DOCUMENT RESUME

ED 111 290 HE 006 692

AUTHOR	Fredriksen, Birger
TITLE	Subject Field and Regional Variations in Student/Staff Ratios, Academic Programmes and Recurrent Expenditures. Technical Report.
INSTITUTION	Organisation for Economic Cooperation and Development, Paris (France). Centre for Educational Research and Innovation.
REPORT NO	CERI/IM/71.38
PUB DATE	29 Oct 71
NOTE	69p.; Presented at the Evaluation Conference on Institutional Management in Higher Education, Paris, November 2-5, 1971
EDRS PRICE	MF-$0.76 HC-$3.32 Plus Postage
DESCRIPTORS	*Academic Education; Budgeting; Conference Reports; Educational Finance; *Educational Planning; *Higher Education; Institutional Administration; *Operating Expenses; Regional Planning; School Surveys; Student Distribution; *Student Teacher Ratio; Teacher Distribution
IDENTIFIERS	England; Netherlands; Norway; Switzerland; Yugoslavia

ABSTRACT

Based on the data obtained from a specially conducted survey of universities in CERI member countries, this report gives a descriptive analysis of interdepartmental and interregional variations in the quantitative aspects of university operations. The data and findings are of a tentative nature since the survey on which the analysis was based suffered from the lack of standard definitions of concepts as well as the paucity of available information at the institutional level. Data were obtained for 32 different departments grouped into six major subject fields, pure sciences, technology, medical sciences, humanities, law, and social sciences. The ratio between student enrollment and academic staff is discussed as an indicator of the need for academic staff. The importance of non-academic staff is also emphasized, and ratios between students and administrative staff indicate distinct differences between pure sciences, technology and medical sciences, as compared with the other fields. Technology provides the highest number of teaching hours per week. Data show that these three fields also spend more of the total annual recurrent expenditure on non-remunerative items. A tabulation is given of average recurrent expenditure per student enrolled by department for England, Netherlands, Norway, Switzerland, and Yugoslavia. The data show substantial cost differences between fields within the same country. (LBH)

STUDIES IN INSTITUTIONAL MANAGEMENT IN HIGHER EDUCATION
- CENTRE FOR EDUCATIONAL RESEARCH AND INNOVATION -

centre for educational research and innovation

SUBJECT FIELD AND REGIONAL VARIATIONS IN STUDENT/STAFF RATIOS, ACADEMIC PROGRAMMES AND RECURRENT EXPENDITURES

technical report

OECD ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

Paris, 29th October, 1971

Centre for Educational Research
and Innovation

Engl. only

CERI/IM/71.38

EVALUATION CONFERENCE ON INSTITUTIONAL MANAGEMENT IN HIGHER EDUCATION

(2nd-5th November, 1971)

- CENTRE FOR EDUCATIONAL RESEARCH AND INNOVATION -

SUBJECT FIELD AND REGIONAL VARIATIONS IN STUDENT/STAFF RATIOS, ACADEMIC PROGRAMMES AND RECURRENT EXPENDITURES

by Mr. Birger Fredriksen, Programme Specialist, UNESCO

(Note by the Secretariat)

Based on the data obtained from a specially conducted survey of universities in the Member countries, this report gives a descriptive analysis of inter-departmental and inter-regional variations in the quantitative aspects of university operations. The data and findings reported here are of a tentative nature since the survey on which the analysis was based suffered from the lack of standard definitions of concepts as well as the paucity of available information at the institutional level. This work was carried out by Mr. Fredriksen, until recently a CERI staff member.

Fre

TABLE OF CONTENTS

CHAPTER I: THE DATA BASE AND APPROACH

The purpose of this report is to provide insights into the ways in which the resources available to different types of university departments were employed during the academic year 1968-69. We have tried to measure and analyse the differences in the use of resources among departments, subject fields and broad geographical regions. The information analysed was collected through a questionnaire survey carried out by the Centre's Programme on Institutional Management in Higher Education. In this chapter we will describe the Survey, the information analysed as well as the departmental groupings into subject fields - and countries into regions. We have also given the main features of university education in different regions.

1.1 The University Information Survey

Background

The University Information Survey was launched during the Spring of 1970 by the Centre's Programme on Institutional Management in Higher Education. A comprehensive questionnaire (to be called the Long Version Questionnaire) on student and staff numbers, academic and student loading, space, and expenditure was designed and sent to 254 institutions in the European OECD Member countries listed as universities in the 1969 World List of Universities and Other Institutions of Higher Education, published by the International Association of Universities. Added to these were 20 selected universities in the United States and 15 in Canada making a total of 289 universities. The procedure of obtaining the information was to mail the Long Version Questionnaire to the responsible authorities of each individual university. Several steps were taken to encourage the universities to answer. A short version of the questionnaire was also designed and mailed to those universities that for various reasons were not able to fill out the Long Version Questionnaire, but that agreed to complete the Shorter Version. The Short Version was also used to obtain information from central national authorities dealing with university affairs.

Response Rate

A total of 48 universities responded to the Long Version Questionnaire while 15 universities responded to the Short Version. Furthermore, 59 Short Version Questionnaires were completed by national authorities bringing the total number of responses (Long and Short Versions) up to 122, which is a response rate of approximately 42% of all universities from whom information was sought.

The questionnaire relevant for this report is the Long Version as the Short Version did not request information for individual departments. Out of the 48 universities completing the Long Version, 33 supplied information on the activities of individual departments.

1.2 Information Tabulated

From the information collected on departmental level, the following items are tabulated and analysed in this report:

(1) Staff numbers
  (i) academic
  (ii) administrative
  (iii) technical

(2) Total number of students enrolled.

(3) Average number of teaching hours given per week by the academic staff in a department.

(4) Average weekly scheduled student hours received by
  (i) first degree students
    - lectures
    - seminars
  (ii) higher degree students
    - lectures
    - seminars

(5) Average and maximum seminar group size for
  (i) first degree students
  (ii) higher degree students

(6) Annual recurrent expenditures
  (i) Total staff remuneration
    - academic staff
    - administrative staff
    - technical staff
  (ii) Non-remunerative recurrent expenditure.

The figures quoted for departments in tables of this report are unweighted arithmetic averages, and the number of observations is given in each case. The figure quoted for each Subject Field (Pure, Sciences, Technology, etc.) is a weighted average of the averages given for the departments listed under that Subject Field, the weights being equal to the number of observations in each case.

The next section presents the departmental classification. The number of departments included in the tabulations of different data elements varies somewhat from element to element. Information was, for example, not available on student hours scheduled for the Department of Mining while information was available on average staff remuneration. Consequently, the Department of Mining was only included under the tabulations of staff remuneration. This means that the estimates made for, for example, student hours scheduled for the subject field of Technology include different departments than those for which the estimates were made for staff remuneration for the same field. This problem is more important when dealing with the regional split of the data. The estimate of a particular parameter for a given subject field and region may be based on observations from different departments than the estimate of the same parameter for the same subject field for another region.

Table 1.1 in Section 1.3 gives a distribution of the departments on country and region.

1.3 Departmental and Country Groupings

The most important reason for the choice of departments as a basic unit for comparative statistical tabulation is that they are considerably homogeneous. Comparisons of university-wide aggregates or faculty-wide aggregates are useful only to a limited extent. Because of large differences in the proportions in which academic activities are mixed in different universities, most comparisons are difficult to interpret at the total level. Insofar as faculties are groupings of departments, comparisons are also difficult by the varying proportions of departmental weights in the similar faculties of different universities. It is not claimed that departments are homogeneous categories but they are likely to display greater homogeneity for reasons of professional affiliation of its staff than larger groupings such as faculties or schools.

Universities often regard departments as the record-keeping units. Therefore, the source of information for a number of measures such as staffing patterns, academic loads and expenditures may be more readily available at the departmental level. Furthermore, academic departments are often considered as the basic units for resource allocation decisions irrespective of the degree of centralisation of administration. Most academic planning and expansion exercises for universities rely on the departmental configuration for the universities even when the existence of a departmental structure is disclaimed.

A further disaggregation below the departmental level is also possible. We may identify "programme of study". A programme of study is a group of study subjects which a student must undertake over an academic year or more in order to obtain a recognised qualification. A "course" then could be treated as the most disaggregated element of the academic/ teaching activities of the university.

While we are in favour of disaggregating the academic activities of a university into its faculty and departmental components, we do not consider any further breakdown as very practical from the point of view of comparative data collection effort.

The use of the departmental category as the basis for a comparative data collection effort is not free of major drawbacks. First, data collection effort for individual universities may become prohibitive when there is a proliferation of departments either because of the size of the university and the diversified nature of its academic programmes or because of the departmental organisation in terms of a finer subject-field classification. Second, depending on the way the basic records are kept, reflecting the organisational structure of the university, it may not be possible to allocate students,,staff or expenditures on the departmental basis. Even when this is possible the university timetable details on staff and student academic loading for individual courses may not be identifiable by department. In any case, universities may find unallocable items within a faculty that are common to a number of departments. A third and related difficulty arises from inter-departmental or even inter-faculty service teaching. By service teaching is meant scheduled teaching provided by staff of a faculty or department for students of another faculty or department. A purely servicing academic department may have teaching staff and teaching hours offered without any departmental students since students taking the courses offered by the service department will be from outside this department. There may also be staff who have joint appointments in more than one department creating the problem of double counting.

Departments included in the Report

In Table 1.1 we give the list of departments and their groupings and subject field on the left side. On the top we list the countries by their regional grouping. The body of the table shows the number of departments concerned in this report.

TABLE 1.1 DISTRIBUTION OF THE DEPARTMENTS INCLUDED IN THE REPORT BY TYPE OF DEPARTMENT, COUNTRY & REGION

Department \ Country Region	Total Region 1	Canada	U.S.A.	Region 2 U.K.	Total Region 3	Belgium	France	Germany	Netherlands	Switzerland	Total Region 4	Denmark	Norway	Total Region 5	Spain	Turkey	Yugoslavia	Total
PURE SCIENCES	(23)	(10)	(13)	(26)	(27)	(5)	(5)	(4)	(11)	(2)	(7)	(0)	(7)	(10)	(0)	(5)	(5)	(93)
Biochemistry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Biology	4	2	2	6	5	1	1	1	3	1	1	1	1	3	1	1	2	19
Botany	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
Chemistry	4	2	2	5	6	1	1	1	3	1	1	1	1	2	1	1	1	18
Geology	4	2	2	1	5	1	1	1	2	1	1	1	1	1	1	1	1	12
Mathematics	4	2	2	5	7	1	1	1	3	1	1	1	1	2	1	1	1	19
Physics	4	2	2	6	4	1	1	1	1	1	1	1	1	2	1	1	1	17
Zoology	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
TECHNOLOGY	(12)	(4)	(8)	(23)	(17)	(1)	(0)	(3)	(6)	(7)	(15)	(8)	(7)	(8)	(0)	(2)	(6)	(75)
Architecture	2	1	2	1	3	1	1	1	1	2	1	1	1	2	1	1	1	9
Eng.Sciences	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	7
Civil Eng.	2	1	1	3	1	1	1	1	1	1	3	2	1	1	1	1	1	10
Metallurgy	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	6
Mining	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	3
Prod.Eng.	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	5
Elect.Eng.	2	1	1	4	2	1	1	1	1	1	3	2	1	1	1	1	1	12
Mech.Eng.	2	1	1	3	3	1	1	1	1	1	3	2	1	2	1	1	2	13
Chem.Eng.	2	1	1	3	2	1	1	1	1	1	3	2	1	1	1	1	1	10
MED. SC.	(3)	(2)	(1)	(2)	(16)	(2)	(1)	(2)	(9)	(2)	(4)	(0)	(4)	(6)	(1)	(3)	(2)	(31)
Dentistry	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	6
Medicine	1	1	1	1	13	2	1	2	6	2	2	1	2	4	1	1	2	20
Pharmacy	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	1	1	5
HUMANITIES	(15)	(7)	(8)	(10)	(35)	(6)	(5)	(2)	(18)	(4)	(7)	(0)	(7)	(10)	(4)	(3)	(3)	(77)
History	3	2	1	2	5	1	1	1	3	1	1	1	1	2	1	1	1	13
Languages	4	2	2	3	7	1	1	1	3	2	1	1	1	3	1	1	1	18
Literature	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	6
Philosophy	3	1	2	2	5	1	1	1	3	1	1	1	1	2	1	1	1	13
Psychology	4	2	2	2	5	1	1	1	3	1	1	1	1	1	1	1	1	13
Theology	1	1	1	1	11	1	1	2	6	2	2	1	2	1	1	1	1	14
LAW	(4)	(2)	(2)	1	(14)	(2)	(1)	(1)	(8)	(2)	(2)	1	(2)	(2)	1	1	(2)	(22)
SOCIAL SC.	(16)	(7)	(9)	(8)	(19)	(5)	(3)	(0)	(10)	(1)	(2)	(0)	(2)	(8)	(2)	(3)	(3)	(53)
Business Man.	5	2	3	1	1	1	1	1	1	1	1	1	1	4	1	1	2	11
Economics	3	2	1	3	8	2	1	1	4	1	1	1	1	1	1	1	1	14
Geography	1	1	1	1	4	1	1	1	2	1	1	1	1	1	1	1	1	7
Pol.Sciences	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4
Sociology	3	2	1	1	6	1	1	1	4	1	1	1	1	1	1	1	1	12
Statistics	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Mixed Soc.Sc.	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	3
TOTAL	73	32	41	69	128	21	15	12	62	18	37	8	29	44	7	16	21	351

Regional Groupings

The main difficulty regarding international comparisons in the field of education is directly related to structural differences in the educational systems of the countries involved. Each country's educational system is a product of a given cultural and historical development, and it functions in a particular socio-political context. The present sizes of the parameter characterising the system are the outcome of complex historical factors and policies that have been gradually evolved through adjustments to changing situations and needs.

The number of universities supplying information on the activities of individual departments was too low to permit a a breakdown on individual countries. The countries were therefore grouped into five regions. The main criterion followed for this classification was to group together countries where the organisational structure of the universities was considered more or less homogeneous with respect to factors like course duration, student attendance pattern, whether or not admission is restricted, the degree of autonomy of the institutions and ways of financing university education.

The countries included in the different regions are, of course, not homogeneous with respect to all these factors, indeed there are often large variations between institutions within the same countries. It is nevertheless believed that the groupings used are the best possible, taking into consideration the data available.

The number of observations available varies considerably from region to region and from country to country within each region. Table 1.1 shows that Region 3 is dominated by observations from the Netherlands (48% of all observations in that region), Region 4 by Norway (78% of all observations) and Region 5 by Yugoslavia (48% of all observations).

1.4 Main Features of University Education in Different Regions

Region 1 (North America)

The universities in the United States display great diversity compared to universities in the four other regions. This variety is no doubt partly a function of the scale on which higher education is provided in the United States as the nature and functions of institutions change as the number of students enrolled grows. In 1968/69 the enrolment in higher education was approximately 35% of the population of the corresponding age group.(1)

(1) All overall enrolment rates presented in this section are taken from Table 2, p. 18, of Towards New Structures in Post-Secondary Education, OECD, Paris, June 1971.
All overall student/staff ratios presented in this section were obtained from Quantitative Trends in Teaching Staff in Higher Education, STP(70)8, OECD, Paris 1970. All overall pass-rates presented in this section were obtained from Development of Higher Education 1950-1967, ED(70)3, OECD, Paris 1970.

The freedom of access varies from one university to another. While there is stiff competition for entry to institutions of national repute, some of the state universities may admit any high school graduate.

The curricular programmes are less specialised than for European universities; the average duration of a first degree about four years, and the total student/staff ratio for all higher education was in 1967 13.5. The United States has a dual system based on public and private universities. In 1968, 70% of the enrolment was in public universities and 72% of the recurrent expenditures were financed by public sources (excluding research grants and ancillary enterprises). The pass rate for all higher education was in 1964/65 approximately 70%.

The Canadian universities have a curricular programme that is more specialised and more oriented to the professions than those of American universities of higher learning, but the Canadian institutions generally resemble those in the United States in the role they play in research and adult education.(1) Except for Quebec which follows the French pattern, the Canadian universities are designed along British lines. The average duration of a first degree is four years, and the freedom of access similar to the American universities. In 1968/69 the percentage of the age group enrolled in higher education was approximately 28.

Region 2 (United Kingdom)(2)

The British universities have been highly selective in admitting students. A child's decision to prepare for entrance to a university must be made at the age of eleven. Those who make the choice must pass a series of ordinary-level (O-level) examinations after eleven years of schooling and, after an additional two years, must pass advanced-level (A-level) examinations in at least three subjects before they can be admitted to a university. Although this system is beginning to change and is being subjected to increasing questioning, it is still common. The traditional dominance of Oxford and Cambridge is declining. The British universities, with the exception of London University, are small institutions in terms of student enrolment compared to the universities in the other four regions.

(1) A description of the higher educational system in Canada is given in Higher Education in Nine Countries, by Barbara B. Burn, The Carnegie Commission for Higher Education, New York 1971, pp. 91-125.

(2) See Carnegie Com. op. cit., pp. 45-91.

The length of study for a first degree is shorter than in any of the other regions (theoretical duration 3.1 years in England and Wales, actual duration during 1962-63 was 3.66 years). The proportion of graduates having obtained their university degree at the end of the prescribed duration is very high (in 1965, 93% in humanities and 80% in Technology and Medicine). The high persistence rate and short study period in British universities is generally ascribed to the competitive admission and low student/staff ratio. The overall ratio between full-time students and full-time staff was 7.8 in 1966.

The percentage of a given age group enrolled in higher education in 1968/69 was 13.5.

The universities are autonomous, but depend upon government for some 90% of their income for capital expenditure and about 75% of their income for recurrent expenditure.

Region 3 (Continental Europe)(1)

Region 3 includes more countries than the other regions. Admission is in general non-restricted apart from some fields where numerus clausus is applied. In France, there is stiff competition for entry to the Grandes Ecoles, but in general France as well as for the rest of the countries in this group, the obstacles at the point of entry to higher education are minimal except for technology and, in some cases, medicine. Easy access usually carries with it a high drop-out rate or prolongation of the study time beyond the minimum period. The average length (theoretical as well as actual) is longer in these countries for a first degree student than in Regions 1 and 2. Although there are subject field variations, the theoretical average was about 4-6 years in Germany, 5-7 years in the Netherlands, 4-7 years in Belgium, 4-6 years in Switzerland and 4-6 years in France. The higher figures refer, in general, to medical sciences and technology. The actual study time may be two years longer or more. Overall student/staff ratio was (in 1963) 13.7 in Switzerland, 10.0 in Germany (1966/67), 7.6 in the Netherlands (1958, including all research personnel), 16.6 in Belgium (1963/64) and 20.6 in France. The percentage of an age group enrolled in higher education was in 1968/69 in Germany 9.0, in Switzerland 7.1, in the Netherlands 9.0, in Belgium 13.7 and in France 9.0.

Several of the countries in this region have been or are in the process of rearranging their systems of higher education. Common for these reforms are increased participation for the students, more autonomy for the universities and decreasing power to the professors.

(1) A description of the higher educational system in France and Germany is given in the study of the Carnegie Commission referred to under Regions 1 and 2.

Higher education was in France until November 1968 completely centralised. One of the aims of the Orientation of Higher Education Act of 1968 was to decentralise this system by breaking up the faculties and their branches into small "education and research units" (UER) similar to departments in American universities. Another major objective of this reform was to give the universities greater autonomy.

Germany has got a federal system where higher education traditionally has been the concern of the Länder. The full professor has played a strong role within the university. In July 1969 West Berlin instituted reforms designed to break down traditional hierarchical powers of faculties, place universities under strong executive administration, and give students a voice in all levels of university decision-making. In the Netherlands all education other than agriculture is administered by the Minister of Education, while in Switzerland education is entirely the responsibility of the individual cantons that comprise the Swiss Confederation.

Belgium has still another system insofar as two-thirds of the total enrolment is in private universities. The financial support is however about 80% from public sources.(1) For Switzerland, 42.5% of the financial resources come from central government and 48.2% from Federal Government (1968).(1)

Region 4 (Scandinavia)

Norway and Denmark have got a highly centralised system of higher education. Access is open to all students who have successfully completed secondary education except for technology in Denmark and technology and medical sciences in Norway.

The overall student/staff ratio was 8.2 in Denmark (1965/66) and 8.3 in Norway (1965). The average length of a first degree was in Norway 5-6 years and in Denmark 4-7 years (figures for 1960-65). The percentage of a given age group enrolled in 1968/69 was 10.9 in Denmark and 9.4 in Norway.

Higher education is almost entirely financed by public sources.

Region 5 (Mediterranean Countries)

The Yugoslav system of higher education is very different from that of the other regions. It is highly decentralised and financed by the regional authorities and the local community. Freedom of access has changed considerably during the last 10 years from a completely non-restricted system to a quite selective system. The percentage of an age group enrolled in higher education was 11.5% in 1968 and the average pass-rate 40% in 1964/65. Average length of study for a first degree was 4-5 years.

