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TWO STUDIES IN EDUCATION

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IN
EDUCATION**

A. R. KAMAT

**GOKHALE INSTITUTE OF POLITICS AND ECONOMICS
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FOREWORD

WE OFFER in the present publication two studies relating to two distinct problems in collegiate and university education. In the Indian educational system, generally speaking, the under-graduate teaching is done in colleges which are either constituent or affiliated institutions of a university. One of the major functions of the universities in this area is to conduct the examinations and to assess the performance of the students. The examination is thus conducted in an impersonal manner and in a sense it is external to the teaching institutions. The defects of such a system are well known. They are sought to be corrected, at least partially, by calling for an internal assessment from the college in which the student is studying and by giving such internal assessment a certain weightage in the final assessment. Since its examinations in March 1962, the University of Poona has adopted this system for its Pre-Degree examination in Arts, Science and Commerce by according a certain credit to the term work in the college. In fact, out of a total of 100 marks assigned to a subject of examination, 20 are reserved for term work and 80 for the external examination conducted by the university. The first of the two studies being presented here reports on an investigation into how the system functioned in the first year of its introduction, namely 1962.

The most important result of the investigation is that the coefficient of correlation between the internal and external assessments is not large; it is smaller in respect of the Arts subjects than the Science subjects; and it is smaller in the colleges in the *mofussil* areas than in the colleges in Poona City and smaller still in the newer colleges than the older colleges in the *mofussil* areas. The average internal assessment was also generally higher than the average external assessment and again the difference was greater in the *mofussil* colleges than in Poona colleges and greater still in the newer *mofussil* colleges. Both these results could be expected. However, there is another striking feature which could not be expected. The dispersion of the internal assessment is generally greater, especially in Arts subjects, than the dispersion of the external assessment. This means that the internal assessment has not been undistinguishing. It distinguishes between one student and another but nevertheless does not show a high degree of correlation with the external assessment.

A direct consequence of the small correlation between the internal and the external assessment is to raise the passing-percentage. This has happened and the student community would be grateful for the same. This raises a question: Should the internal and external assessments have a high degree of correlation? The question is not simple to answer, If the correlation were

high the internal assessment would be considered unnecessary. Alternatively, it could be relied upon to an even greater extent by assigning to it a higher weightage. As it turns out, the correlation is not large. Does it throw doubt on the value and validity of the internal assessment? This would be begging the question, because it implies that the external assessment is valid and reliable. The internal assessment could be considered worthless if it was found to be undistinguishing with a small dispersion. This has not happened. Under the circumstance, a fair interpretation would be that the two assessments assess rather different qualities and therefore should be properly combined in the final result. The relative weightage to be assigned to the two assessments of course still remains unsettled.

The second study is concerned with the cost of collegiate and university education and reports on the institutional costs borne by the colleges in the area of the University of Poona as also those borne by the University of Poona in its post-graduate departments. The study is confined to the current costs and excludes the capital costs.

The results confirm well-known facts. The per pupil cost for the four-year period covering the Pre-Degree year and the three-year degree courses in Commerce, Arts and Science are approximately Rs. 1200, Rs. 1500 and Rs. 1800 respectively. The higher costs in the Science courses are of course due to the costs of laboratories and equipment. The somewhat lower costs in the Commerce as compared to those in the Arts courses are on account of the fact that Commerce courses, in comparison with the Arts courses, constitute a much more homogeneous group allowing many fewer branches of specialization. The necessity to provide for specialized branches of training in which very few students are interested undoubtedly increase the costs of collegiate and university education. For instance, even within the group of Arts subjects, the per pupil costs vary enormously from Rs. 76 and Rs. 142 in Economics and Politics to Rs. 1128 and Rs. 1166 in Sanskrit and History. For the same reason the per pupil costs in *mofussil* colleges are higher than in the colleges in Poona, because in the former the number of students in a number of subjects is too small. In the interest of economy and more equal distribution of costs among students offering different subjects of study, two measures appear necessary. Firstly, the instruction in subjects of study offered by only a few students must be confined to only a few colleges. Secondly, in the formal instruction in those subjects, the degree of specialization to be provided for will have to be much more restricted.

The per pupil per annum cost of post-graduate instruction in the university departments is four or five times as high as the under-graduate instruction in the colleges. This is inevitable. Nevertheless, there is the obvious danger of concentrating resources on post-graduate instruction founded on a very weak under-graduate base. The enormous costs of technical education such

as in Medicine and Engineering raise similar issues. These costs at the under-graduate level are again four or five times as high as those of general education in Arts and Science subjects. It is obvious that technical education requires greater and more expensive equipment and laboratories. However, there is again the danger of believing that the general education, especially in the Arts subjects where the mass of students are crowded, requires no more than a class to sit. The reasons for frustration and consequent indiscipline among the general mass of students are many. However, the manner in which their education is presently neglected because of excessive concentration of resources on a few favoured branches and students is certainly an important reason.

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February 3, 1968.

