		363	983	

1. In instances where charges are on a per course basis, undergraduate tuitions are determined on a 30 credit-hour, academic-year workload and graduate tuitions on a 24 credit-hour, academic-year workload.

SOURCE: Pennsylvania Department of Education, "Undergraduate and Graduate Tuition and Required Fees at Institutions of Higher Education for the 1984-85 Academic Year" and data furnished by individual institutions.

the sources of these data are the Pennsylvania Department of Education and the individual institutions. To facilitate comparisons, all institutions are grouped by level of degrees conferred and type of control (public or private).

From 1983-84 to 1984-85, average undergraduate tuition and fees for in-State students increased by 5.8 percent at the State-owned universities and by 6.5 percent at the State-related universities; tuition increases for out-of-state students at these schools were similar. In 1984-85 in-State student charges at the State-owned schools range from $1,675 (Lock Haven) to $1,830 (California) for undergraduates and from $1,570 (Kutztown) to $1,766 (Slippery Rock) for graduates. At the State-related schools, in-State undergraduate charges range from $1,830 (Lincoln) to $2,940 (Temple) and in-State graduate charges from $2,325 to $3,242 (same schools). At the State-owned universities, average tuition and fees for nonresidents exceed those for residents by about two-thirds for undergraduates, but by only about 5 percent for graduates. At the State-related universities, the average out-of-state premium is approximately three-fourths for both levels of students.

Considering those institutions included in table 19, the in-State tuition at Pennsylvania's State-owned universities is typically much lower than the tuition at the private colleges and universities in the State, but (generally) much higher than the in-State student charges made by the public institutions in the other states. Similar conclusions result from comparisons of student charges at the State-related schools to the charges made by the other institutions.

PUBLIC SHARE: STATE APPROPRIATIONS

Table 20 details fiscal year 1983-84 State appropriations for educational and general purposes, excluding student aid; the sources of these data are the Governor's Office and the State System of Higher Education. In addition, the table shows appropriations per FTE student and appropriations as percentages of total revenues from tuition, fees and appropriations.

Direct appropriations to the public universities totaled $495.5 million, an overall increase of 2 percent over fiscal year 1982-83. However, each of the State-related universities received a 4 percent increase in appropriations, whereas three of the larger State-owned universities (Indiana, West Chester and Slippery Rock) each received increases of 1 percent or less, and the other State-owned schools received no increases. Under the appropriations formula in effect, the remaining 11 State-owned universities were entitled to lower shares of the total appropriation than they received the previous year but were "held harmless."

The appropriation per FTE student was $2,950 in the State-owned universities and $2,360 in the State-related universities. With slightly higher total FTE enrollment during the year, appropriations per FTE student decreased by $50 in the State-owned schools; with slightly smaller total FTE enrollment, appropriations per FTE student increased by $100 in the State-related schools. Appropriations as a percentage of total instructional revenues averaged 66 percent in the State-owned schools and 45 percent in the State-related schools.

Table 20

APPROPRIATIONS FOR INSTRUCTION RELATED TO TUITION AND FEE REVENUES AND FTE STUDENTS[1]
1983-84, CHANGE FROM 1982-83 AND FIVE-YEAR AVERAGE ANNUAL RATE OF CHANGE
(1978-79 to 1983-84)