(1) See Cost and Finance of Post-Secondary Education, DAS/EID/71.22, OECD, Paris, 15th June 1971

CHAPTER II: UNIVERSITY STAFF

2.1 Data

In this chapter we examine the departmental, subject field and regional variations in the ratio between student enrolment and academic staff (to be referred to as the student/staff ratio throughout this study). We also analyse the distribution of academic staff by rank, for selected universities. The last section is concerned with non-academic staff. As was pointed out in the previous chapter, the information is based on the survey carried out by the CERI in the spring of 1970 and relates to the year 1968/69.

Table 2.1 gives the ratios between the total number of students enrolled in a department and the number of academic staff, administrative staff and technical staff, by region. The left hand side of the table lists the different departments, while the head of the table gives the different ratios. The first three columns give average ratios for the total number of observations for a given department, irrespective of region, while the following columns give similar ratios for each of the five regions to the extent data was available. The figures quoted for individual departments are unweighted arimetric averages while the figures quoted for subject fields are weighted averages.

The data on administrative and technical staff will be discussed in the next chapter.

2.2 The Use of Student/Staff Ratios

The largest single element in university budgets and, thus, the largest element in the cost of university programmes is the item of academic remuneration. The academic staff is also the largest single input into the teaching process. To be able to calculate in a rational way the total need for academic staff and to distribute this total properly between the different departments and sections is, therefore, of critical importance for any university.

The student/staff ratio is widely used for calculating the need for academic staff. The ratio is taken as a norm for how much staff a university or university component should have. If this norm is fixed after careful examination of the factors which determine it (teaching load, group size, method of instruction, etc.) then the actual size of the student/staff ratio is, of course, a useful indicator of the extent to which a department is able to carry out a given programme. And year-to-year changes in this ratio will say something about changes in this ability. The ratio is, however, less useful for comparisons between different departments if the purpose is to say how good one department is compared to another as the "best" student/staff ratio undoubtedly varies greatly according to subject, method of instruction and other variables.

The student/staff ratio is also one of the most commonly used measure for the productivity of universities. This approach seems to confuse the total-factor-productivity of universities with the productivity of academic staff, neglecting that other inputs together probably count for more than academic staff measured as a percentage of recurrent expenditure or total costs per student.(1) It also implies the rather doubtful assumption that the student/staff ratio is a good indicator of the productivity of academic staff. It is not the purpose here, however, to examine the productivity of either universities or of academic staff - such an undertaking would be quite fruitless as long as the objectives that the universities are to fulfill are not more concretely specified than is presently the case.

Still, the academic staff is the most important single university input, and the student/staff ratio of a department is an important measure of how much of this resource is actually used by this department. Thus, the size of the student/staff ratio is of interest in its own right quite apart from whether or not it is a good indicator of university or academic staff productivity.

The purpose of this study is then to examine these ratios as they actually were in the universities that provided the relevant information through the survey.

2.3 Regional and Subject Field Variations in the Student/Staff Ratio

Table 2.1 shows considerable variations in the student/staff ratio between subject fields within the same region as well as between regions for the same subject field. Chart 1 suggests however a common pattern for the subject field variations. The chart shows that Pure Sciences, on the average for all regions, has the lowest student/staff ratio, closely followed by Medicine and Technology. Then follows Humanities, Social Sciences and Law. The split on individual regions suggests roughly the same pattern although the variations in the absolute size of the ratio is considerable. The ratio for Pure Sciences is lowest in Regions 1 and 3, second lowest in Regions 2 and 5 and third lowest in Region 3. Medicine has the lowest ratio in Regions 2, 4 and 5, second lowest in Region 1 and third lowest in Region 3. Technology is second lowest in two regions, third lowest in the two other and highest in Region 2. For the last region, there are however no observations available for Law, and the variations in the ratios for four of the other five fields are small.

(1) See Blaug (1968) for a good discussion of this problem.

TABLE 2.1 STUDENT/STAFF RATIOS, by DEPARTMENT AND REGION

Department/ Subject Field	Average All Regions				Region 1				Region 2				Region 3				Region 4				Region 5			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
PURE SCIENCES	7.3	44.6	33.9	(64)	5.5	17.1	54.2	(8)	7.8	43.8	22.0	(25)	5.6	35.2	17.6	(21)	7.0	36.3	14.5		11.1	73.8	81.8	(10)
Biochemistry	6.6	38.9	10.5	(2)	3.2	18.3	11.0	(1)	9.9	59.5	9.9	(1)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)
Biology	8.5	56.0	33.8	(14)	3.3	6.6	29.2	(1)	9.0	42.8	10.4	(6)	5.6	23.8	4.3	(4)	-	-	-	(0)	12.9	93.3	121.5	(3)
Botany	5.7	40.9	26.6	(2)	2.1	8.8	44.0	(1)	9.3	73.0	9.1	(1)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)
Chemistry	8.7	52.3	31.5	(14)	8.0	32.3	85.3	(2)	9.4	50.2	9.9	(5)	7.9	51.0	12.1	(5)	-	-	-	(0)	9.4	80.5	80.1	(2)
Geology	4.9	18.3	15.4	(7)	6.1	11.7	54.7	(1)	8.3	58.0	11.6	(1)	2.4	10.5	4.2	(4)	-	-	-	(0)	10.0	16.7	25.0	(1)
Mathematics	7.0	43.9	52.3	(13)	6.2	12.2	57.6	(1)	6.0	40.5	70.8	(5)	5.9	39.7	47.2	(5)	-	-	-	(0)	12.6	79.0	32.5	(2)
Physics	6.6	40.1	30.2	(12)	7.0	14.8	66.8	(1)	6.1	32.5	9.1	(6)	5.5	4.9	12.8	(3)	-	-	-	(0)	9.3	61.3	101.5	(2)
TECHNOLOGY	8.8	50.1	29.2	(73)	11.2	47.3	71.4	(12)	10.1	60.7	14.8	(22)	6.5	50.2	25.6	(17)	6.3	35.6	19.8	(14)	11.3	50.3	29.4	(8)
Architecture	10.0	59.2	71.3	(8)	11.5	28.5	121.5	(2)	11.1	27.8	33.4	(1)	9.1	96.9	63.3	(3)	-	-	-	(0)	11.1	73.8	81.8	(1)
Eng.Sciences	7.3	40.2	33.6	(7)	7.8	40.6	66.0	(1)	12.5	60.7	11.2	(2)	4.1	40.6	66.0	(2)	4.1	26.7	8.5	(1)	6.2	11.6	6.4	(1)
Civil Eng.	8.5	60.3	28.2	(10)	12.0	47.4	64.4	(2)	11.9	97.5	13.9	(3)	5.4	38.5	14.0	(1)	6.9	38.1	26.8	(3)	11.1	62.4	17.3	(1)
Metallurgy	6.6	26.3	13.0	(5)	6.0	15.4	30.9	(1)	7.4	33.5	10.1	(2)	5.0	29.7	3.9	(1)	7.1	19.2	10.1	(1)	-	-	-	(0)
Mining	8.0	26.9	7.3	(3)	-	-	-	(0)	18.5	37.0	6.2	(1)	2.8	21.8	7.8	(2)	-	-	-	(0)	-	-	-	(0)
Prod.Eng.	9.8	59.4	14.9	(5)	-	-	-	(0)	8.4	63.2	14.7	(3)	10.6	44.9	10.6	(1)	-	-	-	(0)	13.0	62.4	19.8	(1)
Elect.Eng.	9.7	58.2	27.1	(12)	15.4	81.8	70.4	(2)	8.8	67.5	18.8	(4)	8.3	50.4	11.9	(2)	6.2	37.2	23.1	(3)	13.2	52.0	15.9	(1)
Mech.Eng.	8.9	50.6	29.6	(13)	10.4	81.5	89.0	(2)	10.1	50.1	12.2	(3)	5.7	40.2	10.3	(3)	6.3	36.8	22.8	(3)	14.2	56.7	35.7	(2)
Chemic.Eng.	8.2	43.6	17.3	(10)	10.8	16.7	34.7	(2)	9.3	60.0	15.9	(3)	7.2	53.6	7.9	(2)	6.0	38.6	13.4	(3)	-	-	-	(0)
MED. SC.	7.7	34.0	11.6	(33)	7.6	23.6	6.3	(0)	4.9	31.9	5.3	(2)	8.4	36.3	11.4	(16)	4.6	27.0	6.7	(5)	8.3	34.8	28.6	(6)
Dentistry	5.3	23.0	6.2	(6)	6.3	9.2	6.7	(1)	-	-	-	(0)	4.6	9.8	10.8	(1)	3.2	19.5	3.5	(2)	7.1	39.9	-	(1)
Medicine	8.0	31.6	13.4	(21)	3.1	7.7	5.8	(1)	-	-	-	(0)	8.4	31.7	11.6	(13)	5.6	32.0	8.8	(3)	8.2	30.9	28.6	(3)
Pharmacy	9.0	53.5	7.9	(6)	13.5	53.9	-	(1)	4.9	31.9	5.3	(2)	9.9	79.4	10.5	(2)	-	-	-	(0)	11.1	44.3	-	(1)
HUMANITIES	11.3	80.9	268.3	(60)	12.5	60.4	293.7		9.1	71.5	223.2	(10)	10.4	86.8	328.0	(29)	9.6	61.2	229.6	(6)	12.0	102.7	151.6	(9)
History	10.0	82.3	53.8	(8)	-	-	-	(0)	9.8	88.2	∞	(2)	8.1	40.7	105.1	(3)	8.4	54.0	27.0	(1)	13.9	153.0	51.0	(2)
Languages	11.4	87.0	247.4	(13)	-	-	-	(0)	10.2	73.5	298.3	(3)	13.3	103.3	275.9	(1)	14.6	145.8	583.0	(1)	9.8	69.7	41.2	(2)
Literature	14.7	80.5	172.8	(4)	-	-	-	(0)	-	-	-	-	-	-	-	(0)	7.8	44.2	265.0	(1)	23.1	161.0	80.5	(1)
Philosophy	11.0	44.9	210.3	(9)	-	-	-	(0)	7.2	59.5	∞	(2)	4.5	36.3	55.0	(4)	-	-	-	(0)	9.3	50.0	∞	(1)
Psychology	12.2	55.9	54.8	(9)	-	-	-	(0)	13.6	89.3	19.2	(2)	15.6	52.1	99.0	(4)	9.9	56.8	75.7	(1)	8.7	56.5	113.0	(1)
Theology	10.8	101.2	511.8	(17)	-	-	-	(0)	6.8	20.5	∞	(1)	9.7	118.5	577.2	(12)	8.3	33.3	213.3	(2)	9.8	105.8	417.5	(2)
LAW	22.7	84.4	83.9	(23)	15.8	29.7	92.0	(4)	-	-	-	(0)	21.9	140.2	83.8	(14)	31.6	107.6	∞	(3)	29.5	86.5	118.5	(2)
SOCIAL SC.	15.2	86.9	204.6	(38)	13.8	65.1	254.1	(5)	9.2	49.5	196.9	(9)	17.1	116.6	255.3	(14)	17.2	89.2	∞	(2)	18.4	91.3	70.8	(6)
Business Man.	18.7	120.5	157.2	(8)	17.7	106.6	400.1	(3)	9.1	40.3	282.0	(1)	-	-	-	(0)	36.6	329.0	∞	(1)	17.0	91.5	67.3	(3)
Economics	16.0	130.4	337.1	(10)	9.7	12.1	∞	(1)	10.1	74.3	206.0	(3)	20.0	178.2	402.6	(6)	-	-	-	(0)	-	-	-	(0)
Geography	13.0	104.1	55.1	(5)	-	-	-	(0)	-	-	-	(0)	13.2	81.2	36.3	(3)	6.2	∞	∞	(1)	19.2	173.0	∞	(1)
Pol.Sciences	11.1	21.1	∞	(3)	6.1	10.1	∞	(1)	6.4	32.0	∞	(1)	-	-	-	(0)	-	-	-	(0)	-	-	-	0
Sociology	16.0	55.7	178.8	(9)	-	-	-	(0)	6.7	33.5	∞	(1)	16.0	64.0	210.0	(5)	8.7	48.2	∞	(1)	24.5	50.0	100.0	(2)
Mixed Soc.Sc.	10.2	39.0	137.0	(3)	-	-	-	(0)	10.2	39.0	137.0	(3)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)

(1) Column 1 gives the ratio between students and academic staff
Column 2 gives the ratio between students and administrative staff
Column 3 gives the ratio between students and technical staff
Column 4 gives the number of observations available in each case.

(2) The figures given for Humanities for Region 2 and for Pure Sciences for Region 4 are estimates based on the information supplied for individual faculties.

Humanities, Social Sciences and Law have all the same relative position in Regions 1, 3, 4 and 5, Humanities being ranked as No. 4, Social Sciences as No. 5 and Law as No. 6. The ratio for Humanities varies relatively moderately between regions while the ratio for Law varies considerably.

As concerns variations within regions, we note relatively small differences between the different subject fields in Region 2, where the absolute size of the ratios also are lower than for the other regions. This is natural as this region refers to the United Kingdom where small class teaching is much more used than in the other regions. For Region 4 the variances are considerable, while the ratios for Region 5 tend to be on a higher level than for the other regions.

The variations are considerable for Region 4, while the ratios for Region 5 tend to be on a higher level than for the other regions. Inspection of Chart 1 suggests that this region has the highest ratio for Pure Sciences, Technology and Social Sciences and the second highest for Social Sciences and Law. The low number of observations on which some of the regional ratios were calculated (see Table 2.1) suggests, however, prudence in drawing conclusions.

Table 2.1 suggests then, to sum up, relatively common patterns in the way the student/staff ratio varies between subject fields in the five regions. An analysis of variances was carried out in order to test the two Null Hypotheses. the student/staff ratio does not vary significantly with

H_o^1 : Region

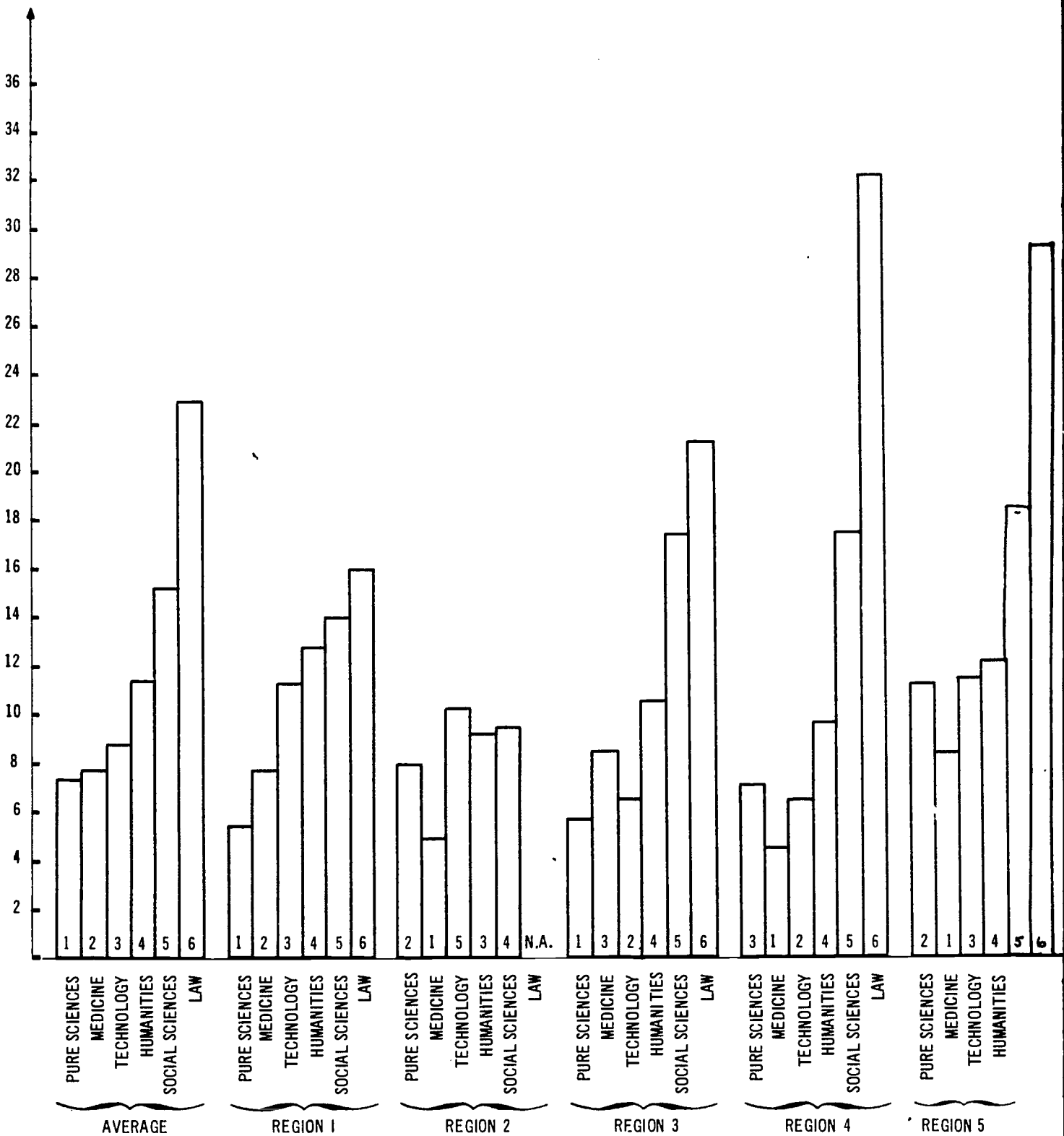
H_o^2 : Subject field

The observations given in Table 2.1 were grouped according to subject field and region. The method which leads to a F-test, is based on the assumption that the subject field and region effects on the student/staff ratio are essentially independent. The calculations showed that while H_o^1 could not be rejected, H_o^2 was rejected ($p = 0.01$). Thus the data suggests significant variation between subject fields in the student/staff ratio. The result is hardly surprising. A further illustration of the importance of the subject field classification is that of the total variance in the sample; 80% was explained by the subject field classification, 11% by the regional classification while 9% could not be explained by either of these two classifications.

When discussing why regional and subject field differences in the student/staff ratio occur, it is important to keep in mind that the present sizes of the ratios are the outcome of complex historical factors and policies that have

Chart 1

STUDENT/STAGF RATIOS, BY SUBJECT FIELD AND REGION



been gradually evolved through adjustments to changing situations and needs. International comparisons are further limited in significance by organisational differences such as course duration, whether or not attendance is compulsory, whether or not admission is restricted, whether or not practical training periods are required, the degree of autonomy of the institution and the presence of part-time students and teachers. Differences in any one of these factors might have led to the variations observed.

One major factor causing the subject field differences observed in Table 2.1 and Chart 1 is differences in the academic programme offered by the different subject fields. We shall not go into this here as this will be discussed in detail in Chapter 3. But to anticipate the conclusions of that chapter somewhat, the analysis shows that there is a distinct difference between Pure Sciences, Technology and Medical Sciences on the one hand, and the three other subject fields on the other as far as the total number of teaching hours provided per week is concerned and also concerning the split of this total on lectures and seminars. Table 3.1 shows, for example, that Technology on the average for all regions, gives 25.5 hours a week of scheduled teaching to a first degree student, while Humanities only provide 14.9 hours. Moreover, Technology gives 46% of its teaching in the form of seminars while the corresponding figure is 32% for Humanities. The rest is given as lectures which require less academic staff. This reflects real differences in teaching techniques as some subjects have to be taught in small classes and, in particular, in laboratories, while other subjects can be taught by lectures The differences in total teaching hours reflect also that some subjects can more easily be learned by self-study while the need for guidance is more important for other subjects.

Different admission procedures in different subject fields is another reason for different student/staff ratios.(1) Thus several countries in Regions 3, 4 and 5 have got restricted admission to Medicine and Technology, while admission to fields like Social Sciences, Humanities and Law is unrestricted. This gives a possibility of keeping the growth in the student population under control in the former fields, and thereby keeping the number of students per teacher at a level which is judged reasonable. The unrestricted fields have, on the other hand, experienced a dramatic growth in student enrolment during the last decade and the number of teachers have not always been able to follow. The development varies, however, a lot from country to country and from field to field. An OECD

(1) A description of admission requirements in the different OECD Member countries is given in Development of Higher Education 1950-1967, ED(70)3, OECD, Paris, November 1970.

study of the development in the student/staff ratios in Member countries during the period 1950-1967 concludes, for example,(1)

> "There is a very great disparity in trends between countries and between different fields of study within the same country; generally speaking, the trends are more favourable in medicine, whereas in humanities and social sciences there is often seen to be a decline in the teaching strength."