V. M. Dandekar

PREFACE

THE FIRST STUDY, "The Internal and External Assessments", was undertaken in 1962 at the suggestion of the late Professor D. G. Karve, the then Vice-Chancellor of the University of Poona, and was completed in 1963. Two articles based on it appeared in *Artha Vijnāna* in 1963, and the Appendix on Factor Analysis appeared as an article in *Indian Educational Review* in 1966 with A. G. Deshmukh and R. K. Pandit as co-authors. The second study, "Unit Institutional Costs in Higher Education", was done in 1965-66 for the Education Commission which had suggested it to the University of Poona which in turn entrusted it to us. An article incorporating its methodology was published in *Artha Vijnāna* in 1967.

I take this opportunity to thank the authorities of the University of Poona for making the relevant data available for both the studies, and the principals of the following colleges for giving us the information necessary for the second study : the Fergusson College, Poona; the B. M. College of Commerce, Poona; Shri Shahu Mandir Mahavidyalaya, Poona; the H.P.T. College, Nasik; the B.Y.K. College of Commerce, Nasik; the R. B. Borawake College, Shirampur; the C. D. Jain College of Commerce, Shirampur; the Law College, Poona; the Tilak College of Education, Poona; and the College of Engineering, Poona. I should also like to thank : Messrs A. G. Deshmukh and R. K. Pandit who helped me in the first investigation; Mrs. Saudamini Rao who assisted me in the second investigation; and Miss S. Barve for drawing excellent graphs of the distributions of marks for the first study.

A. R. KAMAT

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STUDY 1

The Internal and External Assessments

A Study based on the Pre-Degree Examination 1962 of the
University of Poona

1. Introduction

THE QUESTION of introducing internal assessment, at least in part, is being discussed in the academic circles in India for some years past. The idea is to give at least some credit in the final assessment to the work done by a student in the class during the academic year instead of judging him solely on his performance in the public examination at the end of the year as is being done for all these years by most of the universities or examination boards in this country. Schemes of giving partial credit to term work are already in force for the last few years in the M. S. University of Baroda and the Punjab University and also at the Secondary School Certificate Examination in a few States. The University of Poona also adopted a system of giving partial credit to term work in the college at the Pre-Degree course in Arts, Science and Commerce, which corresponds to the First-Year course in college after the Secondary School Certificate Examination. It came into force from the Pre-Degree examination held in 1962. As the introduction of internal assessment (even in part) is a recent development in the field of higher education in India, any such scheme deserves a careful study of its consequences as reflected in the examination results. In the present investigation we propose to study in some detail the internal and external assessments of the candidates who appeared for the Pre-Degree examination of the Poona University in March 1962. The terms internal and external assessments used in this study stand respectively for the credit obtained by a student for term work in a subject in his college and the marks obtained by him in that subject in the University examination.

It is perhaps appropriate at this stage to state briefly why such a change or reform is considered desirable by educationists. In the first place, it is argued that such a change will reduce, at least to some extent, the pressure and the strain, the tension and anxiety, which are always implicit in a single public examination at the year-end. It is also felt that this change will induce students to put in continuous work throughout the year instead of concentrating their entire effort in the few months just before the year-end public examination, neglecting their studies for the rest of the year. Thus by removing, to some extent, some of the undesirable effects of the sole dependence

on a single public examination at the end of the year, the reform is also expected to improve the prevailing low examination-results.¹

2. Scheme of Internal Assessment

The Pre-Degree course in Arts, Science or Commerce of the Poona University in 1962 consisted of seven subjects carrying 100 marks each. In Pre-Degree Science, of the seven subjects, three were Science subjects—Physics, Chemistry and Biology—carrying 70 marks for theory and 30 marks for the practical work which was assessed by an examination at the end of the year. Under the new scheme the marks in theory in each subject were divided into two parts; 80 per cent were reserved for the examination paper in the subject in the University examination held at the end of the year, and 20 per cent were assigned by internal assessment, that is, by giving credit for term work in that subject during the year. For passing in a subject a candidate must attain a minimum level of 30 per cent in the examination paper and 35 per cent in the total of 100 marks consisting of the internal assessment, the external assessment (examination paper) and the practical examination, if any. For easy reference in the following investigations this schemata is displayed below.

Scheme of assessment, and requirements for passing

	<i>Term work</i>	<i>Theory paper</i>	<i>Practical examination</i>	<i>Total</i>
<i>Maximum Marks</i>				
Science subjects	14	56	30	100
Other subjects	20	80	—	100
<i>Minimum level</i>				
Science subjects	—	17	—	35
Other subjects	—	24	—	35

According to the University regulations the credit for term work or the internal assessment in college was the average of marks obtained by the candidate in that subject in the three college examinations : that is, the first mid-terminal, the terminal and the second mid-terminal tests. Regular tutorials and their average assessment were also admissible as substitutes for the three college tests and their average score. Colleges were required to submit to the University detailed records of the results of the three tests (or tutorials) and the final credit for term work was to be expressed as marks secured out of a maximum of 20, separately in each subject.

The new scheme was applicable only to the internal candidates appearing for the examination in March 1962, that is those candidates who were regular

¹ It will be seen in section 6 that the examination results in 1962 were an improvement over the previous years.

students in a college in the academic year ended March 1962. The Poona University also provides facilities to external candidates to appear for the Pre-Degree examination in Arts and Commerce without joining a college, on certain conditions; but, it is obvious, they were outside the purview of the scheme of internal assessment.