Institution[2]	State appropriation			Appropriation as percentage of total revenues from tuition, fees and appropriation	Appropriation per FTE student			
		Percentage change					Percentage change	
	Amount (millions)	One year	Five-year annual average		Amount	One-year change	One year	Five-year annual average
State-related								
Penn State[3]	$109.0	4%	6%	42%	$1,870	$80	4%	4%
Pittsburgh[3]	73.1	4	6	44	2,490	90	4	5
Temple	78.1	4	6	49	3,360	200	6	10
Lincoln[4]	4.5	4	8	58	3,400	220	7	5
Total	264.7	4	6	45	2,360	100	4	6
State-owned								
Indiana	32.0	1	9	63	2,470	10	a	7
West Chester	22.8	1	5	63	2,710	100	4	4
Millersville	17.4	0	7	64	2,770	-110	-4	4
Bloomsburg	17.8	0	8	65	2,880	0	0	8
Slippery Rock	16.3	a	3	62	2,750	-120	-4	2
Edinboro	16.6	0	1	67	2,910	-50	-2	1
Clarion	16.4	0	6	67	2,910	-100	-3	4
Kutztown	15.4	0	7	63	2,790	-120	-4	2
Shippensburg	16.5	0	6	66	3,000	-10	a	5
California	15.1	0	2	70	3,250	-200	-6	a
East Stroudsburg	13.4	0	8	66	3,210	-30	-1	7
Mansfield	10.4	0	2	70	3,800	-100	-3	-1
Lock Haven	10.0	0	6	71	3,880	-20	-1	3
Cheyney	10.7	0	5	76	5,360	-600	-10	10
Total	230.8	a	6	66	2,950	-50	-2	4
All Institutions	495.5	2	6	53	2,600	50	2	5

1. Appropriations include only funding for educational and general purposes (excluding student aid).
2. Arranged in descending order with respect to total full-time equivalent students for 1983-84.
3. Includes appropriation for Titusville campus.
4. Includes appropriation for human services.
a. Rounds to less than 1 percent.

SOURCE: Reports provided by the individual institutions, 1978 to 1984; Governor's Executive Budget, 1984-85; data furnished by the State System of Higher Education, Commonwealth of Pennsylvania, July and December 1984.

Table 20 shows appropriations data for individual schools arranged in descending order with respect to number of FTE students. This arrangement shows that as enrollment increases both per FTE student appropriations and appropriations as a percentage of total revenues tend to decrease. The revised appropriation allocation formula which will be used for the State-owned universities in fiscal year 1984-85 will be based in part on differences in student credit hours produced in the various course disciplines and at the various academic levels.[13]

STUDENT AID FROM PHEAA[14]

During the academic year 1983-84, the Pennsylvania Higher Education Assistance Agency awarded over $10 million (average full-year award $560) to 20,045 undergraduates (28 percent of the fall undergraduate enrollment) at the State-owned universities and nearly $19 million (average award $800) to 25,523 undergraduates (30 percent of the fall undergraduate enrollment) at the State-related universities under the State Higher Education Grant Program. The awards to State-owned university students amounted to about 14 percent and to State-related students about 25 percent of the total value of the grants made to students in all institutions of higher education in Pennsylvania

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[13]See State System of Higher Education, The Allocation Formula for the Pennsylvania State System of Higher Education, May 15, 1984.

[14]Based on data from Pennsylvania Higher Education Assistance Agency, Year-by-Year Summary Statistics, February 1984, updated by PHEAA staff.

under this program. These awards were funded by State appropriations and need not be repaid.

During 1983-84 PHEAA disbursed State funds as allocations to institutions and aid to students in the total amounts of $1,084,000 to the State-owned universities and $323,000 to the State-related universities under the State Matching Fund Program. These funds were used for National Direct Student Loans and nursing student loans and as matching funds for work-study programs and internships, etc.

In the same year PHEAA guaranteed loans by private lenders to 33,468 State-owned university undergraduate and graduate students (average loan value $1,833) and 45,540 State-related university undergraduate and graduate students (average loan value $2,269), under the State Guaranteed Student Loan Program; these loan guarantees to the State-owned university students represented about 14 percent and to the State-related university students about 23 percent of the total value of loans guaranteed to students in all institutions of higher education in Pennsylvania under this program. In addition, PHEAA guaranteed loans to 965 State-owned university students (average loan value $2,176) and 1,559 State-related university students (average loan value $2,516) under its PLUS and ALAS loan programs. All low-interest loans must be repaid; the State becomes the "collector of record" only if a student defaults.