The unrestricted fields are furthermore often organised differently from the restricted ones as to whether or not course attendance is compulsory. In general, course attendance is to a great extent voluntary in the non-restricted fields. The observed student/staff ratio may therefore appear more unfavourable than it is in reality.

This leads us to regional differences which might be caused by the inclusion or not of part-time students and the use of different conversion factors when converting these into full-time equivalents. Part-time students are, however, not very common in European universities, in fact only United Kingdom (Region 2) and Yugoslavia (Region 5) reported this student category. But this is to some extent only a matter of differences in the way students are registered as no distinction is made in many countries between the two types of students. Students who for all practical purposes are only studying part-time are counted together with the ones pursuing their studies on a full-time basis. This system if possible because fees are negligible, the entrance to the universities non-restricted and class attendance not always compulsory. This last element makes it even difficult to determine the staff requirement for the full-time students. Thus, although two departments might have the same student/staff ratio and the same number of students enrolled, the burden on the academic staff might be quite different due to differences in the student attendence pattern.

We have already noticed that Region 2 (United Kingdom) in general has fewer students per teacher than other regions. The main reason for this is the amount of small class teaching given in this region. Another factor causing regional variations is that the part played by teaching and research assistants varies considerably according to country. While, for example, the six British universities participating in the survey on the average had around 10% of the total academic staff in this category, assistants constituted more than 50%

(1) See Appendix to Background Study No. 3 for the Conference on Policies for Educational Growth, STP(70)8, OECD, Paris, May 1970, p. 38.

of the academic staff in the five German universities surveyed. This difference is not reflected to the same extent in the figures provided at departmental level as not all assistants are allocated to individual departments. But it certainly influences the figures given in Chart 1 for Region 3, in particular for Pure Sciences and Technology as the importance of assistants varies from field to field. We shall see in the section on academic staff structure that assistants and other lower ranked academic staff have steadily increased as a part of the total academic staff during the last decade or so.

The definition used for academic staff includes all personnel of academic status, including research personnel. This was done, as a distinction between teaching staff and those exclusively conducting research is not possible in most European universities. The observed student/staff ratio will therefore vary with subject field and region according to the amount of research carried out. An uncertain factor in this connection is the treatment of personnel engaged in sponsored research, and personnel financed by external research funds. It is not always clear from the responses to the questionnaire whether or not such personnel is included. In the case of Region 2 (United Kingdom) it is clear that such personnel has been excluded. This explains to some extent the low number of assistants reported.

Departmental Level

Chart 2 ranks the 32 individual departments included in the analysis above according to the size of the student/staff ratio. The chart shows that Law has the highest student/staff ratio followed by departments within Social Sciences and Humanities. It is interesting to note that all departments belonging to these two last subject fields have got more students per academic staff member than any of the departments belonging to Technology, Pure Sciences and Medical Sciences.

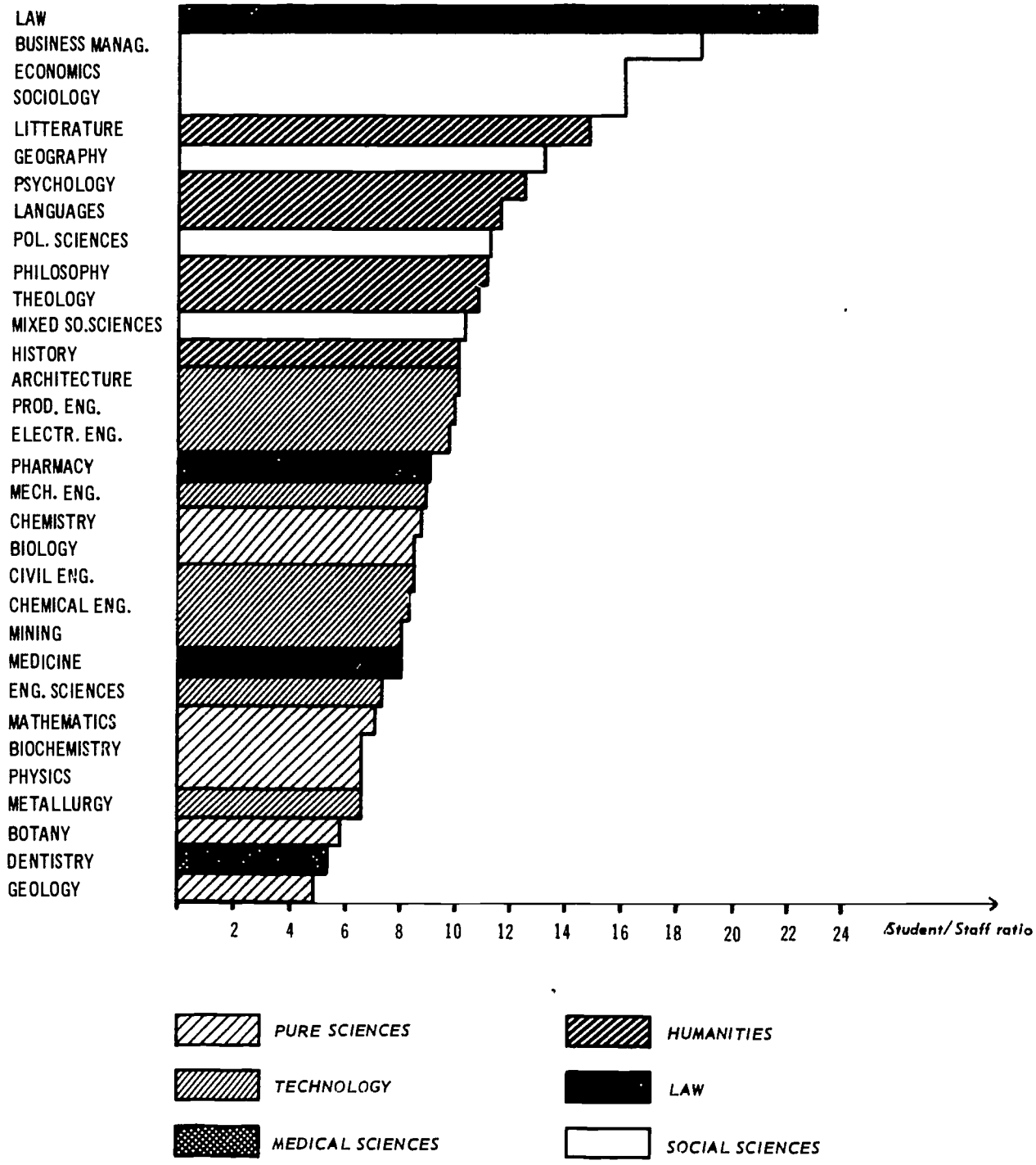
2.4 Academic Staff Structure

Studies of the distribution of time on activities carried out by the academic staff show that as the staff numbers rise in rank, they tend to engage in more and more varied activities which bear a decreasing relationship to the conventional instructional function. In other words, the number of hours taught per week by an academic staff member depends upon his rank. This means that the staffing pattern of a given department or subject field will influence the need for academic staff and thereby the student/staff ratio.

(1) Includes assistant lecturers, research fellows and research assistants in the case of the United Kingdom, and Wissenschaftliche Assistenten and Wissenschaftliche Mitarbeiter in the case of Germany.

Chart 2

STUDENT/STAFF RATIOS, BY DEPARTMENT. ALL REGIONS



The Information collected through the University Information Survey allows a study of the structure of the academic staff for selected universities for five countries. Table 2.2 gives the percentage distribution of academic staff by rank and subject field for 20 selected universities in Belgium, the Netherlands, Norway, Switzerland and Yugoslavia. The reason for selecting these five countries was that at least one observation was available for each of the six subject fields. The academic staff was split into three levels according to rank:

- Level I comprising academic staff of professional rank;
- Level II comprising the middle-level staff;
- Level III comprising junior-level staff.

A detailed definition for each country is given in Appendix 1.

As there is no uniformity in the system of higher education between countries and sometimes between universities within the same country, classifications of the type above are always difficult and comparisons based upon them will tend to give somewhat arbitrary results. The qualifications required to obtain a certain rank vary between countries and universities. Still, for universities within the same country, and even more so, for subject fields within the same university, it is possible to split the academic staff into the three groups mentioned above in a way that makes comparison of the staff structure of different subject fields meaningful.

The definition of subject fields used in Table 2.2 deviates somewhat from the one used elsewhere. The table is based on the information collected for individual faculties as the distribution of academic staff on rank was not available at departmental level. Thus, Pure Sciences refer in Table 2.2 to the Faculty of Science (Faculty of Natural Sciences), Humanities to the Faculty of Humanities (Faculty of Arts, Faculty of Philosophy), Social Sciences to the Faculty of Social Sciences and Medical Sciences to the Faculty of Medicine. Technology refers to Universities of Technology in the case of the Netherlands, Norway and Switzerland, to the Faculties of Applied Sciences in the case of Belgium and to Faculties of Engineering in the case of Yugoslavia. Theology has been added as a separate subject field as this is an independent faculty in many countries. The difference between the classification of departments into subject fields implied by the classification above as compared to the one used earlier, is possibly small in most cases. Exceptions

TABLE 2.2 DISTRIBUTION OF ACADEMIC STAFF, BY RANK, FOR SELECTED UNIVERSITIES.[1)]

PERCENTAGE FIGURES

Subject Field / University	Pure Sciences			Technology			Medical Science			Humanities			Law			Social Sciences			Theology		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
BELGIUM, average	24	25	51	21	26	53	29	35	36	41	22	37	44	20	36	36	21	43	45	32	13
University A	25	30	45	24	32	44	27	43	30	55	13	32	50	22	28	50	24	26	–	–	–
University B	22	20	58	18	20	62	31	27	42	30	18	52	38	18	44	22	18	60	45	32	13
University C	–	–	–	–	–	–	–	–	–	37	36	27	–	–	–	–	–	–	–	–	–
NETHERLANDS, average	11	24	65	15	31	54	8	31	61	20	34	46	30	19	51	15	20	66	31	29	40
University A	–	–	–	–	–	–	–	–	–	–	–	–	29	22	49	21	25	54	–		–
University B	–	–	–	–	–	–	–	–	–	–	–	–	29	11	60	25	3	72	–	–	–
University C	9	22	69	–	–	–	6	36	58	15	33	52	33	32	45	8	25	67	30	28	32
University D	11	34	55	–	–	–	–	–	–	24	38	38	35	19	46	9	32	59	27	42	32
University E	12	26	62	–	–	–	8	41	51	23	29	48	28	23	50	14	21	65	30	35	35
University F	12	20	68	–	–	–	8	27	65	16	40	44	28	15	57	11	23	66	29	29	42
University G	12	16	72	–	–	–	8	19	73	24	31	45	32	12	56	15	12	73	36	7	57
University H	–	–	–	15	27	58	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
University I	–	–	–	15	34	51	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
NORWAY, average	13	52	35	17	53	30	19	55	26	21	65	14	29	37	34	14	63	23	50	19	31
University A	12	45	43	–	–	–	18	53	29	19	61	20	29	37	34	14	63	23	50	19	31
University B	14	59	27	–	–	–	19	57	24	22	69	9	–	–	–	–	–	–	–	–	–
University C	–	–	–	17	53	30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SWITZERLAND, average	21	26	53	21	20	59	24	38	38	38	17	45	41	32	35	33	22	15	52	21	27
University A	–	–	–	21	20	59	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
University B	–	–	–	–	–	–	25	44	31	28	20	52	35	43	38	–	–	–	38	24	38
University C	21	26	53	–	–	–	22	33	45	48	14	38	47	20	33	33	22	15	66	17	17
YUGOSLAVIA, average	13	22	65	11	17	72	9	18	75	12	28	60	28	27	45	19	30	51	–	–	–
University A	17	33	50	–	–	–	10	26	64	9	41	50	38	31	31	28	39	33	–	–	–
University B	8	11	81	11	17	72	8	9	83	14	16	70	17	24	59	10	22	68	–	–	–

1) For definition of ranks I, II and III, see Appendix 1.

are Humanities which now exclude Theology and Medical Sciences which exclude Dentistry and (except for Belgium) Pharmacy.

Table 2.2 then indicates variations in the staff structure between countries as well as between universities and faculties within the same country. The former variations may be caused partly by the use of different definitions. The variations between subject fields within the same country are probably less influenced by such factors. Thus, it is interesting to note that these variations have a fairly common pattern for all the five countries. Table 2.3 gives a ranking of the six subject fields plus Theology according to the proportion of the total academic staff in the professional ranks for each of the five countries. The table is based on the average figures given in Table 2.2 for each country. A low figure means a high proportion of the academic staff in the professional ranks. Thus, the table shows that for Belgium, Theology has the highest proportion of professors, followed by Law, Humanities, Social Sciences, Medicine, Pure Sciences and Technology. Also, the four remaining countries have Theology and Law at the top of the list. Pure Sciences, Technology and Medicine tend to be at the bottom while Social Sciences and Humanities fall in the middle.

Table 2.3 Ranking of subject fields according to proportion of total academic staff in the professional rank, by country

Subject Field / Country	Pure Sciences	Technology	Medicine	Humanities	Law	Social Sciences	Theology
Belgium	5	6	4	2	1	3	0
Netherlands	5	3	6	2	1	3	0
Norway	6	4	3	2	1	5	0
Switzerland	5	5	4	2	1	3	0
Yugoslavia	3	5	6	4	1	2	..

Figures similar to the ones given in Table 2.2 are given in an OECD study referred to earlier for the whole higher educational system.(1) A ranking similar to the one given in

(1) See Quantitative Trends in Teaching Staff in Higher Education, STP(70)8, OECD, Paris 1970

Table 2.3 was carried out for seven countries where information was available for all the six subject fields as well as for all the three staff categories. This ranking is given in Table 2.4. The result is quite similar to the one given in Table 2.3. The two sets of data are however not strictly homogeneous as there are some differences in the definitions of the subject fields (the former OECD study includes Theology under Humanities and Dentistry under Medicine). They refer to different years (1965 and 1969) and have different coverage. Nevertheless, the data indicates that the staff ing structure is different in different subject fields and that there are some common patterns in these differences in the eleven countries examined here. But Table 2.2 also suggests considerable variations between universities within the same country and subject field, in particular for the two lower grades of the academic staff.

As regards variations betwen countries, it has already been pointed out that the criteria used to distinguish between the three categories of staff probably have caused some of the variations observed. But not all differences can be explained in this way. There are some obvious differences in the staff structure in different countries.

The OECD study from which the figures were taken concluded that there are real differences in the staff structure between countries.(1)

Table 2.4 Ranking of Subject Fields According to Proportion of Total Academic Staff in the professorial rank, by country

Subject Field / Country	Pure Sciences	Technology	Medicine	Humanities	Law	Social Sciences
Austria	5	3	6	4	1	2
Germany	4	5	6	2	1	3
Italy	4	5	6	2	1	3
Norway	6	4	2	3	1	5
Northern Ireland	6	5	2	3	1	4
Spain	5	6	2	3	1	4
Sweden	5	6	4	2	1	3

Source: "Quantitative trends in teaching staff in higher education," Appendix to Background Study No. 3 for the Conference on Policies for Educational Growth, OECD, Paris, May 1970.

(1) OECD, op. cit., p.31

2.5 Why Differences in the Staff Structure?

When discussing why differences in the structure of academic staff appear, it is important not to forget that the higher educational system is a dynamic system which changes over time. These changes influence the composition of the academic staff in a number of ways.

The following are probably among the major factors determining the academic staff structure in a subject field:

1. "Production" structure
2. Demand and supply of teachers
3. Wage Structure
4. Historical factors

The four factors are, of course, interrelated.

By differences in the "production" structure is meant differences in the teaching technique used and in the amount of research carried out. Thus, the relatively high proportion of professors in Theology and Law is partly due to the fact that relatively less research is done in these two fields requiring assistants and lower ranked research workers, compared to fields like Pure Sciences and Medical Sciences. Also, as pointed out later in this study, a high proportion of the teaching provided in Law and Theology is given through lectures and thus the need for teachers in the lower grades to minitor seminars, discussion periods and practical training is smaller. The Robbins Report found, for example, that professors give both relatively and absolutely more lectures per week than any of the lower grades which in turn were more engaged in teaching of smaller groups.(1)

Regarding the second factor, the supply of new teachers is mainly in the junior and middle ranks although there are some differences between fields. This combined with the considerable demand for new teachers due to the rapid expansion in student numbers in recent years has led to a much more than proportional increase in the number of junior staff in many countries, and consequently a relative decrease in the number of senior staff.(2) Important in this connection, however, is the fact that different subject fields (faculties), universities and countries have experienced different rates of growth in the student numbers. This is, for example, another fact that is of importance for Theology where student enrolment has increased more slowly than for other fields (in some cases even decreased).

(1)See Appendix Three, p. 70
(2)See OECD, op. cit., pp. 317-319.

Differences in the relative wages of the three staff categories may via the supply and demand mechanism lead to differences in the staffing pattern as the possibilities for substitution, at least between the two lower ranks (1) probably are quite high in the sense that they can perform the same tasks. A factor drawing in the opposite direction is that academic staff positions often are tenured, at least for professors, but in many countries also at lower levels. However, the very strong increase in the use of assistants referred to above is doubtless due partly to the fact that this is relatively cheap labour.

Finally, the academic structure at a particular point in time is the outcome of complex historical factors and policies that have been gradually evolved through adjustments to changing situations and needs.

2.6 Non-Academic Staff

Because of the dominant role the academic staff plays in the teaching and research programme as well as on the budget of universities, more attention has traditionally been paid to this staff category in university planning and modelling effort than to other types of university personnel. Indeed, one often has the impression that the number of technical and administrative staff hired is left more to chance than most ot the other factors involved in university operations. Still, these two staff categories are of crucial importance for the proper carrying out of the teaching and research programme of most departments, and indeed do not play an unimportant role on their budgets either. The figures given in Chapter 4 suggest, for example, that for departments within Pure Sciences, Technology and Medical Sciences these two staff categories may account for 25% or more of the total staff remuneration. To this figure must be added expenditures in connection with staff engaged in central services like central administration. Then there is the personnel engaged in the library, in cleaning and maintenance and in service facilities for the students. Thus, non-academic staff is an important staff category which for many universities may account for as much as 40% or more of the total annual staff remuneration.

Here we give a short discussion of regional and subject field variations in administrative staff followed by a similar discussion for the technical staff.

---

(1) A number of models, mainly of the Markovian chain type, have been developed and applied to the progression of academic staff through the academic structure as well as to the evolving of rank distribution. See, for example, Oliver (1969), Weathersby (1970), Branchflower, Jr., (1969).

2.7 Administrative Staff

Table 2.1 gives the number of students per academic staff member, by department, subject field and region. Chart 3 illustrates the subject field and regional variations. The chart suggests considerable variations between as well as within regions and subject fields. To the extent that it is possible to talk about a common pattern in the variations, Medical Sciences, Pure Sciences and Technology have in general more administrative staff support than the other three subject fields. This suggests that factors other than student enrolment should be drawn in when explaining the requirements for academic staff. We have earlier seen that Medical Sciences, Pure Sciences and Technology have relatively more academic staff than the three other subject fields, and we shall later see that the number of technicians follow the same pattern. The chart also suggests relatively more administrative staff in Region 1 (North America) than in the other regions, but this could also indicate a different organisational structure as other regions might provide more central administrative support.

Table 2.5 gives the number of administrative staff per academic staff member, by region and subject field.