3. Plan of investigation

The study was confined to the internal candidates who appeared for Pre-Degree examination in Arts as well as Science held in 1962; the Commerce candidates were left out for economy of investigation because, in the first place, their number was small, and secondly, the subjects in the Commerce course were more or less similar to the Arts subjects.

Further, this investigation considers only those candidates to whom the new scheme was applicable. As the new scheme came into force in the year 1961-62, such candidates were regular students in college during the academic year 1961-62 and a large majority of them appeared for the Pre-Degree examination for the first time in 1962. From amongst them we considered only those candidates who appeared for all the seven subjects in the final university examination. Those who appeared for less than seven subjects were left out.

Again, a candidate could offer a large variety of seven-subject combinations for the Pre-Degree course. It was observed, however, that a few popular subject-combinations attracted a large majority of students. We have therefore confined our attention to those candidates who offered the following major subject-combinations.

Arts : (1) English, (2) Marathi, (3) Geography, (4) Economics, (5) Civics, (6) Sanskrit or Hindi and (7) Ancient Indian Culture (AIC) or Modern World History (MW).

Science : (1) English, (2) Marathi or Hindi or Additional English (as Modern Indian Language), (3) Mathematics, (4) Physics, (5) Chemistry, (6) Biology and (7) Civics, Sanskrit, Hindi or German as an Additional Arts subject. [It should be noted that a candidate cannot choose Hindi under both heads (2) and (7)].

From previous experience² it was considered desirable to divide the candidates into three groups according to their centres of examination as follows :

- I. *Poona area* : (1) Poona City, (2) Poona Camp.
- II. *Old centres* : (3) Kolhapur, (4) Sangli, (5) Nasik, (6) Sholapur, (7) Ratnagiri, (8) Jalgaon, (9) Amalner, (10) Ahmednagar, (11) Satara.
- III. *New centres* : (12) Karad, (13) Dhulia, (14) Phaltan, (15) Malegaon, (16) Pandharpur, (17) Shrirampur, (18) Barsi, (19) Arjunagar, (20) Chalisgaon, (21) Faizpur, (22) Alibag, (23) Mahad, (24) Sawantwadi (25) Uran

² See Part II of our previous study : *Wastage in College Education*, A. R. KAMAT and A. G. DESHMUKH, 1963.

Islampur, (26) Sangamner, (27) Vengurla, (28) Ulhasnagar. (The last four centres had no candidates in Science).

4. Preliminary summary tables

To summarise what has been described above, the following tables give the total number of internal candidates who appeared for the Pre-Degree Arts and Science examinations in 1962, and their results, classified under the three groups of centres. (The figure in bracket gives the corresponding percentage. Percentages are not given for low figures in First Class.)^a

Table 1.1 : INTERNAL CANDIDATES FOR PRE-DEGREE ARTS 1962

<i>Centre</i>	<i>Appeared</i>	<i>I Class</i>	<i>II Class</i>	<i>III Class</i>	<i>Total Passed</i>	<i>Failed</i>
Poona	1343 (100.0)	5	194 (14.4)	442 (33.0)	641 (47.7)	702 (52.3)
Old Centres	3034 (100.0)	2	268 (8.8)	1229 (40.5)	1499 (49.4)	1535 (50.6)
New Centres	1257 (100.0)	—	214 (17.0)	390 (31.0)	604 (48.0)	653 (52.0)
Total	5634 (100.0)	7	676 (12.0)	2061 (36.6)	2744 (48.7)	2890 (51.3)

Table 1.2 : INTERNAL CANDIDATES FOR PRE-DEGREE SCIENCE 1962

<i>Centre</i>	<i>Appeared</i>	<i>I Class</i>	<i>II Class</i>	<i>III Class</i>	<i>Total Passed</i>	<i>Failed</i>
Poona	2470 (100.0)	166 (6.7)	862 (34.9)	575 (23.3)	1603 (64.9)	867 (35.1)
Old Centres	2801 (100.0)	166 (5.9)	837 (29.9)	629 (22.5)	1632 (58.3)	1169 (41.7)
New Centres	964 (100.0)	37 (3.8)	278 (28.8)	220 (22.8)	535 (55.5)	429 (44.5)
Total	6235 (100.0)	369 (5.9)	1977 (31.7)	1424 (22.8)	3770 (60.5)	2465 (39.5)

From the total internal candidates given in Tables 1.1 and 1.2, those who were regular students in college in the year 1961-62 (for whom therefore the

^a The rule about the award of classes is as follows: "Those of the successful candidates, who obtain 45 per cent or more of the aggregate marks for the whole of the examination shall be placed in the Second Class; and those who obtain 60 per cent or more of the aggregate marks for the whole of the examination, will be placed in the First Class."

data of internal assessment were available) and who offered the major subject-combinations mentioned above are given in the following tables along with their results. (The figure in bracket gives the corresponding percentage).