Grants provided by PHEAA to students reduce their cost shares. Subsidized jobs help students meet educational costs. Loans, often at federally subsidized interest rates, enable students to transfer the cost of higher education to the future when their incomes may be expected to be higher.

COST-SHARING TRENDS

As shown in table 21, from 1978-79 to 1983-84 average tuition and fees for full-time students increased by 10.5 percent per year at the State-owned universities and 16.3 percent per year at the State-related universities. During this same time, direct State appropriations per student increased by average annual percentages of 4.4 percent and 5.7 percent at the two groups of schools, respectively. The greater increase in tuition and fees relative to appropriations increased the students' share of the instructional revenue (tuition and fees plus appropriations) by 5 percent at the State-owned schools and 8 percent at the State-related schools over this interval.

During the period 1978-79 to 1983-84, PHEAA made State grants to about one-third of the full-time undergraduates at the State-owned schools and to about 35 to 40 percent of these students at the State-related schools. The average full-year grant per student increased to $560 from $419 in the former schools and to $800 from $599 in the latter schools. In both cases, however, the percentage of average undergraduate student expenses covered by the State grants fell to about 16 percent from about 20 percent during this five-year period.

From 1978-79 to 1983-84, PHEAA loan guarantees under its largest loan guarantee program increased to nearly 43 percent from 26 percent of the FTE students at the State-owned schools and to nearly 41 percent from about 23 percent of the FTE students at the State-related schools. The average PHEAA loan guarantee amount under this program increased to $1,833 from $1,548 for the former students and to $2,269 from $2,016 for

Table 21

TUITION AND FEES AND STATE APPROPRIATIONS PER FULL-TIME STUDENT[1]
STATE-RELATED AND STATE-OWNED UNIVERSITIES
(1978-79 to 1983-84)

Year	Per State-related FTE student				Per State-owned FTE student			
	Tuition and fees	State appro-priations	Total revenue	Appropriations as a percentage of revenue	Tuition and fees	State appro-priations	Total revenue	Appropriations as a percentage of revenue
1983-84	$2,920	$2,360	$5,280	45%	$1,540	$3,000	$4,540	66%
1982-83	2,610	2,260	4,870	46	1,540	3,000	4,540	66
1981-82	2,210	2,110	4,320	49	1,300	2,850	4,150	69
1980-81	2,000	2,030	4,030	50	1,130	2,760	3,890	71
1979-80	1,780	1,960	3,740	52	1,010	2,630	3,640	72
1978-79	1,610	1,840	3,450	53	1,010	2,460	3,470	71
Average annual increase	16.3%	5.7%	10.6%		10.5%	4.4%	6.2%	

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 (excluding student aid).

SOURCE: State-related tuition and fee data provided by the individual institutions, 1978 to 1984; State-owned tuition and fee data furnished by Pennsylvania Department of Education, Bureau of Budget and Management, 1978 to 1983; the State System of Higher Education, Commonwealth of Pennsylvania, July and December 1984; and Governor's Executive Budget, 1984-85, 1983-84, 1982-83 and 1981-82.

the latter students. Clearly, more students are using low-cost loans to meet their share of the cost of instruction.

INTERSTATE COMPARISON OF COST-SHARING

Table 22 lists by state the fiscal 1984 estimated average tuition and the total state and local appropriations (for current operating expenses) per FTE student in all publicly controlled institutions of higher education; these data were compiled by D. Kent Halstead of the National Institute of Education. Table 22 includes tuition and appropriations for four-year colleges and universities, two-year colleges, medical schools and research institutions; some of the appropriations are not related to student enrollments. Thus, the data for Pennsylvania in this table differ from the data for the State in tables 20 and 21, which include only tuition and State appropriations (for educational and general purposes) per FTE student for the State-owned universities and State-related universities, excluding medical schools. Nevertheless, a comparison of the state data is informative.

In table 22 Pennsylvania's total State and local appropriations are $3,791 per FTE student, an amount just slightly less than the U.S. average. On the other hand, Pennsylvania's average public institution student tuition is $2,209, more than double the U.S. average. Only two states--Vermont and New Hampshire--have higher average tuition in their public colleges and universities than Pennsylvania.