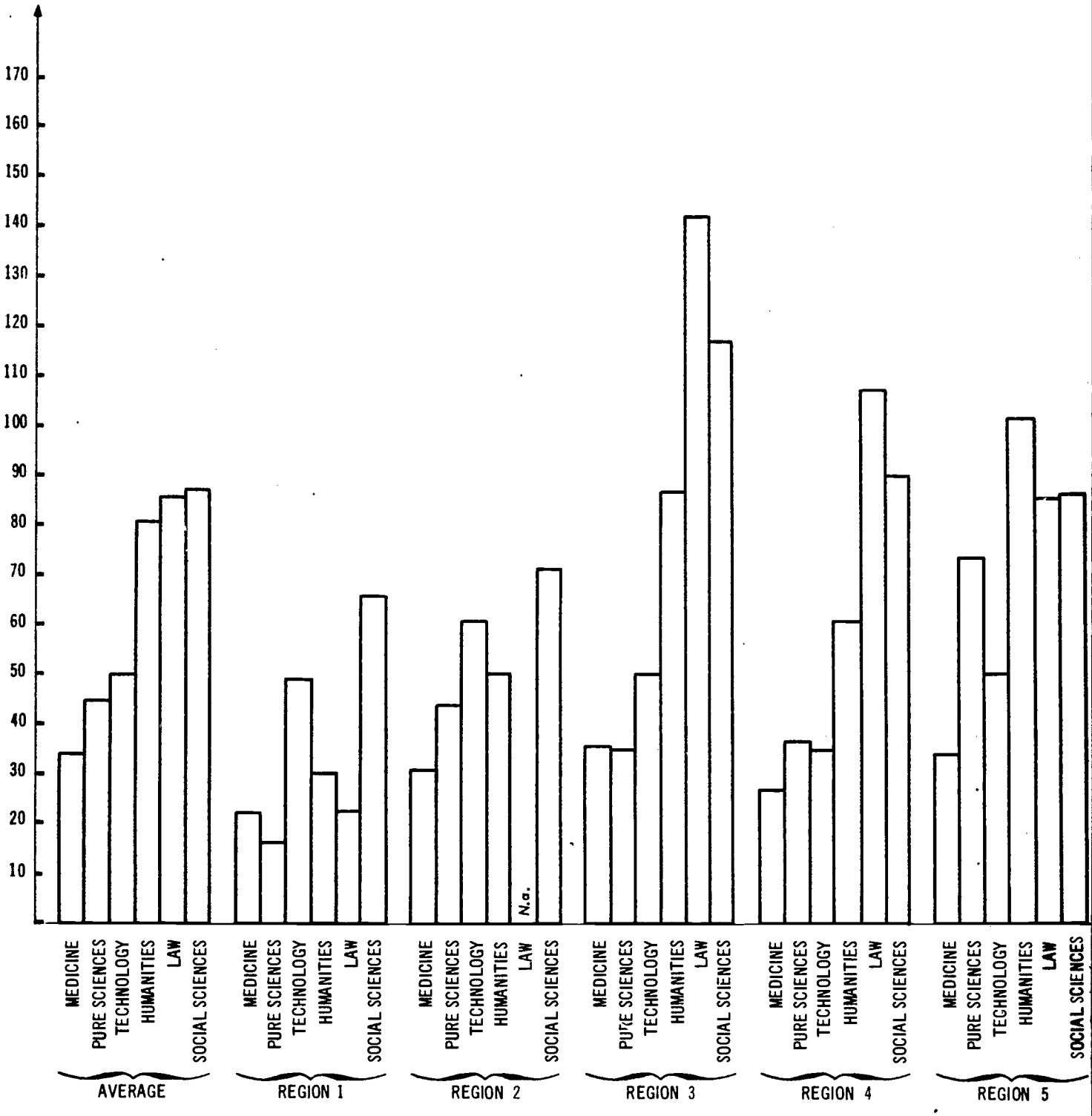
Table 2.5 Number of Administrative Staff per Academic Staff Member, by Region and Subject Field

Region / Subject Field	Region 1	Region 2	Region 3	Region 4	Region 5
Pure Sciences	0.32	0.18	0.16	0.19	0.15
Technology	0.24	0.17	0.13	0.18	0.22
Medical Sciences	0.32	0.15	0.23	0.17	0.24
Humanities	0.21	0.13	0.12	0.15	0.12
Law	0.53	-	0.16	0.29	0.34
Social Sciences	0.21	0.19	0.15	0.19	0.20
Overall average	0.31	0.16	0.16	0.20	0.21

The table suggests, on the average, more administrative staff for North America than for the other four regions, which have got a fairly equal amount of administrative staff. As far as subject field differences are concerned, there is no general pattern apart from that Humanities for all regions have got

Chart 3

STUDENTS/ADMINISTRATIVE STAFF MEMBER,
BY FIELD OF STUDY AND REGION



the lowest ratio, and maybe a bit surprising, Law tends to have a high ratio. The subject field variations are, however, relatively smaller here than was the case for the ratios between student enrolment and academic staff in Table 2.1. As we already know that there are considerable differences in the number of students per academic staff member, Table 2.5 might suggest that the number of administrative staff varies more according to the number of academic staff than to the number of students enrolled. Table 2.6 supports this proposition. It gives the correlation coefficients between students and academic staff, students and administrative staff as well as the multiple correlation coefficient between administrative staff on the one hand and students and academic staff on the other. The coefficients are calculated on the basis of data for individual departments - the number of departments is given for each subject field.

Table 2.6 Correlation between Administrative Staff and Students, Administrative Staff and Academic Staff and Multiple Correlation, by Subject Field

Subject Field	Correlation Adm.staff/ Students	Correlation Adm. Staff/ Acd. Staff	Multiple Correlation Adminstr/ Students/ Acd.Staff	No. Obs
Pure Sciences	0.57	0.87	0.92	(63)
Technology	0.21	0.89	0.90	(74)
Med.Sciences	0.44	0.58	0.59	(27)
Humanities	0.31	0.62	0.64	(55)
Social Sciences	0.39	0.62	0.64	(42)

The size of the correlation coefficient between the two staff categories is always higher than between administrative staff and students. The size of the multiple correlation coefficient compared to the correlation coefficient between administrative and academic staff shows that to add students

does not improve the multiple correlation much. This suggests strong correlation between students and academic staff. The size of the multiple correlation coefficient is quite high, particularly for Pure Sciences and Technology taking into consideration that they refer to micro data.

If technical staff were added as a variable, the multiple correlation between administrative staff on the one hand, and students, academic staff and technical staff on the other would rise to 0.78 for Medical Sciences and 0.73 for Social Sciences, while it would not lead to any increase for the three other subject fields.

2.8 Technical Staff

Table 2.1 gives the number of students per technical staff member, by department, subject field and region. Chart 4 illustrates the subject field and regional variations. The chart suggests considerable variations between as well as within regions. Again, there is a distinct difference between Pure Sciences, Technology and Medical Sciences on the one hand, and the three other subject fields on the other. This is natural as the need for technicians in a department depends largely on the role laboratory work plays in the teaching and research programme. It is therefore a little surprising that Law in Regions 1 and 3 has a fairly low ratio compared with Social Sciences and Humanities. The reason is probably that the figures here refer to faculties and schools of Law rather than to departments, and that the figures reported therefore include some other personnel who would not be included in the figures for Social Sciences and Humanities which are aggregates of departmental figures.

Regarding regional variations, Region 5 has on the average got more technicians per student than the other regions. This difference is due mainly to the fact that the figures almost exclusively refer to Yugoslavia where all supporting staff in the faculty (e.g., porters, cleaners, maintenance staff) has been included.

Table 2.7 Number of Technical Staff per Academic Staff Member, by Region and Subject Field

Region / Subject Field	Region 1	Region 2	Region 3	Region 4	Region 5
Pure Sciences	0.10	0.35	0.32	0.48	0.14
Technology	0.16	0.68	0.25	0.32	0.38
Med.Sciences	1.21	0.92	0.74	0.69	0.29
Humanities	0.02	0.04	0.03	0.04	.08
Law	0.17	-	0.26	0.00	.25
Pure Sciences	0.05	0.05	0.07	0.00	.26

Chart 4

STUDENTS/ TECHNICAL STAFF MEMBERS,
BY FIELD OF STUDY AND REGION

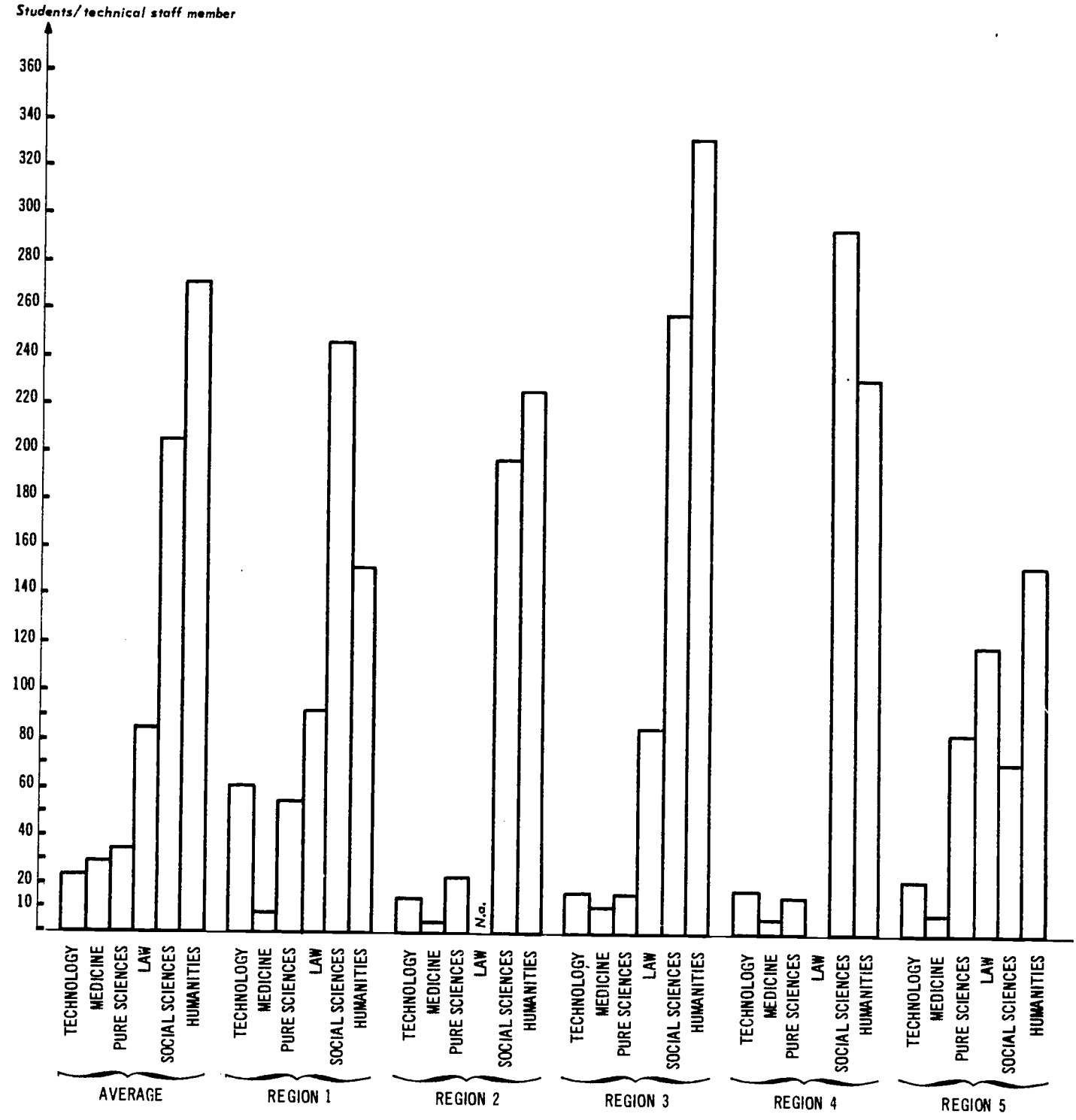


Table 2.7 gives the number of technicians per academic staff member, by region and subject field. The figures suggest large inter as well as intra regional variations. The variations within the regions are natural and are as said above caused by differences in the teaching and research programmes offered by the different fields. Thus, Humanities have got less technical staff than the other fields in four out of the five regions, closely followed by Social Sciences. Law has again a fairly high ratio which is caused partly by a relatively high student/staff ratio and organisational differences as explained above. Medical Sciences have the highest ratio in four out of five regions.

As regards regions, North America has, on the average, lower ratios than the other regions. But the most striking impression given by the table is considerable regional differences in the ratios for the same subject field, in particular for Pure Sciences, Technology and Medicine.

Although the data available did not permit a thorough check, it is believed that these variations are, at least to a great extent, caused by differences in what personnel has been included under technical staff rather than by a real regional difference in the use of this staff category.

CHAPTER III: ACADEMIC PROGRAMME

3.1 Introduction

The number of academic staff needed to teach a given number of students on a particular level is governed by two factors, the number of teaching hours received by the students and the number of students that a particular staff member can teach. The latter factor is again governed by two factors, the number of classes that a faculty member appears before (teaching load) and the number of students in attendance at that class (class size). The relationship between these factors might be expressed as:

$$(1) \quad T = f(S;t,h,g)$$

where:

T = number of full-time academic staff
S = number of full-time students enrolled
t = average weekly teaching load per academic staff member
h = average number of teaching hours received/week by the students
g = average group size

The form of the relationship might vary from case to case. One simple specification would be(1):

$$(2) \quad T = \frac{h}{t.g} \; S \; .$$

Although the relationship postulated above includes some of the most important factors determining the need for academic staff, it is rather crude, and there are possible improvements. Firstly, different ways of teaching have different staff requirement, depending on the group size used.

Thus, the total number of teaching hours provided per week (h) may be divided into hours given as seminars (s) and hours given as lectures (l):

$$(3) \quad h = s + l.$$

The group size g now refers to seminar group size, assuming all students enrolled in the department attend the lectures.

The next important distinction to be made is between students on different levels, as the parameters l, s and g may vary by

(1) A relationship of this type is proposed in the Robbins Report, see Appendix Three, Annex D.

level. Assuming only two levels, e.g. first degree students (under-graduates) and higher degree students (post-graduates) equation (2) may now be written(1):

$$(4)\quad T = \left[\frac{l_1}{t} + \frac{s_1}{t.g_1} S_1\right] + \left[\frac{l_2}{t} + \frac{s_2}{t.g_2} S_2\right] + \frac{k}{t}$$

The subscripts 1 and 2 refer to first and higher degree students, respectively, while k is a constant term. Equation (4) thus says that the total requirement for academic staff in a department is a linear function of the number of students enrolled for first and higher degree. The first parenthesis refers to the requirement for first degree students, the second to the requirement for students enrolled for higher degrees. The constant term k includes other items of the programme offered by this department requiring staff, for example short specialised courses for retraining of people other than the regular students, service teaching (scheduled teaching provided by staff in this department for students enrolled in other departments) or special departmental research projects.

In addition to the total student enrolment, the split of this total on first and higher degree students and the constant term k, we note from equation (4) that the parameters characterizing the programme offered (l_1, l_2, s_1, s_2, g_1, g_2) play a major role in determining the need for academic staff(2).

The purpose of this chapter is then to discuss in detail the departmental, subject field and regional variation in these parameters. Section 3.2 presents the data available. Section 3.3 analyses the total teaching hours given in different subject fields and regions for first and higher degree students, while Section 3.4 examines the split of the total hours between lectures and seminars. In Section 3.5 the attention is switched to the average group size for seminars and lectures whereas Section 3.6 discusses the average weekly teaching load per academic staff members. The chapter ends with a short section on possibilities for economies of scale with increasing student enrolment (Section 3.7).

---

(1) Similar relationships for determining the departmental staff requirement is proposed in Legg (1969). The definition of first and higher degree students will of course vary by subject field and country as the course duration may differ quite considerably.

(2) Division on both sides of equation (4) with (S_1+S_2) and rearranging gives the following expression for the student/staff ratio:

$$\frac{S_1 + S_2}{T} = \frac{t}{\left[\frac{l_1}{S_1+S_2} + \frac{s_1}{g_1}\frac{S_1}{S_1+S_2}\right] + \left[\frac{l_2}{S_1+S_2} + \frac{s_2}{g_2}\frac{S_2}{S_1+S_2}\right] + \frac{k}{S_1 + S_2}}$$

This expression illustrates that the student/staff ratio discussed in Chapter II is a complex parameter influenced by a number of factors.

3.2 Data

The following information was obtained through the survey:

(i) total weekly teaching hours scheduled for first and higher degree students, and the split of this total into lectures and seminars;

(ii) average and maximum group seminar size, by first and higher degree students;

(iii) average weekly teaching load per academic staff member.

The information tabulated, is presented in Table 3.1. The left-hand side of the table lists the departments grouped into the six major subject fields while the head of the table gives the information listed under points (i), (ii) and (iii) above. The figures quoted are unweighted arithmetric averages for individual departments and weighted averages for each subject field as explained in Chapter I. A number of summary tables mainly based on tables 3.1 and 3.2 (which gives a regional split of the information on total teaching hours) are presented in the text.

An example of the information in Table 3.1 is as follows: The second row in the table shows that a department of Biology provided, on the average, 19.8 hours a week for a first degree student of which 9.3 hours were given as lectures and 10.5 hours as seminars. A higher degree student received 14.1 hours of scheduled teaching of which 5.8 hours were given in the form of lectures and 8.3 hours in the form of seminars. The average seminar group size was 16 for a first degree student and 6 for a higher degree student, whilst the corresponding maximum sizes were 30 and 11. Finally, an academic staff member taught on the average 8.7 hours a week. The last figure was not requested specifically in the questionnaire. It was calculated by dividing the total number of hours taught by the academic staff in a department by the total number of staff.

3.3. Teaching Hours Scheduled

First Degree Students

Chart 5, based on Table 3.1,,illustrates the variations in the number of hours received by a first degree student. The length of each bar shows the total number of hours given while the hatched part shows the proportion of the total given as lectures, the remainder being seminars. The first bar for each subject field gives the average for the whole field while the following ones refer to individual departments. The chart indicates that Technology and Medicine rank highest in total teaching hours while Social Sciences and Humanities are lowest.