Table 2.1 : NUMBER OF CANDIDATES UNDER INVESTIGATION IN PRE-DEGREE ARTS

<i>Centre</i>	<i>Appeared</i>	<i>I Class</i>	<i>II Class</i>	<i>III Class</i>	<i>Total Passed</i>	<i>Failed</i>
Poona	743 (100.0)	1	126 (16.9)	257 (34.6)	384 (51.7)	359 (48.3)
Old Centres	2074 (100.0)	1	213 (10.3)	751 (36.2)	965 (46.5)	1109 (53.5)
New Centres	972 (100.0)	—	189 (19.4)	317 (32.6)	506 (52.1)	466 (47.9)
Total	3789 (100.0)	2	528 (13.9)	1325 (35.0)	1855 (49.0)	1934 (51.0)

Table 2.2 : NUMBER OF CANDIDATES UNDER INVESTIGATION IN PRE-DEGREE SCIENCE

<i>Centre</i>	<i>Appeared</i>	<i>I Class</i>	<i>II Class</i>	<i>III Class</i>	<i>Total Passed</i>	<i>Failed</i>
Poona	1757 (100.0)	146 (8.3)	679 (38.7)	321 (18.3)	1146 (65.3)	611 (34.7)
Old Centres	1828 (100.0)	131 (7.1)	664 (36.4)	302 (16.5)	1097 (60.0)	731 (40.0)
New Centres	731 (100.0)	34 (4.6)	245 (33.5)	116 (15.9)	395 (54.0)	336 (46.0)
Total	4316 (100.0)	311 (7.2)	1588 (36.8)	739 (17.1)	2638 (61.1)	1678 (38.9)

The number of candidates considered for this investigation in Tables 2.1 and 2.2 is appreciably smaller in each group of centres than the total number of internal candidates given in Tables 1.1 and 1.2. This is due to the following reasons: Some of the internal candidates were not regular students in a college in 1961-62; they were repeaters from earlier years. For them the scheme of internal assessment was not applicable. Among the remaining students there were those who had offered the subject-combinations different from those considered above. For instance, for the Poona centre the break-down is as follows:

	<i>Arts</i>	<i>Science</i>
Total internal candidates	1343	2470
Repeaters (Internal Assessment Scheme not applicable)	396	548
Freshers (Internal Assessment Scheme applicable)	947	1822
Major subject-combinations (covered by the sample)	743	1757
Other subject-combinations (not covered by the sample)	204	165

This shows that our investigation covered more than 75 per cent of the candidates (743 out of 947) in Arts and more than 90 per cent of the candidates (1757 out of 1822) in Science, to whom the scheme was applicable. The proportion of those covered in the other two groups of centres is even higher. This study may therefore be considered adequately representative of the Arts and the Science candidates at the Pre-Degree examination, and also of the subjects offered by the candidates.

5. Sampling scheme and other details

A sample of 400 candidates each was drawn in Arts and in Science from the candidates given in Tables 2.1 and 2.2 in each of the three groups of centres mentioned above by the method of systematic sampling.⁴

The following tables give the results of the candidates in the samples in Arts and Science in the three groups of centres.

Table 3.1 : RESULTS OF CANDIDATES IN THE ARTS SAMPLE

<i>Centre</i>	<i>Appeared</i>	<i>I Class</i>	<i>II Class</i>	<i>III Class</i>	<i>Total Passed</i>	<i>Failed</i>
Poona	400 (100.0)	1	70 (17.5)	145 (36.3)	216 (54.0)	184 (46.0)
Old Centres	400 (100.0)	—	46 (11.5)	145 (36.2)	191 (47.7)	203 (52.3)
New Centres	400 (100.0)	—	82 (20.5)	131 (32.7)	213 (53.2)	187 (46.8)
Total	1200	1	198	421	620	580
Simple percentage	(100.0)	—	(16.5)	(35.1)	(51.7)	(48.3)
Weighted percentage	(100.0)	—	(15.0)	(35.3)	(50.4)	(49.6)

⁴ The same sample-size was adopted for the three groups of centres since the results were mostly studied separately for each of the three groups. For studying the results of the whole University they may be combined with appropriate weighting factors. For instance, see the last row in Tables 3.1 and 3.2.

Table 3.2 : RESULTS OF CANDIDATES IN THE SCIENCE SAMPLE

<i>Centre</i>	<i>Appeared</i>	<i>I Class</i>	<i>II Class</i>	<i>III Class</i>	<i>Total Passed</i>	<i>Failed</i>
Poona	400 (100.0)	30 (7.5)	162 (40.5)	74 (18.5)	266 (66.5)	134 (33.5)
Old Centres	400 (100.0)	25 (6.3)	162 (40.5)	63 (15.8)	250 (62.6)	150 (37.4)
New Centres	400 (100.0)	18 (4.5)	135 (33.7)	67 (16.8)	220 (55.0)	180 (45.0)
Total	1200	73	459	204	736	464
Simple percentage	(100.0)	(6.1)	(38.2)	(17.0)	(61.3)	(38.7)
Weighted percentage	(100.0)	(6.5)	(39.4)	(17.0)	(62.9)	(37.1)

A comparison of these tables with Tables 2.1 and 2.2 from which the samples are drawn, shows that, within limits of sampling fluctuations, the proportions in the various classes in the sample are close to the proportions in the corresponding classes in the population in Tables 2.1 and 2.2. It was in fact verified that in all cases except those with very small frequencies the proportion in every category in the sample was within two standard deviations of the corresponding proportion in the same category in the population from which the sample was drawn. Thus, the samples were representative in this important character. The samples may, therefore, be considered representative for the purpose of studying the internal and external assessments.⁵