Table 22

TUITION AND APPROPRIATIONS PER FTE STUDENT
ALL PUBLIC INSTITUTIONS OF HIGHER EDUCATION
FISCAL YEAR 1984

State	Per FTE student: Estimated average tuition[1]	Per FTE student: State & local appropriations[2]	Per FTE student: Total	Percentage of appropriations to total
Alabama	$1,108	$3,356	$4,464	75.2%
Alaska	966	11,495	12,461	92.2
Arizona	958	3,431	4,389	78.2
Arkansas	935	3,680	4,615	79.7
California	515	3,614	4,129	87.5
Colorado	1,582	3,177	4,759	66.8
Connecticut	519	3,972	4,491	88.4
Delaware	1,959	3,626	5,585	64.9
Florida	768	3,826	4,594	83.3
Georgia	1,077	4,583	5,660	81.0
Hawaii	600	5,190	5,790	89.6
Idaho	614	3,818	4,432	86.1
Illinois	853	3,541	4,394	80.6
Indiana	1,712	3,396	5,108	66.5
Iowa	1,287	3,834	5,121	74.9
Kansas	950	3,806	4,756	80.0
Kentucky	1,125	4,690	5,815	80.7
Louisiana	958	3,966	4,924	80.5
Maine	1,609	3,086	4,695	65.7
Maryland	1,314	3,640	4,954	73.5
Massachusetts	810	3,948	4,758	83.0
Michigan	1,607	3,243	4,850	66.9
Minnesota	1,154	3,891	5,045	77.1
Mississippi	1,027	4,010	5,037	79.6
Missouri	1,172	2,963	4,135	71.7
Montana	689	3,660	4,349	84.2
Nebraska	1,087	3,831	4,918	77.9
Nevada	1,031	3,472	4,503	77.1
New Hampshire	2,576	1,925	4,501	42.8
New Jersey	1,215	4,178	5,393	77.5
New Mexico	860	4,405	5,265	83.7
New York	998	5,185	6,183	83.9
North Carolina	545	3,688	4,233	87.1
North Dakota	953	3,659	4,612	79.3
Ohio	1,912	3,063	4,975	61.6
Oklahoma	607	3,386	3,993	84.8
Oregon	1,363	3,768	5,131	73.4
PENNSYLVANIA	2,209	3,791	6,000	63.2
Rhode Island	1,579	3,636	5,215	69.7
South Carolina	933	4,250	5,183	82.0
South Dakota	1,054	2,487	3,541	70.2
Tennessee	1,024	3,289	4,313	76.3
Texas	737	4,929	5,666	87.0
Utah	964	3,912	4,876	80.2
Vermont	3,520	2,450	5,970	41.0
Virginia	1,286	3,446	4,732	72.8
Washington	746	3,673	4,419	83.1
West Virginia	1,045	3,129	4,174	75.0
Wisconsin	1,218	3,582	4,800	74.6
Wyoming	794	6,279	7,073	88.8
U.S. average[3]	1,048	3,850	4,898	78.6

1. Tuition revenues for fiscal year 1984 were estimated by the U.S. Department of Education.
2. State and local appropriations for current operating expenses of all publicly supported institutions, including two-year colleges, four-year colleges and universities, medical schools and research institutions.
3. U.S. average includes the District of Columbia.

SOURCE: D. Kent Halstead, How States Compare in Financial Support of Higher Education 1983-84 (Washington, D.C.: National Institute of Education, March 1984).

On a per student basis, total governmental appropriations are about equal to and total instructional cost much higher than the national averages; therefore, higher tuition for Pennsylvania students is required to make up the difference. As demonstrated previously (p. 57), one of the factors contributing to higher instructional cost is the small average enrollment at Pennsylvania's public higher education campuses. At least a part of the higher tuition can be viewed as the price paid for the convenience and economy to students of the availability of many geographically diverse campuses.