TABLE 3.1 STUDENT HOURS SCHEDULED, SEMINAR GROUP SIZE, AND TEACHING LOAD, BY DEPARTMENT AND SUBJECT FIELD

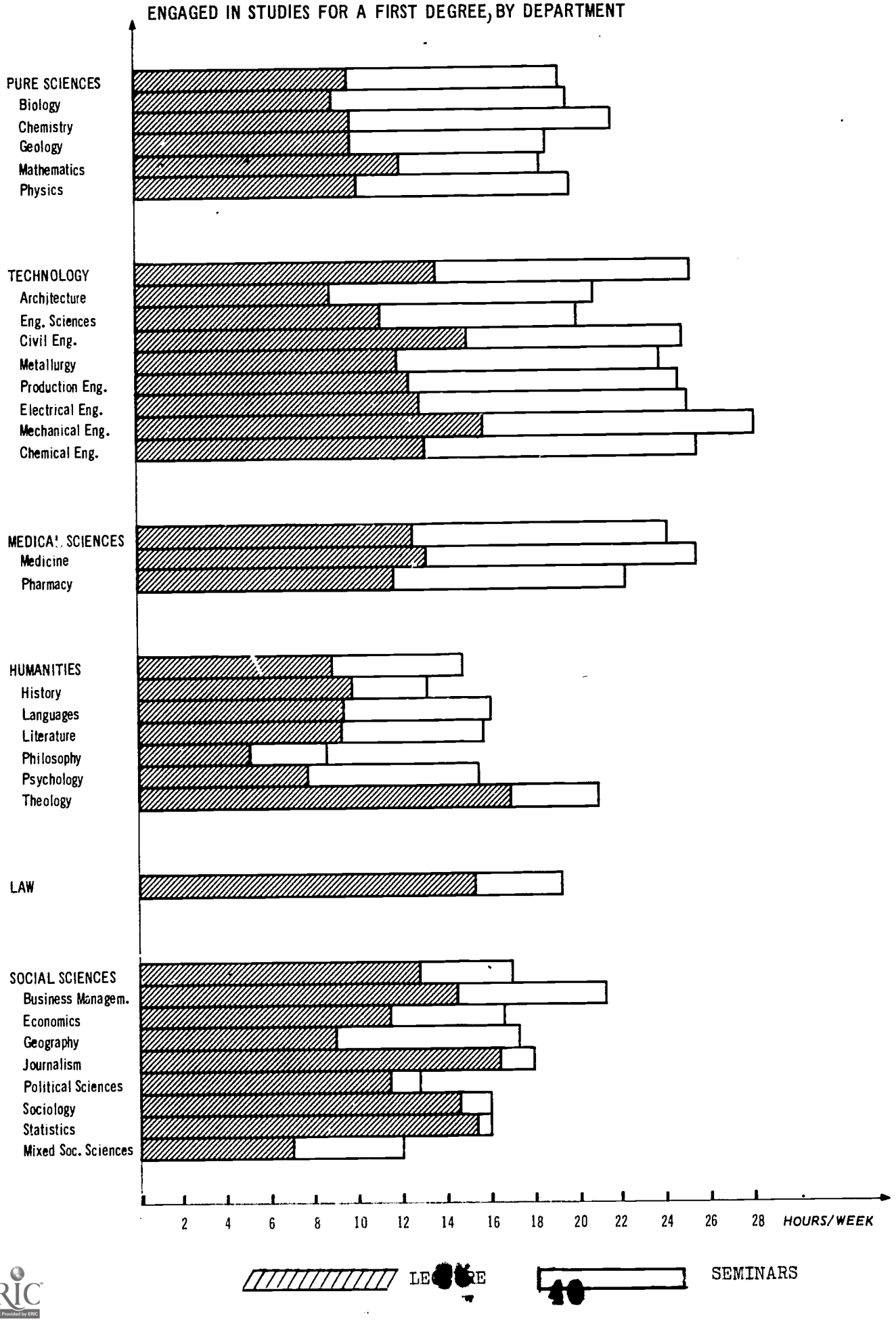
DEPARTMENT/ SUBJECT FIELD	STUDENT HOURS SCHEDULED								SEMINAR GROUP SIZE						Average Teaching Load	NO OBS
	FIRST DEGREE				HIGHER DEGREE				FIRST DEGREE			HIGHER DEGREE				
	TOTAL	LEC	SEM	NO OBS	TOTAL	LEC	SEM	NO OBS	AV	MAX	NO OBS	AV	MAX	NO OBS		
PURE SCIENCES	19.5	9.9	9.6	(47)	14.9	6.2	9.0	(32)	16	30	(40)	7	13	(33)	8.1	(61)
Department of:																
Biology	19.8	9.3	10.5	(12)	14.1	5.8	8.3	(8)	16	30	(10)	6	11	(8)	8.7	(15)
Chemistry	21.9	10.0	11.9	(10)	16.0	4.7	11.3	(7)	20	38	(9)	8	14	(7)	7.1	(13)
Geology	18.8	10.0	8.8	(4)	14.8	4.0	10.8	(4)	20	32	(5)	7	11	(5)	8.0	(7)
Mathematics	18.6	12.2	6.4	(11)	14.8	10.5	4.3	(6)	16	27	(7)	10	16	(6)	8.3	(13)
Physics	20.0	10.3	9.7	(10)	14.9	5.6	9.3	(7)	16	25	(9)	6	12	(7)	8.2	(13)
TECHNOLOGY	25.5	13.8	11.7	(33)	20.9	11.1	9.8	(21)	17	34	(17)	7	12	(13)	8.9	(48)
Department of:																
Architecture	21.0	9.0	12.0	(2)	23.0	5.0	18.0	(2)	13	23	(2)	5	10	(1)	10.8	(5)
Engineering Sc.	20.3	11.2	9.0	(4)	14.0	5.5	8.5	(2)	15	28	(2)	-	-	(0)	7.7	(5)
Civil Eng.	25.0	15.2	9.8	(4)	25.0	15.0	10.0	(4)	17	51	(2)	7	11	(3)	9.4	(7)
Metallurgy	24.0	12.0	12.0	(1)	18.0	6.0	12.0	(1)	13	25	(1)	-	-	(0)	9.3	(4)
Production Eng.	24.8	12.5	12.3	(4)	15.0	10.0	5.0	(2)	19	33	(3)	7	15	(1)	8.1	(4)
Electrical Eng.	25.2	13.0	12.2	(5)	22.2	12.2	10.0	(5)	16	28	(4)	8	13	(5)	9.7	(8)
Mechanical Eng.	28.3	15.8	12.5	(6)	22.6	11.3	11.3	(3)	9	46	(3)	6	9	(3)	8.9	(8)
Chemical Eng.	25.5	13.2	12.3	(7)	13.0	5.0	8.0	(2)	-	-	(0)	-	-	(0)	7.9	(7)
MEDICAL SCIENCES	24.2	12.6	11.6	(7)	19.5	11.5	8.0	(2)	16	28	(5)	5	12	(2)	6.2	(4)
Department of:																
Medicine	25.5	13.2	12.3	(4)	25.0	15.0	10.0	(1)	14	30	(3)	-	-	(0)	5.8	(1)
Pharmacy	22.3	11.7	10.6	(3)	14.0	8.0	6.0	(1)	20	25	(2)	5	12	(2)	6.4	(3)
HUMANITIES	14.9	9.0	5.9	(35)	11.4	7.7	3.7	(23)	14	23	(16)	6	10	(13)	8.4	(45)
Department of:																
History	13.5	9.8	3.7	(6)	12.7	8.4	4.3	(3)	18	28	(4)	8	11	(2)	10.0	(8)
Languages	16.1	9.4	6.7	(9)	14.5	10.3	4.2	(4)	13	20	(5)	6	9	(3)	9.6	(12)
Literature	15.7	9.3	6.4	(4)	11.0	9.3	1.7	(4)	-	-	(0)	-	-	(0)	5.7	(5)
Philosophy	8.7	5.2	3.5	(6)	10.0	6.6	3.4	(5)	7	10	(2)	6	9	(3)	9.2	(8)
Psychology	15.6	7.8	7.8	(5)	11.8	7.4	4.4	(5)	14	23	(2)	5	12	(3)	7.7	(7)
Theology	21.0	17.0	4.0	(5)	5.5	2.0	3.5	(2)	15	28	(3)	8	12	(2)	5.2	(5)
LAW	19.3	15.3	4.0	(7)	16.3	11.6	4.7	(3)	15	38	(4)	-	-	(0)	5.9	(9)
SOCIAL SCIENCES	17.0	12.8	4.2	(31)	12.7	9.3	3.4	(23)	17	29	(18)	10	15	(15)	9.2	(4)
Department of:																
Business Management	21.3	14.5	6.8	(6)	14.6	10.3	4.3	(3)	23	49	(3)	12	33	(2)	7.6	(9)
Economics	16.6	11.4	5.2	(5)	18.0	10.0	8.0	(2)	30	40	(3)	11	14	(2)	7.4	(7)
Geography	17.3	9.0	8.3	(4)	18.0	13.0	5.0	(2)	10	20	(1)	-	-	(0)	9.9	(4)
Journalism	18.0	16.5	1.5	(2)	16.5	15.0	1.5	(2)	-	-	(0)	-	-	(0)	13.5	(2)
Political Sciences	12.7	11.3	1.4	(3)	11.0	9.7	1.3	(3)	19	25	(2)	15	7	(2)	9.8	(6)
Sociology	16.0	14.5	1.5	(6)	11.2	6.8	4.4	(6)	10	17	(5)	12	15	(4)	9.8	(8)
Statistics	16.0	15.5	0.5	(2)	10.5	9.5	1.0	(2)	15	25	(1)	9	15	(2)	12.1	(2)
Mixed Social Sciences	12.0	7.0	5.0	(3)	6.0	4.0	2.0	(3)	11	26	(3)	3	4	(3)	10.1	(3)

TABLE 3.2 WEEKLY STUDENT HOURS SCHEDULED, by DEPARTMENT and REGION

Region / Hours Scheduled / Level / Department Subject Field	REGION 1								REGION 2								REGION 3								REGION 5							
	Student Hours Scheduled								Student Hours Scheduled								Student Hours Scheduled								Student Hours Scheduled							
	First Degree				Higher Degree				First Degree				Higher Degree				First Degree				Higher Degree				First Degree				Higher Degree			
	Total	Lec	Sem	No Obs	Total	Lec	Sem	No Obs	Total	Lec	Sem	No Obs	Total	Lec	Sem	No Obs	Total	Lec	Sem	No Obs	Total	Lec	Sem	No Obs	Total	Lec	Sem	No Obs	Total	Lec	Sem	No Obs
NATURAL SCIENCES	17.0	7.0	10.0	(10)	14.4	5.2	9.2	(10)	19.0	10.7	8.3	(18)	13.2	6.0	7.2	(11)	25.7	12.5	13.2	(9)	25.0	8.0	17.0	(6)	15.8	14.9	4.9	(5)	6.4	5.3	3.1	(6)
Department of																																
Biology	14.0	5.0	9.0	(3)	17.0	4.5	12.5	(2)	11.8	3.7	10.1	(5)	6.0	2.7	3.3	(3)	27.0	12.0	15.0	(2)	29.0	9.0	20.0	(1)	20.5	14.0	6.5	(2)	18.0	10.5	7.5	(2)
Chemistry	17.0	6.0	11.0	(4)	15.0	3.0	12.0	(2)	23.0	9.0	14.0	(4)	12.0	6.0	10.0	(3)	27.0	10.5	16.5	(3)	27.0	5.0	22.0	(1)	18.0	15.5	2.5	(2)	7.0	4.0	3.0	(1)
Geology	14.0	6.0	8.0	(2)	14.0	4.0	10.0	(2)	-	-	-	(0)	-	-	-	(0)	25.0	13.0	12.0	(1)	26.0	6.0	20.0	(1)	17.0	14.0	3.0	(1)	6.0	4.0	2.0	(1)
Mathematics	20.0	10.0	10.0	(2)	17.0	13.5	3.5	(2)	15.8	10.8	5.0	(4)	14.0	10.5	4.0	(2)	24.0	14.0	10.0	(3)	20.0	11.0	9.0	(3)	19.5	14.0	5.5	(2)	6.0	4.0	2.0	(1)
Physics	17.0	7.0	10.0	(2)	14.5	5.0	9.5	(2)	23.0	10.4	12.6	(5)	14.3	6.5	13.0	(3)	25.0	13.0	12.0	(1)	24.0	10.0	14.0	(1)	12.0	7.0	5.0	(2)	6.0	4.0	2.0	(1)
SOCIOLOGY	20.0	13.0	10.7	(4)	14.0	7.8	6.2	(4)	21.6	11.2	9.8	(10)	19.1	9.0	10.1	(6)	34.0	17.0	17.0	(5)	26.0	11.0	15.0	(1)	27.5	15.7	12.0	(4)	27.0	15.7	11.3	(3)
Department of																																
Eng. Sciences	-	-	-	(0)	-	-	-	(0)	18.0	10.5	7.5	(2)	-	-	-	(0)	27.0	12.0	15.0	(1)	26.0	11.0	15.0	(1)	17.5	12.5	5.0	(1)	-	-	-	(0)
Civil Eng.	20.0	13.0	7.0	(1)	14.0	9.0	5.0	(1)	21.5	13.5	8.0	(2)	34.0	17.0	17.0	(1)	35.0	21.0	14.0	(1)	-	-	-	(0)	-	-	-	(0)	31.0	17.0	14.0	(1)
Metallurgy	-	-	-	(0)	-	-	-	(0)	24.0	12.0	12.0	(1)	13.0	6.0	13.0	(1)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)
Production Eng.	-	-	-	(0)	-	-	-	(0)	22.0	11.0	11.0	(3)	18.0	8.0	10.0	(1)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)
Elec. Eng.	24.0	14.0	10.0	(1)	15.0	9.0	6.0	(1)	22.3	11.0	11.3	(3)	14.5	8.5	6.0	(1)	35.0	18.0	17.0	(1)	-	-	-	(0)	33.0	17.0	1.0	(1)	12.0	12.0	0.0	(1)
Mech. Eng.	24.0	10.0	14.0	(1)	11.0	7.0	4.0	(1)	23.0	12.5	10.5	(2)	28.0	13.0	15.0	(1)	36.0	20.0	16.0	(1)	-	-	-	(0)	-	-	-	(0)	35.0	15.0	20.0	(1)
Chem. Eng.	20.0	14.0	14.0	(1)	14.0	8.0	6.0	(1)	20.3	12.0	8.3	(3)	11.0	4.0	7.0	(1)	35.0	12.0	23.0	(1)	-	-	-	(0)	34.0	10.0	14.0	(2)	-	-	-	(0)
BIOLOGICAL SC.	14.0	12.0	2.0	(1)	14.0	8.0	6.0	(1)	24.5	11.5	13.0	(2)	24.5	11.5	13.0	(2)	25.0	15.0	10.0	(1)	-	-	-	(0)	31.0	16.0	15.0	(3)	-	-	-	(0)
Department of																																
Medicine	-	-	-	(0)	-	-	-	(0)	24.5	11.5	13.0	(2)	-	-	-	(0)	25.0	15.0	10.0	(1)	-	-	-	(0)	31.0	16.0	15.0	(3)	-	-	-	(0)
Pharmacy	14.0	12.0	2.0	(1)	14.0	8.0	6.0	(1)	-	-	-	(0)	24.5	11.5	13.0	(2)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)
HUMANITIES	13.4	11.6	1.8	(10)	14.8	11.8	3.2	(5)	9.3	5.6	3.7	(5)	7.3	3.0	4.3	(3)	14.8	8.3	6.6	(11)	9.1	5.3	3.8	(7)	21.5	15.7	5.8	(6)	9.0	6.0	3.0	(2)
Department of																																
History	13.0	4.0	9.0	(3)	15.0	11.0	4.0	(2)	6.0	4.0	2.0	(1)	8.0	4.0	4.0	(1)	13.0	-	-	(2)	-	-	-	(0)	21.0	14.0	7.0	(1)	-	-	-	(0)
Languages	13.0	12.0	1.0	(3)	15.0	11.5	4.0	(3)	10.0	8.0	7.5	(2)	-	-	-	(0)	15.0	7.3	8.3	(3)	16.0	12.0	4.0	(1)	15.5	11.0	7.5	(2)	9.0	6.0	3.0	(2)
Literature	14.0	10.0	4.0	(1)	15.0	11.0	4.0	(1)	-	-	-	(0)	-	-	-	(0)	14.0	14.0	0.0	(1)	5.0	2.5	2.5	(2)	15.0	13.0	5.0	(1)	-	-	-	(0)
Philosophy	14.0	8.0	6.0	(3)	13.0	10.0	3.0	(2)	9.0	5.0	4.0	(2)	7.0	3.0	4.0	(1)	9.0	1.5	7.5	(2)	5.5	2.0	3.5	(2)	-	-	-	(0)	-	-	-	(0)
Psychology	13.0	10.0	3.0	(2)	15.0	11.0	4.0	(2)	-	-	-	(0)	-	-	-	(0)	15.0	15.0	0.0	(1)	5.0	0.0	5.0	(1)	-	-	-	(0)	6.0	6.0	3.0	(1)
Theology	-	-	-	(0)	-	-	-	(0)	10.0	7.0	3.0	(1)	10.0	7.0	3.0	(1)	22.0	17.5	4.5	(2)	4.0	2.0	2.0	(1)	25.0	21.5	4.0	(2)	-	-	-	(0)
Art	12.0	12.0	0.0	(1)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)	16.5	14.3	4.2	(4)	16.3	11.7	4.6	(3)	23.5	19.5	4.0	(2)	-	-	-	(0)
SOCIAL SC.	15.0	12.0	3.0	(10)	14.1	12.0	2.1	(7)	12.0	7.5	4.0	(5)	8.0	4.0	2.0	(3)	19.7	13.3	6.4	(10)	16.0	10.0	6.0	(7)	20.0	14.8	5.2	(4)	7.0	5.0	2.5	(2)
Department of																																
Bus. Adm.	15.0	12.0	3.0	(1)	-	-	-		11.0	8.0	3.0	(1)	-	-	-	(0)	24.0	14.0	10.0	(1)	23.0	15.0	7.0	(1)	-	-	-	(0)	-	-	-	(0)
Economics	19.7	11.3	8.4	(3)	15.0	11.0	4.0	(1)	9.0	6.0	3.0	(1)	-	-	-	(0)	21.0	14.3	6.7	(3)	21.0	14.0	7.0	(1)	21.0	17.0	12.0	(1)	-	-	-	(0)
Geography	15.0	15.0	0.0	(1)	15.0	15.0	0.0	(1)	-	-	-	(0)	-	-	-	(0)	20.0	6.5	13.5	(2)	21.0	11.0	10.0	(1)	14.0	8.0	6.0	(1)	-	-	-	(0)
Journalism	12.0	12.0	0.0	(1)	12.0	12.0	0.0	(1)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)
Pol.Sciences	15.0	15.0	0.0	(1)	15.0	15.0	0.0	(1)	-	-	-	(0)	-	-	-	(0)	19.0	17.0	2.0	(1)	15.0	14.0	1.0	(1)	-	-	-	(0)	-	-	-	(0)
Sociology	12.0	11.0	1.0	(2)	13.5	10.5	3.0	(2)	-	-	-	(0)	-	-	-	(0)	17.0	15.3	1.7	(3)	10.7	5.0	5.7	(3)	17.0	15.0	2.0	(1)	6.0	4.0	2.0	(1)
Statistics	15.0	15.0	0.0	(1)	15.0	15.0	0.0	(1)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)	-	-	-	(0)	20.0	15.0	5.0	(1)	6.0	3.0	3.0	(1)
Mixed Subjs.	-	-	-	(0)	-	-	-	(0)	12.0	7.0	5.0	(3)	6.0	4.0	2.0	(3)	-	-	-	(0)	-	-	-	(0)	17.0	15.0	1.0	(1)	6.0	4.0	2.0	(1)
																									-	-	-	(0)	-	-	-	(0)

Chart 5

NUMBER OF TEACHING HOURS SCHEDULED PER WEEK FOR STUDENTS ENGAGED IN STUDIES FOR A FIRST DEGREE, BY DEPARTMENT



The data is too sparse to allow exact divisions between all regions for individual departments. Chart 6 gives, however, an indication of the inter-and intra-regional variations for each of the six subject fields for Regions 1, 2, 3 and 5. The first set of bars labelled "average" give the total number of teaching hours by subject field, irrespective of region, while regional classification is given below. On the right-hand side of the chart the subject fields are listed in the same order as for the average for all regions. The figure in front indicates the ranking of the subject field within the regions in question. No observations were available for Law in Region 2.

The chart suggests that on average Technology provided most teaching closely followed by Medicine. Then follows Pure Sciences, Law, Social Sciences and Humanities. Although there are considerable regional variations in the absolute number of hours given within each subject field, the ranking is fairly stable. The chart also suggests that Regions 3 and 5 on average provide more teaching than the other regions.

An analyses of variances was carried out in order to test the following two Null Nypotheses: The total number of teaching hours provided for first degree students does not vary according to:

H^1_o : Region

H^2_o : Subject Field

The method used is the same as in Chapter II. The assumptions of such a model are that the subject field and region effects are essentially independent. Both hypotheses were rejected ($p = 0.01$). Of the total variance in the sample 54% was explained by the subject field grouping and 28% by the regional grouping while 18% could not be explained by either.

Higher Degree Students

Table 3.3 gives the total number of teaching hours given per week for higher degree students, expressed as a percentage of the total number of hours given for first degree students. The table indicates that higher degree students receive less scheduled teaching than first degree students. This goes for all the six subject fields and for all individual departments with the exception of the departments of Architecture, Geography and Economics (see Table 3.1). Only two observations were available, however, for higher degree students for these three departments. The averages for all regions given in the first column of Table 3.3 also indicate a relatively small variation between subject fields, the total number of hours scheduled for a higher degree student ranging from 75 to 82 per cent of the total number of hours scheduled for a first degree student. The regional variations are, however, considerable. This together with the small number of observations available suggests caution in drawing conclusions based on these figures. Regional variation might partly be caused by the use of different definitions in the different regions for first and higher degree students. Also, the importance of non-scheduled teaching, in particular research supervision, no doubt varies between regions.

Chart 6

NUMBER OF TEACHING HOURS SCHEDULED PER WEEK FOR STUDENTS ENGAGED IN STUDIES FOR A FIRST DEGREE, BY SUBJECT FIELD AND REGION

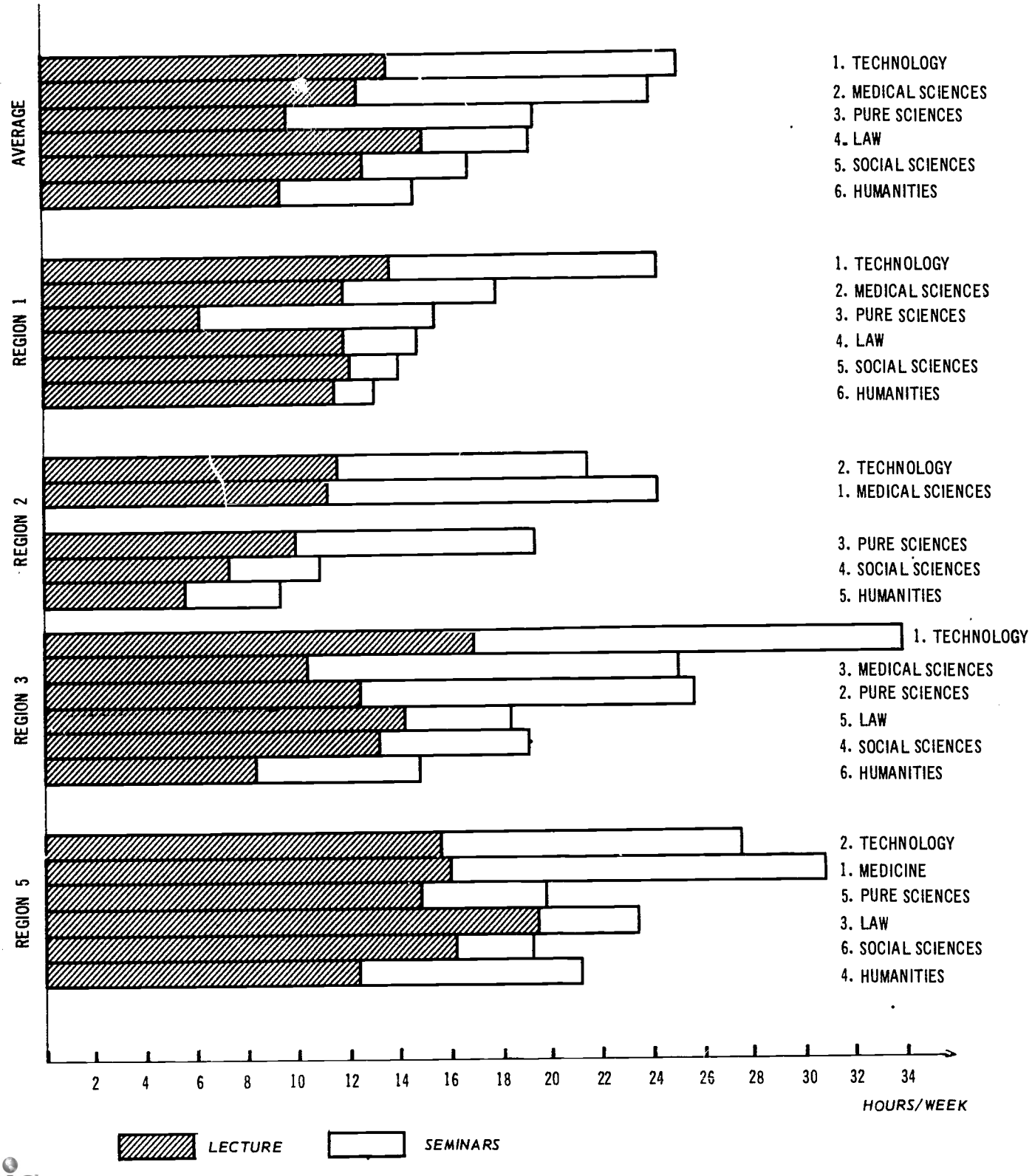


Table 3.3 Total number of hours scheduled for higher degree students, as percentage of total number of hours scheduled for first degree students, by region and subject field.