The data for the candidates in the various samples were taken from the records of the University. Marks secured by the candidates in internal and external assessments in each of the seven subjects, were, for the purpose of analysis, punched on 36-column cards. For the three Science subjects additional cards were prepared with marks obtained in the theory paper, marks for term work and marks in the practical examination. In the case of those candidates whose failures were condoned according to the University regulations, by giving them additional or grace marks in one or more subjects, these additional marks were incorporated in the marks in the theory paper, for the sake of uniformity of procedure and simplicity of analysis.⁶

⁵ The last two rows in Tables 3.1 and 3.2 give percentages in various categories for the combined samples of size 1200 by using : (i) simple averages, and (ii) weighted averages. For calculating the weighted averages the weights were taken proportional to the number of candidates in each group of centres, to whom the scheme of internal assessment was applicable, given in Tables 2.1 and 2.2. For instance in Arts the weights were in the proportion 743 : 2074 : 972. These figures may be compared with the figures given in the last two rows of Tables 2.1 and 2.2 and of Tables 1.1 and 1.2.

⁶ See sections 13, 14 and 15 in this connection where analysis with ungraded marks is done for a few subjects.

6. General improvement in results

There is no doubt that there was considerable improvement in the results of the Pre-Degree examination in 1962, as compared to the three previous years, especially in the case of Arts and Science. This can be seen from the following figures for the internal students for the four years from 1959 to 1962.

Table 4 : COMPARISON OF RESULTS FOR THE YEARS 1959-1962

<i>Year</i>	<i>Percentage of Passes</i>		
	<i>Arts</i>	<i>Science</i>	<i>Commerce</i>
1959	42.0	38.7	51.5
1960	39.9	37.7	48.8
1961	36.3	43.8	40.0
1962	48.7	60.5	50.6

There was an increase of 12, 17 and 11 points respectively in Arts, Science and Commerce in the year 1962, when the internal assessment came into force. In Commerce the percentage of passes in 1962 was of the same order as in the years 1959 and 1960 but was an improvement over the year 1961.

Again, this improvement was observed in all the three groups of centres. This can be seen from the results for the internal candidates for the years 1961 and 1962 given in Table 5. The increase in the percentage of passes is much greater in the Old Centres than that in Poona, and it is the greatest in the New Centres where the results shot up by 17, 23 and 30 points respectively in Arts, Science and Commerce.

Table 5 : COMPARISON OF RESULTS FOR DIFFERENT GROUPS OF CENTRES FOR 1961 AND 1962

<i>Centre</i>	<i>Year</i>	<i>Percentage of Passes</i>		
		<i>Arts</i>	<i>Science</i>	<i>Commerce</i>
Poona	1961	42.6	51.5	50.7
	1962	47.7	64.9	54.3
Old Centres	1961	34.9	39.6	39.1
	1962	49.4	58.3	45.1
New Centres	1961	30.6	32.1	30.6
	1962	48.1	55.5	60.7

Thus the expectation that the introduction of the new scheme with internal assessment may bring about improvement in the results, mentioned in the first section, appears to have been fulfilled.⁷ Perhaps this was also consequen-

⁷ It is quite possible that this improvement was due to other factors, e.g. improvement in teaching, changes in the content of questions asked, etc., and it is difficult to isolate the various factors.

tial to the division of marks and the requirements of passing described in section 2. If the internal assessment is assumed to be on the average relatively more liberal than the external assessment in the university examination, the reduction of the minimum requirement in the paper from 35 per cent to 30 per cent (from 28 to 24 marks out of 80) would no doubt help those candidates who obtain less than 35 per cent marks in the paper to make up for this deficiency by their having obtained much more than 35 per cent marks in the internal assessment. (This has been analysed in greater detail in sections 10, 12 and 15.)

It is also important to note that in the 1962 examinations a sizable proportion of the candidates were repeaters who did not get the benefit of the new scheme. The number of such students will go on dwindling rapidly, and in the next few years when all the internal students come under the new scheme of internal assessment, the results may show further improvement.⁸

7. Comparison of distributions in Arts

The distribution of internal assessment in a subject was compared with the distribution of the external assessment. This was first done for the Pre-Degree Arts for each of the three samples from the three groups of centres. For this purpose bivariate distributions were first prepared with x and y denoting respectively the marks in internal and external assessments. Here x and y can have values $0 \leq x \leq 20$ and $0 \leq y \leq 80$. In presenting the results, however, both scores are scaled up to denote marks obtained out of 100, so as to make them directly comparable.

Table 6 gives for each of the three samples and for each of the subjects, the average marks in internal assessment (\bar{x}), the average marks in external assessment (\bar{y}), the standard deviation of marks in internal assessment (s_x), the standard deviation of marks in external assessment (s_y), and the correlation coefficient between the internal and external assessments (r_{xy}). As mentioned above both x and y now represent percentage marks (that is marks out of 100) and are immediately comparable. For easy comparison the table also gives the difference between the internal and external assessments ($\bar{x} - \bar{y}$)

⁸ This has in fact taken place as will be seen from the following figures for the percentage of passes among the internal candidates in Pre-Degree Arts, Science and Commerce in the next three years.

Percentage of passes in the Pre-Degree Examinations 1963-1965

Year	Percentage of Passes		
	Arts	Science	Commerce
1963	49.4	57.9	54.3
1964	54.2	62.0	60.1
1965	56.0	60.0	64.2

and the ratio of the standard deviations (s_x/s_y). It should be noted that while for each of the five subjects English, Marathi, Geography, Civics and Economics the sample size is 400, the sample size for other subjects which are alternatives to one another (Hindi and Sanskrit in the Second Language, and Ancient Indian Culture and Modern World in History) is less than 400.

The difference $\bar{x} - \bar{y}$ was statistically tested by the t -test. (The procedure followed was the paired-comparison test and is briefly described in Appendix 1). Values of t are given in column 7 of the table; the stars denote the level of significance reached by the difference $\bar{x} - \bar{y}$ and N.S. denotes that the difference is not significant. (These symbols and the abbreviation N.S. are also explained in Appendix 1). The difference between the variances s_x^2 and s_y^2 , was also statistically tested by calculating the correlation coefficient r' between $x + y$ and $x - y$. (The test procedure followed for this comparison is also briefly described in Appendix 1). Values of r' are given in column 11 of the table; again the stars and N.S. denote the level of significance attained by r' , that is, by the difference between s_x^2 and s_y^2 , and have the same meaning as in the case above. The last column gives r_{xy} the correlation coefficient between x and y together with the level of significance attained by it.

It is clear from column 7 of Table 6 that the average internal assessment \bar{x} differs from the average external assessment \bar{y} in almost all subjects for all centres. In most cases the difference is highly significant. But it is also evident that the three groups of centres have very different patterns.

In Poona the average internal assessment is not greater than the average examination marks in every subject; in Marathi, Civics, Sanskrit and Hindi it is actually less; in Geography and Ancient Indian Culture it is greater, but the difference is negligible; and in other subjects it is not greater than four per cent. In the Old Centres the difference is always positive and greater than that in Poona although it is never greater than six per cent. But in the New Centres the average score in internal assessment is much higher in every subject. The difference is higher than eight per cent in all subjects except Marathi where it is 6.9, and it is as high as 12 and 18 per cent in some subjects. There is no doubt that the internal assessment has been more liberal than the examination marks.

Comparing the standard deviation of the internal assessment scores and the examination marks, we find that they differ significantly for all subjects at all centres. The internal scores have a greater dispersion in each subject; the ratio s_x/s_y is greater than unity for all subjects and at each group of centres. This is perhaps due to the fact that the internal score is not the result of the final effort of the student, which is actually reflected in the examination score where the scatter of marks would naturally tend to be less. What is also of some importance is to note that s_x/s_y was very high at the *mofussil* centres for some subjects such as Hindi, and Ancient Indian Culture.

It can be concluded therefore that the distributions of the internal assessment scores and the examination marks are different for most subjects and

Table 6 : COMPARISON OF INTERNAL AND EXTERNAL ASSESSMENTS FOR PRE-DEGREE ARTS

Subject	Centre	Size	\bar{x} Average of internal assessment	\bar{y} Average of external assessment	$\bar{x} - \bar{y}$	t (to test $\bar{x} = \bar{y}$)	S_x Standard deviation of internal assessment	S_y Standard deviation of external assessment	S_x/S_y	r (to test $S_x = S_y$)	r_{xy} Correlation between internal and external assessments
English	Poona	400	35.2	33.0	2.2	5.70***	8.69	6.92	1.256	0.244 ***	0.488 ***
	Old	400	33.6	30.1	3.5	5.89***	12.50	7.47	1.673	0.490 ***	0.419 ***
	New	400	40.2	30.9	9.3	12.19***	16.04	8.79	1.836	0.571 ***	0.373 ***
Marathi	Poona	400	44.7	45.8	- 0.9	2.04*	11.40	8.00	1.425	0.380 ***	0.470 ***
	Old	400	41.3	40.6	0.7	1.15(N.S.)	12.65	6.60	1.916	0.594 ***	0.330 ***
	New	400	48.4	41.5	6.9	12.10***	11.88	6.33	1.877	0.581 ***	0.339 ***
Geography	Poona	400	37.3	36.6	0.7	1.27(N.S.)	13.66	10.23	1.335	0.344 ***	0.410 ***
	Old	400	41.1	36.6	4.5	6.76***	14.47	9.77	1.481	0.451 ***	0.448 ***
	New	400	48.4	36.3	12.1	19.56***	13.29	10.02	1.326	0.302 ***	0.467 ***
Economics	Poona	400	38.7	34.6	4.1	6.46***	14.22	7.48	1.901	0.617 ***	0.483 ***
	Old	400	40.4	34.5	5.9	9.22***	13.21	8.30	1.591	0.458 ***	0.353 ***
	New	400	46.5	36.6	9.9	12.57***	15.06	10.51	1.433	0.359 ***	0.289 ***
Civics	Poona	400	42.2	45.0	- 2.8	4.75***	12.26	6.55	1.872	0.577 ***	0.322 ***
	Old	400	40.6	37.4	3.2	5.91***	12.03	7.40	1.625	0.481 ***	0.487 ***
	New	400	49.9	36.8	13.1	19.38***	13.37	7.62	1.754	0.522 ***	0.247 ***
Sanskrit	Poona	102	41.1	47.0	- 5.9	2.38*	14.26	10.17	1.402	0.398 ***	0.585 ***
	Old	79	49.1	43.8	5.3	5.42***	13.11	9.91	1.322	0.394 ***	0.752 ***
	New	166	56.3	44.5	11.8	11.24***	16.13	9.57	1.685	0.552 ***	0.556 ***
Hindi	Poona	298	38.9	40.7	- 1.8	3.50***	9.96	6.26	1.591	0.476 ***	0.461 ***
	Old	321	39.3	38.1	1.2	1.75(N.S.)	12.76	7.09	1.799	0.544 ***	0.285 ***
	New	234	47.0	38.5	8.5	12.95***	12.12	6.00	2.020	0.683 ***	0.574 ***
Ancient Indian Culture	Poona	191	39.2	39.1	0.1	0.13(N.S.)	13.35	8.40	1.589	0.466 ***	0.415 ***
	Old	281	43.6	37.0	6.6	10.07***	11.63	7.81	1.489	0.410 ***	0.413 ***
	New	332	50.4	36.8	13.6	15.57***	15.79	6.68	2.363	0.703 ***	0.197 ***
Modern World	Poona	209	37.7	34.4	3.3	3.83***	13.79	8.19	1.683	0.516 ***	0.424 ***
	Old	119	39.5	33.7	5.8	5.45***	12.56	8.45	1.486	0.416 ***	0.459 ***
	New	68	48.1	29.3	18.8	8.46***	13.73	10.13	1.355	0.298 *	-0.159 (N.S.)