Region / Subject Field	Average all regions	Region 1	Region 2	Region 3	Region 5
Pure Sciences	76	93	67	100	42
Technology	82	88	77	76	97
Medical Sciences	78	78	-	-	-
Humanities	77	113	78	61	42
Law	77	-	-	77	-
Social Sciences	75	102	55	78	35

Departmental Level

Chart 7 ranks the 30 individual departments included in the analyses above according to total number of teaching hours scheduled per week for first degree and higher degree students. The length of each bar gives the total number of hours scheduled for a particular department while different types of hatchings indicate which subject field the department belongs to. The chart suggests considerable variations within each subject field, in particular for higher degree students. There is a clearer distinction between Technology, Medical Sciences and Pure Sciences on the one hand and Social Sciences and Humanities on the other for first degree students than for higher degree students. The chart also shows fewer hours scheduled for higher degree students than for first degree students.

3.4 Lectures versus Seminars

The importance of distinguishing between that part of the total teaching hours given as lectures and that given as seminars was emphasised in the introduction of this chapter as the staff requirement for these two forms of teaching is quite different.

First Degree Students

Chart 5 suggested considerable variations between subject fields in the proportion of the total teaching hours given in the form of lectures. The main difference was between Pure Sciences, Technology and Medical Sciences on the one hand and Humanities, Law and Social Sciences on the other.

Chart 7

TOTAL NUMBER OF WEEKLY TEACHING HOURS SCHEDULED,
BY DEPARTMENT AND LEVEL OF STUDY. ALL REGIONS

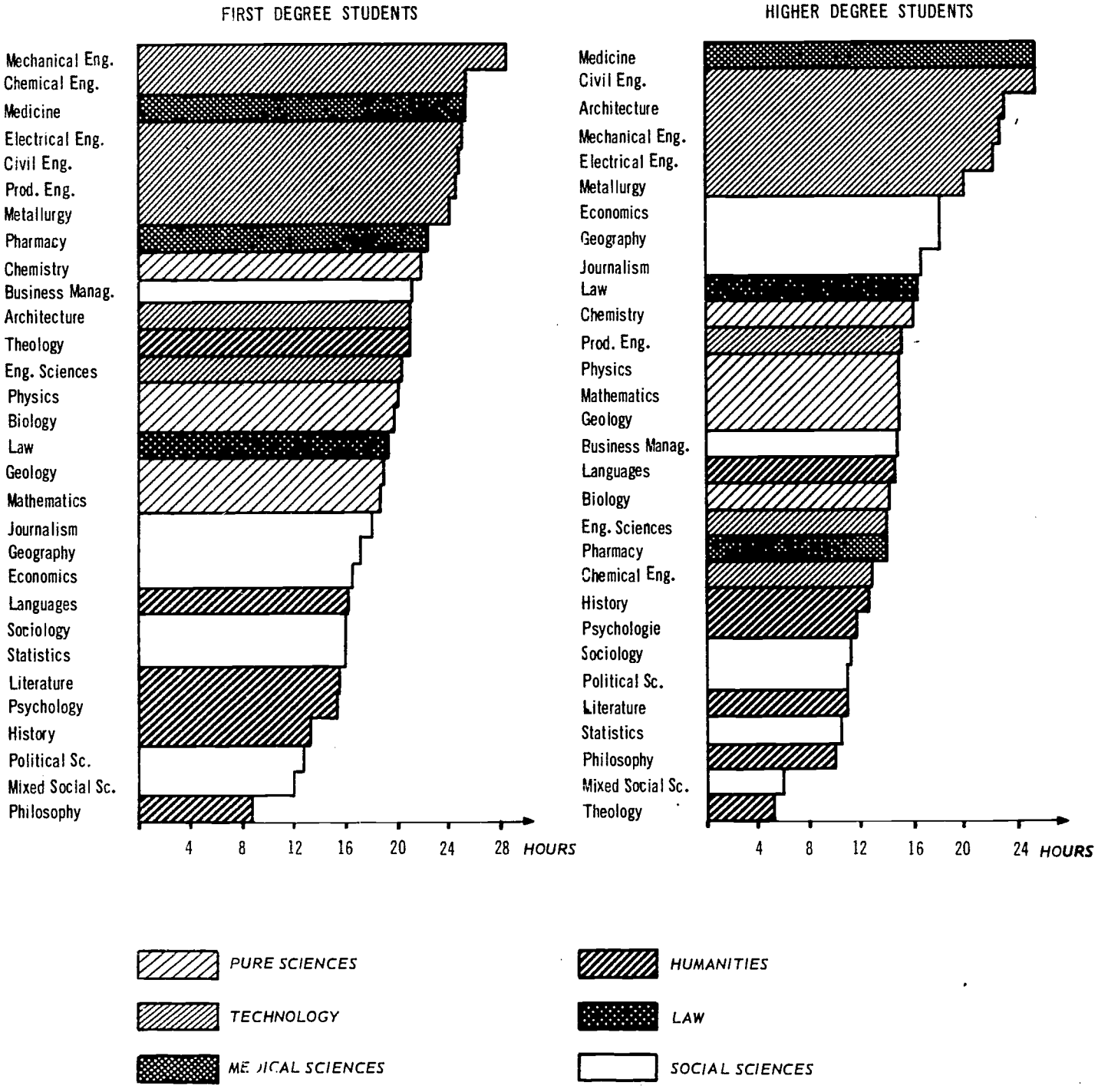


Chart 6 suggested that the same broad pattern applies for the four individual regions where information was available. Table 3.4 gives the percentage of total hours scheduled as lectures. The first column gives average figures for all regions while the following columns give figures for Regions 1, 2, 3 and 5. On the average about 55% of the scheduled teaching was given as lecture for Pure Sciences, Technology and Medical Sciences

Table 3.4 Lecture hours as a percentage of a total teaching hours: first degree students

Region / Subject Field	Average(1) all regions	Region 1	Region 2	Region 3	Region 5
Pure Sciences	51	41	51	49	75
Technology	54	56	54	50	56
Medical Sciences	54	67	47	60	52
Humanities	68	88	60	56	73
Law	79	80	-	77	83
Social Sciences	75	85	68	69	74

while the corresponding figure was about 75% for the remaining three fields. Although there are regional variations within each subject field, the ranking of the different subject fields is quite similar for the four regions, the most apparent exception being that of Pure Sciences in Region 5. Regions 2 and 3 tend to have less lectures than the two other regions.

As before, two Null Hypotheses were tested: The part of the total teaching scheduled as lectures for first degree students does not depend on:

H^1_o: Region

H^2_o: Subject Field

H^o_1 could not be rejected while H^o_2 was rejected ($p = 0.01$). Of the total variance in the sample 54% was explained by the subject field classification, 22% by the regional classification, while 24% could not be explained by either. This result supports the proposition that there is a significant difference in the way the different subject fields provide their teaching as far as lectures and seminars are concerned.

(1) Note that these averages are wighted averages calculated on the bases of the figures given in Table 3.1.

Higher Degree Students

Table 3.5 gives figures for higher degree students similar to the ones discussed above for first degree students. Information was however more sparse on the higher level. The figures given in the first column of the table for each subject field are very similar to, but slightly lower than, the ones given for first degree students. However no significant differences appear, apart from Pure Sciences. The ranking of the subject fields is almost the same on both levels.

Classification by individual regions yields the same pattern in the ranking of the different subject fields but the absolute level of the figures varies widely. We notice that there are only small differences for Region 5 (which here almost exclusively refers to Yugoslavia) between the two levels. This small difference is probably because the distinction between first and higher degree students is not clear. In many cases the students listed as higher degree in this region would probably have been listed as first degree students in Regions 1 and 2 (according to the length of study).

Table 3.5 Lectures as a percentage of total teaching hours: higher degree students

Region / Subject Field	Average(1) all regions	Region 1	Region 2	Region 3	Region 5
Pure Sciences	42	36	45	38	63
Technology	53	47	46	42	58
Medical Sciences	57	57	-	-	-
Humanities	68	78	41	58	67
Law	72	-	-	72	-
Social Sciences	73	85	67	63	79

An analysis of variances was carried out to test the two Null Hypotheses: That the part of total teaching given as lectures does not depend upon:

H^1_o: Subject Field

H^2_o: Level of Study

(1) Note that these averages are weighted averages calculated on the bases of the figures given in Table 3.1.

The figures used were the average figures given in the first column of Tables 3.4 and 3.5. The method is the same as above assuming that the subject field effect and the level of study effect are independent. H_o^1 was again rejected, while H_o^2 could not be rejected ($p = 0.01$). Of the total variance in the sample, 95% was explained by the subject field classification, only 1% by the classification into levels of study leaving 4% of the variance unexplained.

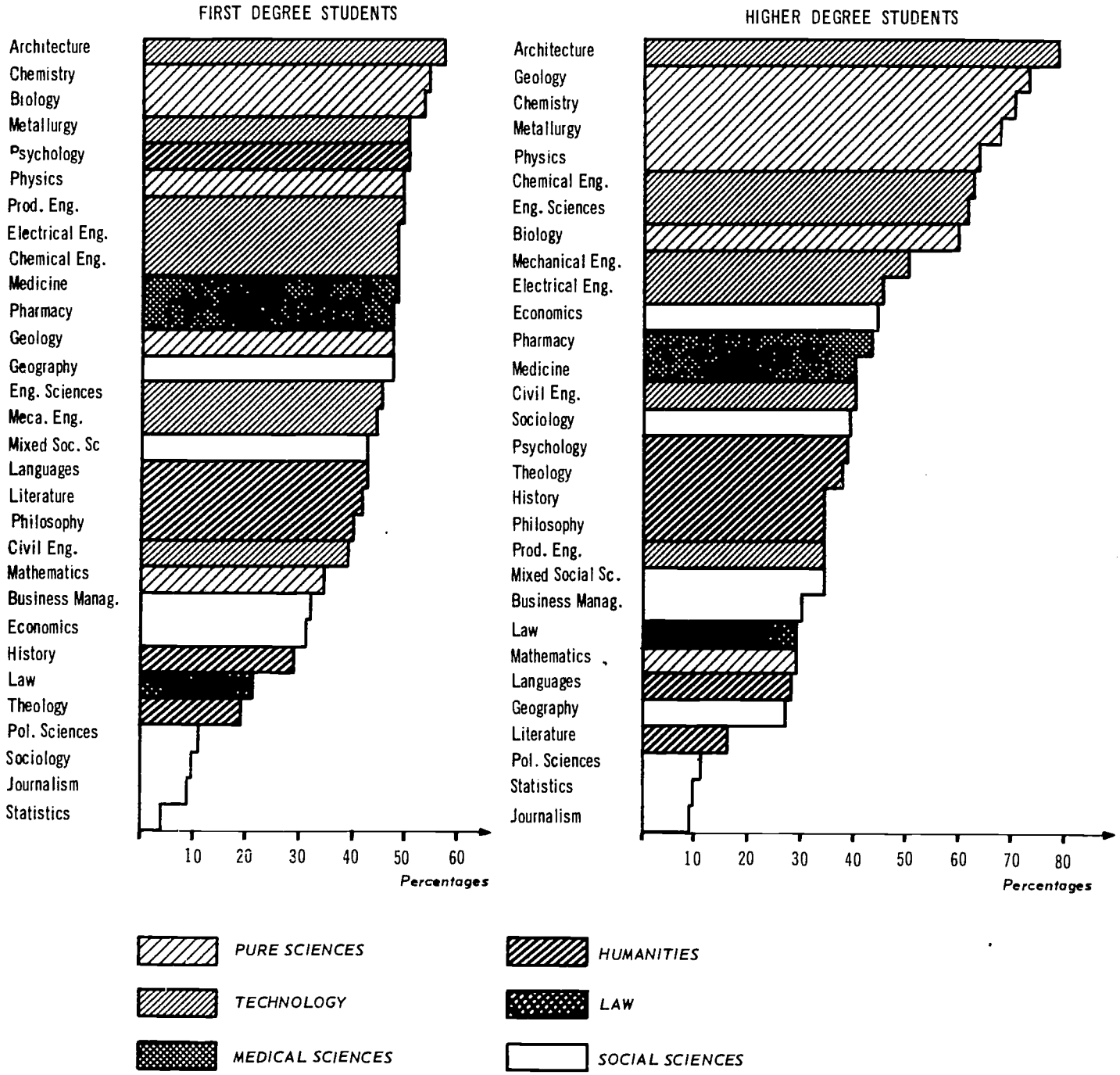
This result, together with what has been found earlier, suggests that the level of study has an effect on the total number of hours scheduled per week, but a relatively small effect on the composition of this total as far as lectures and seminars are concerned. The classification into subject fields is important on both levels.

One would perhaps have expected that higher degree students received relatively more teaching in the form of seminars than first degree students. The conclusion above is therefore surprising. The figures presented here should however be interpreted with some caution as they include only scheduled teaching. Non-scheduled research supervision is no doubt more common for higher degree students than for first degree students. If this is the case, then the total number of hours given to higher degree students as well as the part of this total given as seminars is larger than indicated by the figures above. Added to this is the problem of defining first and higher degree students. An inclusion of first degree students in the higher degree student category would lead to less seminars than if the higher degree students had been reported separately, provided there is a difference between the two levels.

Finally, terms like "lecture" and seminars are far from being unambiguous. Whether a meeting between a teacher and students should be deemed lecture or seminar should depend upon the technique used. A seminar is usually a meeting where the students are involved actively in the teaching process, while the students attending a lecture listen to the teacher and take notes. The teaching technique used determines the class size, as a technique which allows for active participation from the students, at least with the educational technology presently employed in the universities, pre-supposes a group size smaller than a technique where the students are passive. But there are of course lectures where the number of students attending is small enough to allow the students to participate. And these lectures are probably more frequently found on the higher level than on the lower level as in general first degree students outnumber higher degree students. A lecture given for higher degree students might therefore be much closer to the seminar type of teaching than a first degree lecture. The figures given in Tables 3.6 and 3.7 in the following section suggest that the average group size for lectures for higher degree students is of the same magnitude as the average seminar group size for first degree students.

Chart 8

PERCENTAGE OF TOTAL TEACHING HOURS SCHEDULED AS SEMINARS, BY DEPARTMENT AND LEVEL OF STUDY. ALL REGIONS



Departmental Level

Chart 8 ranks the 30 individual departments included in the analyses above according to the percentage of total teaching hours scheduled as seminars, for first and higher degree students. The length of each bar gives the percentage of the total teaching hours given as seminars for a particular department while different types of hatchings indicate which subject field the department belongs to.

Again there are considerable differences between individual departments. Departments within Technology, Pure Sciences and Medicine rank highest and departments within Social Sciences and Humanities lies lowest.

3.5 Group Size

The number of students a particular faculty member can teach is governed by two factors, the number of classes the member appears before (teaching load) and the number of students in attendance at that class (group size). In the perspective of rapid growths in student enrolment, the latter one is probably most important. Future changes in the teaching load will have to be marginal and any change is more likely to have the effect of decreasing than of increasing the number of hours taught by a staff member.

The extent to which a class can grow without diminishing the educational effectiveness of the teacher is however a difficult problem. It no doubt depends upon the teaching technique used. While the marginal improvement of effectiveness of reducing a lecture group from 150 to 100 students may be negligible, a reduction in a seminar group from 15 to 10 students may lead to considerable improvement.

The importance of small class teaching is however far from proved. A Pennsylvania State University publication abstracting studies in class size states:

> "Class size in itself is a relatively minor factor in educational efficiency as measured in terms of student achievement or of any other measurable outcome." (see Woodhall and Blaug, 1965).

Another author states:

> "Naturally, it is harder to teach more students than it is to teach less, but the prevalent ideas about this subject are scarcely based on rational analysis. Some time ago a colleague and I studied the matter briefly and interviewed a good many teachers and other educators. We concluded that, according to our informants, the optimum size of any class is three less than are in it, and we came away with the impression that each teacher can name the three he wants out." (Kershaw, 1965).

Finally, when discussing the effect of changing class size it is important to distinguish between total and marginal utility of smaller classes as well as realise that there are alternative uses of the resources.

This report cannot provide the academic administrator with a solid basis for judgment whether or not a particular class should be larger or smaller. A more statistical measure of class size can provide no guide as to the educational effectiveness of a particular class. The purpose is to study the class sizes as they actually were during the academic year 1968-69, not what would have been the right size.

Table 3.1 gives average and maximum seminar group size for individual departments for first and higher degree students, while Table 3.6 repeats the average and maximum figures for each subject field. The information on class size was too scanty to permit a regional classification.

Table 3.6 Average and maximum seminar group size, by subject field

Level / Subject Field	Average Group Size		Maximum Group Size	
	First Degree	Higher Degree	First Degree	Higher Degree
Pure Sciences	16	7	30	13
Technology	17	7	34	13
Medicine Sciences	16	5	28	12
Humanities	14	6	23	10
Law	15	-	38	-
Social Sciences	17	10	29	15
Average	16	7	30	13

The figures given in the first two columns of Table 3.6 suggest relatively small variations in class size by subject field for both first and higher degree students, while the difference in size for the two types of students is considerable. The average size for first degree students ranges from 14 to 17, with an average of 16, while the average size for higher degree students ranges from 5 to 10 with an average of 7.

The information supplied on lecture group size for higher degree students was more sparse than on seminar group size. Information could only be tabulated for average lecture size for the four subject fields Pure Sciences, Technology, Humanities and Social Sciences. The figures are given in Table 3.7:

Table 3.7 Average lecture group size, by subject field

Subject Feild	Average lecture size
Pure Sciences	18
Technology	11
Humanities	10
Social Sciences	15

There is some variance between the four subject fields. These differences may reflect differences in the number of students enrolled for the different subjects as well as differences in teaching technique. The data is however too poor to allow conclusions of this type. It is nevertheless interesting to note that the figures suggest an average lecture size close to the average seminar group size for first degree students. It is, therefore, questionable whether or not the term lecture has the same meaning on the two levels. A lecture for 15 students may very well be conducted as a seminar or discussion group. The Robins Report found, for example, that half of all lectures in English universities were attended by under 20 students and that a quarter had an audience of under 10. Only 6% of the lectures had an audience of over 100 (see Appendix Three, pp. 74-75). The report comments on this:

> "On the whole we think that there is little virtue in formal lecture delivered to very small audiences." (see p. 187 of the report).

Although small lectures probably are more common in the United Kingdom than in most other countries, relatively small lectures are not uncommon in the continental European countries either. Figures given in the O.E.C.D. study on Teaching Staff in Higher Education(1) referred to earlier show, for example, that 34% of all lectures given in Switzerland during 1962-63 had an audience of less than 20 students whereas only 15% of the lectures had more than 100 students.

(1) O.E.C.D., op. cit., p. 254.

3.6 Average Teaching Load

The time a teacher spends in class teaching is of course only a part of his total professional working week. A survey of university teachers carried out in connection with the Robins Report showed that out of a total working week of 40.5 hours, a teacher spent an average of 7.5 hours a week teaching and 5.5 hours preparing for classes and correcting students' work (Appendix Three, p. 56). Thus, a teacher spent, on the average less than 1/5 of the total working week in the classroom. However, this is the overall situation and large variations were found according to the rank of the staff member, subject field and university. And there are considerable variations between countries. The matter is further complicated where university teaching staff have supervisory and advisory responsibilities for individual students and groups outside the formal courses. The data collected through the Survey permits only a limited discussion of some of the above factors as well as give a rough indication of variations in teaching load between subject fields and regions.

Table 3.8 gives the average number of weekly teaching hours given per academic staff member, by subject field and region. The universities were not explicitly asked for teaching load figures but for the total number of hours provided per week by the department, including research supervision. This total was then divided by the total number of academic staff for the department. As explained in Chapter II, the academic staff includes research personnel and assistants. The average figures given in Table 3.8 are therefore influenced by the presence of staff that have no teaching or teaching-related responsibilities.

Table 3.8 Average number of weekly teaching hours per academic staff member, by subject field and region

Region / Subject Field	Average all regions	Region 1	Region 2	Region 3	Region 5
Pure Sciences	8.1	8.6	9.6	4.8	6.6
Technology	8.9	11.6	7.3	-	11.9
Medical Sciences	6.2	4.3	8.0	-	7.6
Humanities	8.4	9.7	10.7	6.4	6.5
Law	5.9	5.6	-	4.8	6.3
Social Sciences	9.2	11.9	9.6	8.0	7.2

The average figures given in the first column of the table indicate relative small differences between Pure Sciences, Technology, Humanities and Social Sciences, and a lower teaching load for Medicine and Law. Few observations were however available for these two fields (see Table 3.1).

There is considerable regional variation, suggesting that the small differences in the average figures appeared by chance. The regional observations suggest a lower teaching load for Region 3 than for the three other regions. This is partly due to the high proportion of research assistants and other research personnel in some continental universities. The low figure for Law may also partly be explained by the fact that Law in general has a higher proportion of the total academic staff professorial level than other subject fields (see the section on academic staff structure in Chapter II), and that professors on the average teach less than the lower ranks. In fact, the differences observed in Chapter II as regards academic staff structure in the different subject fields would lead to variations in the average teaching load, by field, provided that the teaching load varies according to rank.

3.7 Economies of Scale

We shall end this chapter by a brief discussion of economies of scale as concerns academic staff requirements with increasing student enrolment.

Although it is not usual among university teachers to regard their work in terms more commonly applied to industrial production, there are certain features of university teaching that might produce economies of scale. The work of preparing for two parallel classes in the same subject is, for instance, generally less than twice of the work of preparing for only one class. To deliver a lecture to five hundred students hardly takes more time than if the audience numbers fifty. The extent to which such economies of scale are possible depends on the proportion of teaching given as lectures and the proportion given as seminars where the opportunities for economies of scale are smaller. As seen previously in this chapter, this proportion varies according to region and more particularly according to subject field. One would therefore a priori assume that the possibilities for scale effects was higher for Law, Humanities and Social Sciences than for Pure Sciences, Technology and Medical Sciences where a greater proportion of the total teaching is given as seminars.

Several linear regressions were run for each subject field to test whether the constant term in the regression equation was significantly different from zero. None of the regressions gave a significant difference(1). The present data does therefore not suggest scale effects. One reason for this negative result could be that the data was not divided into individual regions. But a more fundamental reason is probably that large departments tend to provide a more diversified programme than small departments. It is the number of classes offered and not primarily the number of students that determines the basic need for academic staff. And if the number of classes offered increases with the student enrolment, then the gain will go to support a more diversified programme instead of to lower, for example, average costs in terms of academic staff use. It must also be borne in mind that the data refers to individual departments. Thus, possibilities for economies regarding the use of administrative and technical staff for central services are excluded.

---

(1) The following regression were run for each subject field:

(1) $T = a + b\,S$
(2) $A = a + b\,S$
(3) $A = a + b\,S + cT$
(4) $P = a + b\,S$
(5) $P = a + b\,S + cT$

where:

S = number of students enrolled
T = number of full-time academic staff
A = number of administrative staff
P = number of technical staff

It was in each case tested whether or not a was significantly different from nil.

CHAPTER IV: RECURRENT EXPENDITURE

4.1 Introduction

The usual purpose of cost analyses is to provide insights into the ways in which the resources available to an organisation have been devoted to various activities. The purpose of comparing costs between different departments and faculties within a university is to highlight the differences in level and structure of the costs and to examine why differences occur. International comparisons provide a possibility to examine the differences in costs implied by different educational systems.

Cost analyses in education displease those people who feel that educational policy ought not to be discussed in reference to economic consequences. But although there exist different views as to the utility of cost studies, few would disagree that cost differentials beyond certain limits are not acceptable unless explained by special circumstances. There is no contradiction between feeling strongly about the non-economic utility of education and still acknowledging the importance of paying attention to the economic effects of different educational policies.

The problems and pitfalls involved in comparing costs between universities or university components are, however, numerous and many of the objections to such studies arise precisely on this ground. And when the universities involved are from different countries, cost comparisons may be very misleading if proper attention is not paid to differences in historical and cultural background, educational goals, attainment level, accounting procedures, prices, etc., as the value of such studies depend on that like is compared with like.

The limitations above must be borne in mind when examining the information collected on recurrent expenditure through the University Information Survey. In addition to the problems faced in the previous chapters where comparisons have been made of different types of non-monetary figures, in this chapter we have in addition the very serious problem of comparing monetary figures referring to countries and regions with very different levels of prices and productivity. To avoid these problems, no comparisons of costs in absolute figures are made. Thus, all the analyses done in this chapter will be based upon relative figures, for example, comparisons of the proportion of total remuneration spent on administrative staff in different regions and subject fields.

In addition to the qualifications taken above, two more have to be added before the data is presented. Firstly, the data collected refers to annual recurrent expenditure, not to annual recurrent costs. Although these two terms are similar, not all recurrent expenditure results in costs, and not all costs are related to recurrent expenditure. And although the distinction is more significant in commercial enterprises than in universities, there are expenditures which are not costs; purchase of investment goods or of some permanent asset for example, and there are costs such as those related previously-acquired assets, which are not related to current expenditure. In this study we shall, however, use these two terms synonymously.

Secondly, the analyses of costs of larger organisations involve the selection of some suitable subdivision of the organisation as the basic analytical unit or "cost centre". As far as universities are concerned, the choice is between faculty and department. As the data anlysed was collected at departmental level, the department was, of course, selected. To use a department as the cost centre has advantages, as most universities (but not all) use the department as the basic accounting and budgeting unit. Detailed analyses of most cost items can, in fact, often only be carried out at this level. The disadvantage is that costs of central services are not allocated to individual departments, but over the whole institution. Moreover, there are a number of joint costs, that is costs which are incurred jointly by two or more departments. These problems are easier to handle at faculty level. Thus the figures analysed here exclude several important cost items not allocated to individual departments.

4.2 Total Annual Recurrent Expenditure

Table 4.1 gives percentage figures by department, subject field and region for the distribution of total annual recurrent expenditure on total staff remuneration (column 1), and other recurrent (non-remunerative) expenditure (column 5). Columns 2, 3 and 4 give the remuneration for academic staff, administrative staff and technical staff respectively, as percentage of total recurrent expenditure, while column 6 gives the number of observations in each case. The first six columns give average figures for all regions while the following columns give the details between the five regions. Very few observations were available for Region 5.

Staff Remuneration

As far as total remuneration, as a part of total recurrent expenditure is concerned, Table 4.1 suggests fairly small regional variations within a given subject field for Regions 1, 2, 3 and 4 and a relatively common pattern in the variations between subject fields within the regions. In general, Pure

TABLE 4.1 DISTRIBUTION OF TOTAL ANNUAL RECURRENT EXPENDITURES ON DIFFERENT STAFF CATEGORIES, BY DEPARTMENT AND REGION, PERCENTAGE FIGURES

Region / Department/Subject Field	Average all Regions						Region 1						Region 2						Region 3						Region 4						Region 5					
	Remuneration				Other Rec	No Obs	Remuneration				Other Rec	No Obs	Remuneration				Other Rec	No Obs	Remuneration				Other Rec	No Obs	Remuneration				Other Rec	No Obs	Remuneration				Other Rec	No Obs
	Tot	Acd	Adm	Tech			Tot	Acd	Adm	Tech			Tot	Acd	Adm	Tech			Tot	Acd	Adm	Tech			Tot	Acd	Adm	Tech			Tot	Acd	Adm	Tech		
PURE SCIENCES	85	68	5	12	15	(69)	85	72	6	7	15	(15)	86	66	4	16	14	(23)	84	65	5	14	16	(20)	80	61	5	14	20	(5)	93	79	6	8	7	(6)
Biology	84	62	6	16	16	(16)	76	54	8	6	24	(3)	81	57	4	20	19	(5)	81	55	5	21	19	(5)	71	43	4	13	10	(1)	87	70	5	12	13	(2)
Chemistry	82	61	5	16	18	(16)	76	54	6	6	24	(3)	81	57	4	20	19	(5)	81	55	5	21	19	(5)	71	43	4	13	10	(1)	87	70	5	12	13	(2)
Geology	84	67	6	11	16	(8)	81	68	6	7	19	(3)	92	74	4	15	8	(1)	87	66	6	13	13	(3)	77	53	4	17	23	(1)	-	-	-	-	-	(0)
Mathematics	92	83	5	4	8	(15)	99	87	5	1	5	(3)	96	90	4	2	4	(5)	85	71	6	8	15	(5)	90	80	4	6	10	(1)	96	87	9	-	4	(1)
Physics	84	62	5	13	16	(14)	87	71	6	10	13	(3)	81	59	4	18	19	(4)	85	72	4	9	15	(3)	82	55	6	21	18	(1)	97	84	9	4	3	(1)
PSYCHOLOGY	86	66	6	14	14	(54)	86	68	10	7	15	(12)	87	65	4	18	13	(22)	91	71	5	15	9	(8)	86	65	6	14	15	(7)	73	52	7	14	27	(5)
Architecture	89	78	8	3	11	(7)	91	70	17	4	9	(2)	86	69	7	12	12	(1)	95	91	3	1	5	(2)	90	81	6	3	10	(1)	75	50	7	9	25	(1)
Civil Eng.	86	65	6	15	14	(8)	82	68	8	6	18	(2)	89	63	3	23	11	(3)	88	64	9	15	12	(1)	88	69	7	13	11	(1)	77	55	8	14	23	(1)
Metallurgy	87	73	6	18	13	(4)	87	68	13	6	13	(1)	87	67	4	16	13	(3)	90	50	5	35	10	(1)	84	58	8	18	16	(1)	-	-	-	-	-	(0)
Prod. Eng.	85	63	4	18	15	(4)	-	-	-	-	-	(0)	88	67	3	18	12	(3)	-	-	-	-	-	(0)	-	-	-	-	-	(0)	74	50	7	17	26	(1)
Elec. Eng.	87	67	5	15	13	(9)	86	70	8	8	14	(2)	90	69	4	17	10	(4)	95	77	7	11	5	(1)	81	63	5	13	19	(1)	74	47	8	19	26	(1)
Mech. Eng.	85	64	6	15	15	(9)	85	72	8	5	15	(2)	89	63	4	22	11	(3)	90	68	5	17	10	(2)	84	60	6	18	16	(1)	62	46	7	9	38	(1)
Chem. Eng.	82	60	6	16	18	(7)	80	58	10	12	20	(2)	87	63	3	18	16	(3)	84	59	5	20	16	(1)	76	57	5	14	24	(1)	-	-	-	-	-	(0)
MEDICAL SC.	87	72	7	16	13	(16)	82	68	6	8	18	(2)	83	60	4	19	17	(2)	90	65	6	19	10	(10)	88	60	5	21	14	(1)	-	-	-	-	-	(0)
Medicine	87	71	6	16	13	(11)	79	58	7	14	21	(1)	-	-	-	-	-	(0)	90	64	8	18	10	(8)	-	-	-	-	-	(0)	-	-	-	-	-	(0)
Pharmacy	86	65	5	16	14	(5)	85	78	5	2	15	(1)	83	60	4	19	17	(2)	90	65	5	20	10	(2)	88	60	5	21	14	(1)	-	-	-	-	-	(0)
HUMANITIES	92	83	6	3	8	(43)	96	87	8	1	4	(10)	96	89	4	3	4	(10)	90	82	5	3	10	(13)	90	81	6	3	10	(6)	82	70	4	8	18	(4)
History	91	83	5	3	9	(6)	98	94	4	0	2	(2)	98	94	4	0	2	(2)	89	81	5	3	11	(3)	76	56	8	12	24	(1)	83	70	4	9	17	(1)
Languages	94	85	6	3	6	(11)	95	84	10	1	5	(3)	97	92	4	1	3	(3)	92	84	7	1	10	(3)	94	80	4	1	6	(1)	83	66	4	13	17	(1)
Literature	87	78	3	6	13	(2)	-	-	-	-	-	(0)	-	-	-	-	-	(0)	-	-	-	-	-	(0)	92	84	7	1	8	(1)	82	68	5	9	18	(1)
Philosophy	94	79	4	1	6	(0)	90	93	5	0	2	(2)	96	95	3	0	3	(2)	88	83	2	3	12	(3)	92	87	5	0	8	(1)	-	-	-	-	-	(0)
Psychology	88	76	8	5	8	(8)	92	80	12	0	8	(2)	93	96	4	23	7	(2)	89	77	8	4	11	(3)	95	83	7	5	5	(1)	-	-	-	-	-	(0)
Theology	91	84	6	1	9	(5)	94	79	11	4	6	(1)	97	87	10	0	3	(1)	93	90	3	0	7	(1)	93	80	3	0	7	(1)	80	75	3	2	20	(1)
LAW	89	78	9	3	8	(11)	90	70	11	9	10	(2)	-	-	-	-	-	(0)	91	83	6	2	9	(6)	95	88	7	0	5	(1)	78	57	9	13	22	(2)
SOCIAL SCIENCES	93	84	7	2	7	(35)	93	84	8	1	7	(11)	95	86	7	2	5	(9)	90	80	6	4	10	(10)	95	92	3	0	5	(4)	-	-	-	-	-	(0)
Bus. Man.	91	83	7	1	9	(6)	89	79	9	1	11	(4)	93	84	8	1	7	(1)	-	-	-	-	-	(0)	98	96	2	0	2	(1)	-	-	-	-	-	(0)
Economics	92	85	6	1	8	(11)	94	85	9	0	6	(3)	95	90	4	1	5	(3)	92	82	7	3	8	(5)	-	-	-	-	-	(0)	-	-	-	-	-	(0)
Geography	90	80	5	5	10	(4)	-	-	-	-	-	(0)	-	-	-	-	-	(0)	85	70	5	10	15	(2)	94	94	0	0	4	(1)	-	-	-	-	-	(0)
Pol.Sciences	95	85	10	0	5	(3)	96	85	11	0	4	(2)	94	84	10	0	6	(1)	-	-	-	-	-	(0)	-	-	-	-	-	(0)	-	-	-	-	-	(0)
Sociology	93	87	6	0	7	(7)	96	92	4	0	4	(2)	98	91	7	0	2	(1)	90	82	6	2	10	(3)	92	88	4	0	8	(1)	-	-	-	-	-	(0)
Mixed Soc.Sc.	95	88	7	3	5	(4)	-	-	-	-	-	0	95	82	8	5	5	(3)	-	-	-	-	-	(0)	96	93	3	0	4	(1)	-	-	-	-	-	(0)

Sciences, Technology and Medical Sciences spend more on non-remunerative recurrent expenditure than the other three fields. Region 3 shows less variations in this respect.

Academic staff remuneration expressed as a percentage of total recurrent expenditure shows variations similar to the ones observed for total staff remuneration. This is natural as their remuneration is the largest part of this total. An impression of the importance of the different types of staff in terms of their share of total annual remuneration is given in Table 4.2.

Table 4.2 Percentage distribution of total annual remuneration by staff category, region and subject field

Region / Subject Field	Region 1			Region 2			Region 3			Region 4			Region 5		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Pure Sciences	85	7	8	77	5	18	77	6	17	76	6	18	85	6	9
Technology	80	12	8	75	5	20	78	5	17	76	7	17	71	10	19
Med.Sciences	83	7	10	72	5	23	72	7	21	70	6	24	62	11	27
Humanities	91	8	1	92	5	3	91	6	3	90	7	3	85	5	10
Law	78	12	10	..	..	..	91	7	2	93	7	0	73	12	15
Soc.Sciences	90	9	1	91	7	2	89	7	4	97	3	0	90	10	0

The proportion of total staff remuneration used on academic staff tends again to vary more between subject field than between regions. The variations are caused by differing expenditure on technical staff as the part spent on administrative staff varies slightly except for a couple of odd cases in Regions 1 and 5.

Differences in accounting procedures make it difficult to draw conclusions from the type of figures given above. It is true that such differences do exist even between universities belonging to the same country. But it is probably also true that differences in accounting procedures are more common in the treatment of overhead and non-remunerative recurrent expenditure than of staff remuneration. Thus, one might draw the conclusion from Table 4.2 that Regions 2, 3 and 4 have a very similar distribution of expenditure between both the staff categories and subject fields. While the technical staff remunerations differ greatly between Pure Sciences, Medical Sciences and Technology on the one hand and the three other subject fields on the other, the administrative staff remuneration is relatively constant,

constituting 5-6% of the total remuneration. The part allocated to non-remunerative expenditure (see Table 4.1) varies more between these three regions than the part allocated to different types of staff remuneration. But this might merely reflect differences in accounting procedures.

The figures given for Regions 1 and 5 vary somewhat more than for the other regions. A somewhat higher proportion of the total remuneration is allocated to administration in these two regions.

4.3 Average Staff Remuneration

Table 4.3 gives the average annual remuneration in United States dollars per staff member for the three staff categories, by region and department/subject field. The annual remuneration includes all payments by the university made to an employee before tax deductions, including employer's contributions to social security, pension schemes, etc. Annual remuneration differs from basic salary and professional income which includes income from professional activities outside the university. The annual remuneration represents the total financial burden of an employee to the university.

The figures given for annual remuneration in Table 4.3 show large variations between regions. This is natural as price differences have not been taken into account. Comparisons of the absolute figures between regions are therefore not enlightening. Comparisons of academic staff remunerations between subject fields within the five regions, suggest a weak tendency to higher average remuneration for Law and Social Sciences than for Pure Sciences, Technology and Medical Sciences. If such a difference exists it may be explained by the differences in staff structure seen in Chapter II. However, the average remuneration within each grade might be higher in Pure Sciences, Technology and Medical Sciences than in Law and Social Sciences.

The remuneration for administrative and technical staff does not show any common variation between regions. The variations observed may be due to the inclusion of a number of countries with differing average remuneration in each regional group.

Table 4.3 gives the average remuneration of administrative and technical staff as a percentage of the academic staff remuneration. The figures, by subject field, are calculated as percentages of the academic staff remuneration for that field and region. The relative remuneration for administrative staff varies only moderately between subject fields in Regions 1, 2 and 4.