(N.B. : Marks in internal and external assessments are both scaled up to 100 so as to make them comparable.)

for most of the centres. This is especially true of the *mofussil* centres and the difference is very pronounced in the case of the New Centres in the *mofussil*.

The differences between the distributions of the internal and external scores of Pre-Degree Arts are also well brought out by their graphical representation. They are shown on the next two pages for the two subjects—English and Economics, for the three groups of centres. Here, one unit of length on the horizontal axis represents one mark of internal assessment and four marks of external assessment so that the two scores are brought to a common scale. One unit of length on the vertical axis represents 20 candidates. The graphs which are frequency polygons show very clearly that the distribution of internal scores is to the right of the distribution of examination scores and this is especially marked in the right hand tails for the New Centres. The greater dispersion of the internal scores is also evident from the graphical representation. The high peaks for the graphs of the examination scores are also worth noting; they are to some extent due to the gracing-procedure described in section 9.⁹

The correlation coefficients between the internal and external scores are given in column 12 of Table 6. They are all very highly significant. But it is clear that most of them lie between .3 and .5 and do not therefore indicate much predictive value for the internal score for anticipating marks in the external assessment. The variation explained is never greater than 25 per cent, except in the case of Sanskrit at all centres and Hindi in the New Centres. It should be pointed out that for the New Centres in the subject Modern World the correlation is negative! This is perhaps another aspect of the very high difference (almost 19 points in the averages \bar{x} and \bar{y}) between the internal and external scores which was noted above.

8. Comparison of distributions in Science

For the Pre-Degree Science the seven subjects were conveniently divided into four groups: (1) English, (2) and (3) Modern Indian Language and Additional Arts subject, (4) Mathematics, and (5), (6), (7) the three Science subjects of Physics, Chemistry and Biology. Table 7 gives the means \bar{x} and \bar{y} , the standard deviations s_y and s_x and the correlation coefficient r_{xy} for the internal and examination scores. Other columns of the Arts table are also given. The scores are all scaled up to denote per cent marks or marks out of 100.