TA 2.1.4.3 AVERAGE ANNUAL STAFF REMUNERATION, BY STAFF CATEGORY, DEPARTMENT AND REGION. U.S. DOLLARS

Region / Department/ Subject Field	Region 1				Region 2				Region 3				Region 4				Region 5			
	Acd Staff	Adm Staff	Tech Staff	No Obs	Acd Staff	Adm Staff	Tech Staff	No Obs	Acd Staff	Adm Staff	Tech Staff	No Obs	Acd Staff	Adm Staff	Tech Staff	No Obs	Acd Staff	Adm Staff	Tech Staff	No Obs
MEDICAL SCIENCES	13730	4360	5910	(23)	6410	2170	2700	(26)	8710	3740	3640	(26)	6440	3050	3460	(7)	4130	3930	1530	(10)
Biochemistry	14460	4030	7140	(1)	5544	1610	2200	(1)	–	–	–	(0)	–	–	–	(0)	–	–	–	(0)
Biology	12460	4370	5650	(4)	6040	2210	2580	(5)	9610	3520	3370	(5)	6600	3190	3480	(1)	3800	2810	1570	(3)
Botany	10010	4380	6340	(1)	5590	2460	2610	(1)	–	–	–	(0)	7120	3130	3660	(1)	–	–	–	(0)
Chemistry	13280	4340	5730	(4)	6830	2370	2550	(5)	8820	3710	3710	(5)	6440	3090	3610	(1)	4140	4010	1570	(2)
Geology	13200	4070	5590	(4)	6760	2390	1980	(1)	9020	3700	3590	(5)	6890	3130	3610	(1)	5400	4720	1750	(1)
Mathematics	13410	4420	6340	(4)	6460	1970	3630	(2)	8190	3860	3840	(7)	6960	3130	–	(1)	3740	4010	1290	(2)
Physics	14190	4560	6060	(4)	6240	2180	2050	(6)	7810	3870	3590	(4)	6510	3380	3840	(1)	4160	4010	1660	(2)
Zoology	13230	3860	4650	(1)	5730	1780	1900	(1)	–	–	–	(0)	3870	2190	2350	(1)	–	–	–	(0)
SOCIAL SCIENCE	13500	5770	6550	(12)	7190	2830	3060	(23)	8740	4330	3450	(17)	7360	3290	4000	(15)	3300	2020	1470	(8)
Architecture	12960	7750	6220	(2)	7510	1960	3770	(1)	8530	4130	2260	(3)	6850	3400	4030	(1)	3730	1660	1460	(2)
Eng. Sciences	13500	7500	7000	(1)	7350	2560	3200	(2)	10310	3950	3240	(2)	6850	3400	4035	(1)	2350	1400	1060	(1)
Civil Eng.	13500	6150	5560	(2)	6910	2070	2940	(3)	9750	5000	3420	(1)	7300	3240	3690	(3)	3500	3090	1450	(+)
Metallurgy	14500	7000	7000	(1)	7220	2000	2870	(3)	7570	4160	4290	(1)	9390	3400	4030	(1)	–	–	–	–
Mining	–	–	–	(0)	6670	2480	1860	(1)	7680	4620	3870	(2)	–	–	–	(0)	–	–	–	–
Prod. Eng.	–	–	–	(0)	7070	2220	3190	(3)	10010	2480	2870	(1)	–	–	–	(0)	3250	2160	1720	(1)
Elec. Eng.	12970	5000	6330	(2)	7310	2370	3370	(4)	8800	4790	3400	(2)	7360	3210	4180	(3)	3710	2400	1840	(1)
Mech. Eng.	12250	4910	6020	(2)	7110	1910	2960	(3)	9460	4650	4210	(3)	7220	3350	4020	(3)	3010	1690	1350	(2)
Chem. Eng.	12040	4950	6190	(2)	6830	2290	3200	(3)	8900	5380	3600	(2)	7190	3260	3810	(3)	–	–	–	(0)
MEDICAL SCIENCES	13910	4010	4380	(2)	7070	2420	2620	(2)	9650	4130	3870	(12)	6930	3140	3000	(5)	4070	2570	1860	(5)
Dentistry	14990	3530	3970	(1)	–	–	–	0	12260	3340	4240	(1)	6720	3460	3140	(2)	4370	2880	2320	(2)
Medicine	–	–	–	(0)	–	–	–	0	9170	3720	3880	(9)	7070	2520	2810	(3)	3610	2710	1670	(5)
Pharmacy	13630	4490	4780	(1)	7070	2420	2620	(2)	10700	6390	3650	(2)	–	–	–	–	5780	4500	–	(1)
HUMANITIES	13460	4305	5550	(18)	6020	2120	2190	(11)	10400	3310	3400	(30)	6910	3150	3290	(8)	4150	2510	2010	(9)
History	14070	4030	–	(3)	5970	1990	–	(2)	11840	3180	3690	(5)	4150	3610	2650	(1)	3800	2120	1660	(1)
Languages	12190	4590	5970	(4)	6170	1900	2050	(3)	9230	3680	2840	(7)	7300	2970	4000	(1)	4070	3560	2740	(2)
Library Sc.	14253	4070	–	(1)	6100	2230	2760	(1)	–	–	–	(0)	–	–	–	(0)	–	–	–	(0)
Literature	13770	4005	–	(1)	–	–	–	–	9300	2270	2420	(2)	7250	3190	4000	(1)	4010	2120	1700	(2)
Philosophy	12030	3760	–	(3)	5530	2424	–	(2)	11330	2720	3490	(5)	7260	2970	–	(1)	4300	2500	–	(1)
Psychology	13790	4770	5120	(4)	6110	2150	2110	(2)	8910	3330	3350	(5)	7530	3450	3660	(1)	4580	4440	3200	(1)
Theology	–	–	–	(0)	6340	2230	–	(1)	11390	3820	3940	(6)	7270	3040	1930	(3)	4300	2140	3000	(2)
LAW	15030	4020	5040	(4)	–	–	–	(0)	10190	3050	3350	(8)	7600	3180	–	(2)	3830	1890	2000	(2)
SOCIAL SCIENCES	14410	4610	8270	(17)	6200	2420	2630	(9)	9820	3240	3570	(14)	7270	2700	–	(2)	4240	3230	1910	(10)
Business Man.	14450	5000	11160	(5)	5850	2310	3160	(1)	11080	–	–	(1)	–	–	–		3400	1990	1250	(4)
Economics	14460	4250	–	(3)	6070	2130	1910	(3)	8630	3090	3230	(2)	–	–	–		–	–	–	(0)
Geography	14950	4190	–	(1)	–	–	–	(0)	9420	3160	3040	(4)	7140	–	–	(1)	3200	3200	–	(1)
Journalism	13590	3270	7600	(1)	–	–	–	(0)	–	–	–	(0)					–	–	–	(0)
Pol.Sciences	14440	5050	–	(3)	5460	3050	–	(1)	11060	–	–	(1)					4200	–	–	(1)
Sociology	13420	3950	4380	(3)	5700	2380	–	(1)	11880	–	–	(1)	7350	2700	–	(1)	4400	3060	3200	(2)
Statistics	10480	4450	–	(1)	–	–	–	(0)	9170	3340	3440	(5)					5100	5750	1290	(1)
Mixed Soc.Sc.	–	–	–	(0)	6040	2530	2940	(3)	–	–	–	(0)					8330	1340	–	(1)

Table 4.3 Average Remuneration for Administrative and Technical Staff as a Percentage of the Average Remuneration for Academic Staff, by Region and Subject Field

Region / Subject Field	Region 1		Region 2		Region 3		Region 4		Region 5	
	Adm	Tech	Adm	Tech	Adm	Tech	Adm	Tech	Adm	Tech
Pure Sciences	32	43	33	41	43	42	47	54	88	37
Technology	45	51	31	43	50	39	44	54	61	45
Med.Sciences	25	28	34	37	43	40	45	43	73	46
Humanities	32	41	35	36	32	33	46	48	60	48
Law	25	55	-	-	30	33	42	-	47	52
Social Sciences	32	57	39	42	33	36	37	..	76	45
Overall Average	32	46	34	40	39	37	44	50	68	46

The table does not suggest a common pattern in the subject field variations for all regions, but it does suggest an overall regional variation in the relative remuneration of administrative staff. This is especially apparent for Region 5. If substitution possibilities exist between administrative staff and the two other staff categories, one would expect that a substantial difference in relative wages in one region, compared to other regions, would lead to a different composition of the total staff.

The relative price of administrative staff is in Region 5 double that of Region 1. One should therefore, according to this theory, expect relatively more administrative staff in Region 1 than in Region 5. Table 2.1 suggests that this is the case. But whether this is due to the differences in the relative prices of the two staff categories is doubtful. If one demand function exists for administrative staff, then the income effect has to be taken into account as well as the effect of different relative prices. The American universities (Region 1) have more money to spend on administrative staff than the Yugoslav universities, and the former ones probably perform a number of functions in addition to the ones performed in Region 5 (e.g.in sponsored research). In addition, the possibilities for substitution are probably not great. An inspection of the raw data suggests that Region 5 does not have significantly less administrative

staff than the other regions, and the relatively high remuneration is because there is a high proportion of administrative staff in the higher brackets in this region.

For technical staff the variations are somewhat smaller than for administrative staff. Furthermore, there is no common pattern for all regions as to which of these two staff categories that, on the average, is remunerated highest. Thus, Regions 1, 2 and 4 pay technical staff relatively more than administrative staff, Region 3 pays about the same to the two categories, while Region 5 pays administrators highest. But in no region does a technical staff member earn on average more than half of the average remuneration of an academic staff member, in most cases much less. An administrator earns, except for Region 5, less than 40% of an academic staff member's remuneration.

4.4 Recurrent Expenditure per student

The amount of data available does not permit student unit cost figures to be calculated for the five regions. Besides this, unit costs vary considerably from country to country within each region. Tabulation was, however, made for five countries where a reasonable number of observations were available. The tabulation was made in order to illustrate the enormous difference in costs between the different subject fields and departments within each region, and to show that these cost differentials vary from region to region. The figures are given in Table 4.4. However, the number of observations available are too few to permit conclusions as to the most expensive ones or to show exactly how large the differences in costs are. Note also that the figures only include recurrent expenditure allocated to individual departments, leaving out recurrent expenditure for central services (central administration, library, maintenance, cleaning, etc.).

TABLE 4.4 AVERAGE RECURRENT EXPENDITURE PER STUDENT ENROLLED FOR SELECTED COUNTRIES

U.S. dollars

Department \ Country	ENGLAND		NETHERLANDS		NORWAY		SWITZERLAND		YUGOSLAVIA	
	Expenditure per student	NO OBS	Expenditure per student	NO OBS	Expenditure per student	NO OBS	Expenditure per student	NO OBS	Expenditure per student	NO OBS
PURE SCIENCES	1400	(23)	3760	(11)	-	-	2050	(2)	290	(5)
Biology	1480	(6)	3630	(3)	-	-	-		350	(2)
Chemistry	1410	(5)	2990	(3)	-	-	-		290	(1)
Geology	1094	(1)	5580	(2)	-	-	-		-	-
Mathematics	1330	(5)	3450	(2)	-	-	1360	(1)	190	(1)
Physics	2130	(6)	-	-	-	-	2730	(1)	270	(1)
TECHNOLOGY	1140	(22)			1780	(7)	1750	(7)	530	(6)
Architecture	980	(1)	-	-	1740	(1)	1130	(2)	560	(1)
Eng. Sciences	1090	(2)	-	-	2576	(1)	-		-	-
Civil Eng.	920	(3)	-	-	1030	(1)	1660	(1)	590	(1)
Metallurgy	1500	(2)	-	-	2260	(1)	-		-	-
Mining	890	(1)	-	-	-	-	3620	(1)	-	-
Prod. Eng.	1330	(3)	-	-	-	-	-		500	(1)
Elec. Eng.	1060	(4)	-	-	1230	(1)	1370	(1)	600	(1)
Mech. Eng.	1120	(3)	-	-	1360	(1)	1710	(1)	460	(2)
Chem. Eng.	1220	(3)	-	-	2300	(1)	1630	(1)	-	-
MEDICAL SC.	2620	(2)	3020	(8)	3940	(1)	3080	(1)	1140	
Medicine	-	-	3470	(6)	3940	(1)	3080	(1)	1140	(2)
Pharmacy	2620	(2)	1680	(2)	-	-	-	-	-	-
HUMANITIES	850	(10)	1550	(17)	830	(5)	870	(4)	390	(3)
History	650	(2)	2010	(3)	870	(1)			360	(1)
Languages	690	(3)	1460	(3)	560	(1)	440	(2)	570	(1)
Literature	-	-	-	-	1100	(1)	-	-	240	(1)
Philosophy	1080	(2)	2270	(2)	-	-	-	-	-	-
Psychology	960	(2)	890	(3)	910	(1)	-	-	-	-
Theology	1070	(1)	1450	(6)	715	(1)	1300	(2)	-	-
LAW	-	-	560	(5)	350	(1)	690	(2)	230	(2)
SOCIAL SCIENCES	870	(7)	800	(8)	1110	(2)	-	-	200	(3)
Business Man.	760	(1)	-	-	-		-	-	210	(2)
Economics	680	(1)	540	(3)	-	-	-	-	-	-
Geography	-	-	920	(2)	1230	(1)	-	-	190	(1)
Pol. Sciences	1010	(1)	-	-	-	-	-	-	-	-
Sociology	950	(1)	970	(3)	980	(1)	-	-	-	-
Mixed Social Sc.	890	(3)	-	-	-	-	-	-	-	-

CHAPTER V: SUMMARY OF FINDINGS

The purpose of this report has been to provide insights into the ways in which the resources available to different types of university departments in different geographical regions were employed during the academic year 1968-69.

The information analysed was collected through a questionnaire survey carried out by the Centre's Programme on Institutional Management in Higher Education. It concerns the number of students enrolled, the numbers and remuneration of academic, administrative and technical staff, as well as provides the total number of teaching hours given for first and higher degree students and the division of this total between lectures and seminars, the average and maximum seminar group size, the average number of hours taught per week by an academic staff member and annual recurrent expenditure.

This information was obtained for 32 different university departments which were grouped into six major subject fields: Pure Sciences, Technology, Medical Sciences, Humanities, Law and Social Sciences. The countries supplying information were grouped into five regions: North America (Region 1), United Kingdom (Region 2), Continental Europe (Region 3), Scandinavia (Region 4), and the Mediterranean Countries (Region 5).

ChapterII discusses the use of the ratio between student enrolment and academic staff as an indicator of the need for academic staff. It is argued that although this ratio should not be taken as an indicator of university or academic staff productivity, it is still an important measure of the use of academic staff which in terms of annual recurrent expenditure is the most important single resource used at departmental level. The data suggests a relatively common pattern in the variations of the student/staff ratio between subject fields within each of the five regions. Pure Sciences, Technology and Medical Sciences alternate in having the lowest ratio while Humanities, Social Sciences and Law are ranked as number 4, 5 and 6, respectively, in the four regions where information was available for all subject fields. Although there are also considerable variations between regions in the absolute size of the ratio, Region 2 in general having the lowest ratio and Region 5 the highest, an analysis of the total variance in the sample suggests that the subject field classification accounts for more of this total than does the regional classification.

As important factors causing the variations observed are suggested differences in the teaching and research programme offered (the teaching programme is examined in detail in Chapter III), and differences in the seniority structure of the academic staff, as the teaching load varies according to rank. A study of the distribution of the academic staff on three different levels according to rank (professional level, middle level and junior level) for different faculties for 20 selected European universities shows that faculties of Pure Sciences, Technology and Medical Sciences has a smaller proportion of the total academic staff in the professorial rank and a higher proportion in the junior rank than faculties of Law, Theology and Social Sciences.

The importance of non-academic staff is emphasised in the last section of Chapter III. The ratios between student enrolment and administrative staff indicate distinct differences between Pure Sciences, Technology and Medical Sciences on the one hand, and the three other subject fields on the other hand. The ratio between administrative and academic staff shows smaller subject field variations. Calculation of correlation coefficients suggests stronger correlation between these two staff categories than between student enrolment and administrative staff. The ratio between student enrolment and technical staff varies considerably between Pure Sciences, Technology and Medical Sciences on the one hand and the three other subject fields on the other.

Chapter III shows that Technology provides the highest number of teaching hours per week for a first degree student (25.5 hours) followed by Medical Sciences (24.2), Pure Sciences (19.5), Law (19.3), Social Sciences (17.0) and Humanities (14.9). The same broad pattern holds for all regions. All subject fields provide less teaching for higher degree students than for first degree students. Expressed as a percentage of the total number of hours received by a first degree student, there are only small subject field differences, ranging from 75% for Social Sciences to 82% for Technology. There are, however, considerable regional variations.

The percentage of the total number of teaching hours given in the form of seminars varies considerably according to subject field, but, except for Pure Sciences, there is no large difference between first and higher degree students. For a first degree student, around 50% of all scheduled teaching is given as seminars for Pure Sciences, Technology and Medical Sciences while the corresponding figures for Humanities, Law and Social Sciences are 32%, 21% and 25%.

The seminar group size varies only slightly between subjects: from an average of 14 students for Humanities to 17 for Social Sciences and Technology. For higher degree students, the size ranges from 5 students for Medical Sciences to 10 students for Social Sciences. Data available for lecture group size for higher degree students in Pure Sciences, Technology, Humanities and Social Sciences suggests a lecture group size of approximately the same magnitude as for seminars for first degree students.

The average number of hours taught per week by an academic staff member are fairly similar for Pure Sciences (8.1 hours), Technology (8.9 hours.)Humanities (8.4 hours) and Social Sciences (9.2 hours), and somewhat lower for Medical Sciences (6.2 hours) and Law (5.9 hours).

Chapter III ends with a discussion of economies of scale in terms of staff requirement with increased student enrolments. Although there are certain features of university teaching that might be expected to produce economies of scale, the present data do not suggest such effects.

The data on annual recurrent expenditures analysed in Chapter IV show that Pure Sciences, Technology and Medical Sciences spend more of the total annual recurrent expenditure on non-remunerative items than the other three subject fields. These three subject fields also spent more of the total staff remuneration on technical staff than Humanities, Law and Social Sciences. The data do not suggest differences between subject fields as regards the part spent on administrative staff. Regions 2, 3 and 4 have furthermore a very similar pattern as regards the part of the total staff remuneration spent on each of the three staff categories.

The figures given for average staff remuneration are not reduced by any cost-of-living index and can therefore not be compared directly across regions. Comparison of the relative remuneration of the three staff categories shows that Regions 1, 2 and 4 pay technical staff relatively more than administrative staff, Region 3 pays about the same to the two, while Region 5 pays administrators higher than technicians. But in none of the five regions is a technical staff member on the average paid more than half the average remuneration of an academic staff member, in most cases considerably less. An administrative staff member earns on the average less than 40% of the remuneration of an academic staff member (except for Region 5).

The report ends with a tabulation of average recurrent expenditure per student enrolled by department for England, Netherlands, Norway, Switzerland and Yugoslavia. The figures indicate substantial cost differences between fields within the same country and suggest that the relative cost of different subjects varies considerably from country to country.

APPENDIX I

CLASSIFICATION OF RANKS OF ACADEMIC STAFF IN SELECTED COUNTRIES BY THREE LEVELS[1)]

Country	Level I	Level 2	Level 3
BELGIUM	1. Professeurs Ordinaires A 2. Professeurs Extraordinaires A 3. Professeurs Associés A 4. Professeurs A à l'Institut	1. Chefs de Travaux A 2. Chefs de Travaux Associés A 3. Chargés de cours Associés A 4. Chefs de Travaux à titre Personnel	1. Lecture A 2. Assistants A 3. Assistants A. Hors cadre
NETHERLANDS	Hoogleraren	1. Lectoren 2. Buitengewoon hoogleraren 3. Buitengewoon lectoren 4. Onderwijsopdrachten 5. Wetenschappelijke hoofdmedewerkers 6. Wetenschappelijke hoofdambtenaren	1. Wetenschappelijke ambtenaren 2. Wetenschappelijke medewerkers 3. Wetenschappelijke assistenten 4. Studentassistenten
NORWAY	1. Professor	1. Dosent 2. Prospectors 3. Amanuenses 4. Konsenvator 5. Laboratorieeingenieur 6. Universitetslektor	1. Universitetsstipendiat 2. Vitenskapeligassistent
SWITZERLAND	1. Professeurs Ordinaires 2. Professeurs Extraord. 3. Professeurs Invités	1. Professeurs Suppléants 2. Professeurs assistants 3. Prof. assoc., ch. cours 4. Chargés rech./chef travaux	5. Assistants
YUGOSLAVIA	1. Permanent Professor 3. Professor	1. Docent 2. Scientific Counsellor 3. Senior lecturer 4. Lector 5. Scientific Collaborator 6. Lecturer	1. Coach 2. Assistant Professor

1) Names of ranks as reported in the returns to the Questionnaire

REFERENCES

BARTHOLOMEW, D.J.: "Mathematical Analysis of a Graded Manpower System", Paper P-3. Ford Foundation Research Program in University Administration, University of California, Berkeley 1970.

BLAUG, M. : The Productivity of Universities, published in Blaug (ed.): Economics of Education 2, London, 1969.

BRANCHFLOWER, N.H. (Jnr.): A Case Study of the Distributors of Faculty within the College of Engineering at the University of California, Berkeley for the Peeriod 1960-1968, University of California, Berkeley, 1969.

BURN, B.B : Higher Education in Nine Countries: A Comparative study of colleges and universities abroad, The Carnegie Commission on Higher Education, New York, 1971.

FREDRIKSEN, B. : "University Information Survey, 1968-69: Report on Data Collection and Processing", CERI/IM/71.21, Paris, 17th March, 1971.

KERSHAW, J.A. : Productivity in American Schools and Colleges, in Blaug (ed.): Economics of Education 2, London, 1969.

Higher Education: Report of the Committee Appointed by the Prime Minister under the Chairmanship of Lord Robbins, 1961-63, Cmnd. 2154, HMSO, London, 1963.

LEGG, K. : "Note on the extension of work on an analytical approach to university staff and facility planning", CERI/IM/69.06, Annex 1, Paris, 3rd November, 1969.

LEGG, K. : "Brief Data Analysis on a 5-University International Sample", CERI/IM/71.27, Paris, 21st May, 1971.

OECD : Development of Higher Education, 1950-57, ED(70)3, Paris, 9th November, 1970.

OECD : Quantitative Trends in Teaching Staff in Higher Education, STP(70)8, Paris, 29th May, 1970.

OECD : Towards New Structures of Post-Secondary Education, Paris, June, 1971.

OECD : Cost and Financing of Post-Secondary Education, Paris, 15th June, 1971.

OECD : Methods and Statistical Needs for Educational Planning, Paris, 1967.

OLIVER, R.M. : "An Equilibrium Model of Faculty Appointments, Promotions, and Quota Restrictions", Report No. 69-10, Ford Foundation Research Program in University Administration, University of California, Berkeley, 1969.

WOODHALL, M. and BLAUG, M. : Productivity trends in British university education: 1938-62; Minerva, Vol. 3 (1965), No. 4, pp. 483-498.