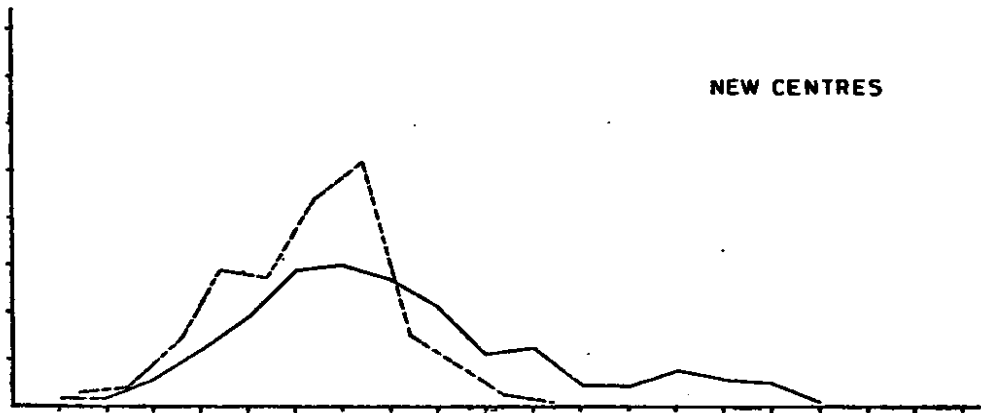
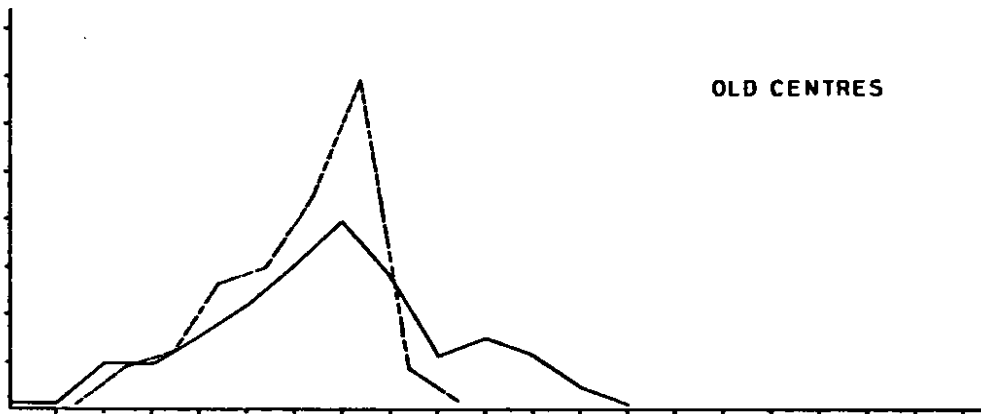
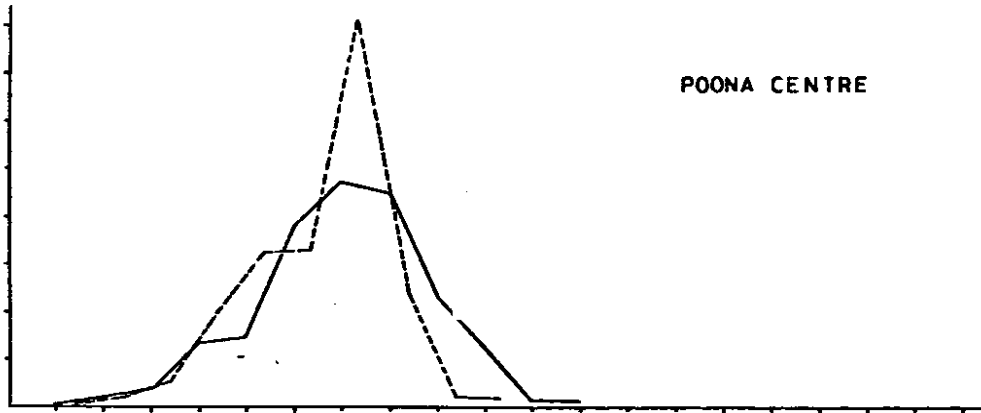
Here again we find that the internal assessment differs from the external assessment both in the average marks and in the standard deviations in most subjects and most centres; and these differences are in most cases highly significant.

So far as English is concerned the pattern is not very different from that

⁹ For additional discussion of the graphs see Appendix 2.

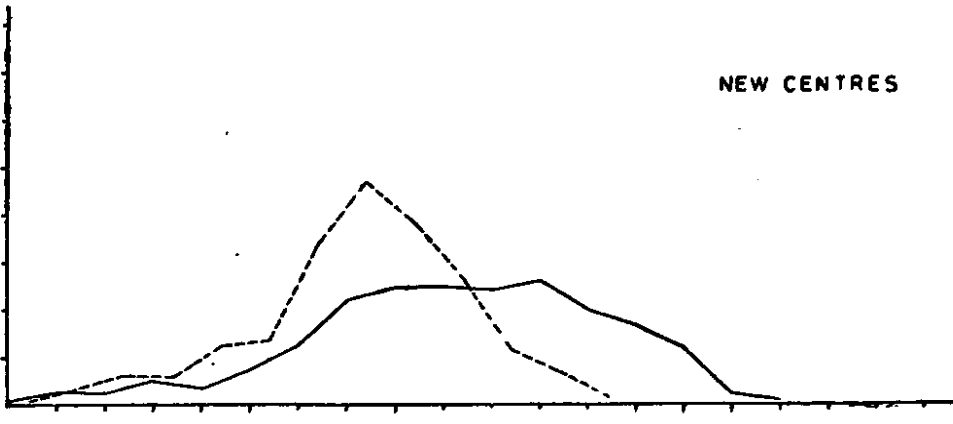
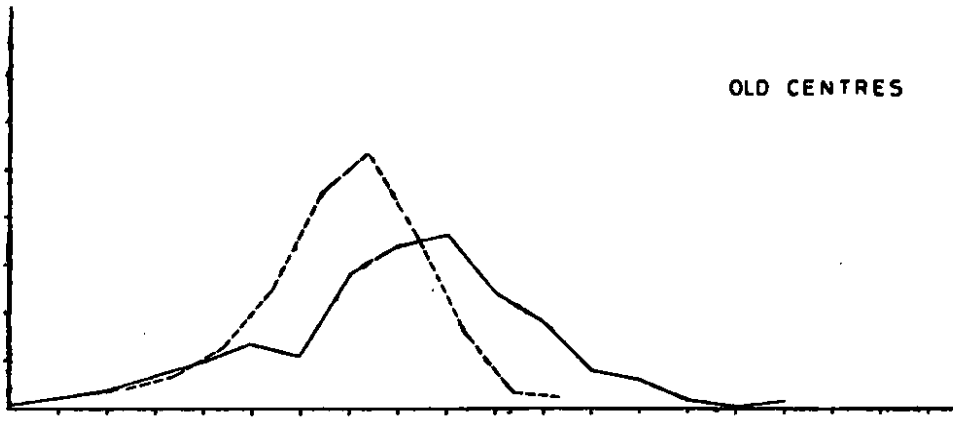
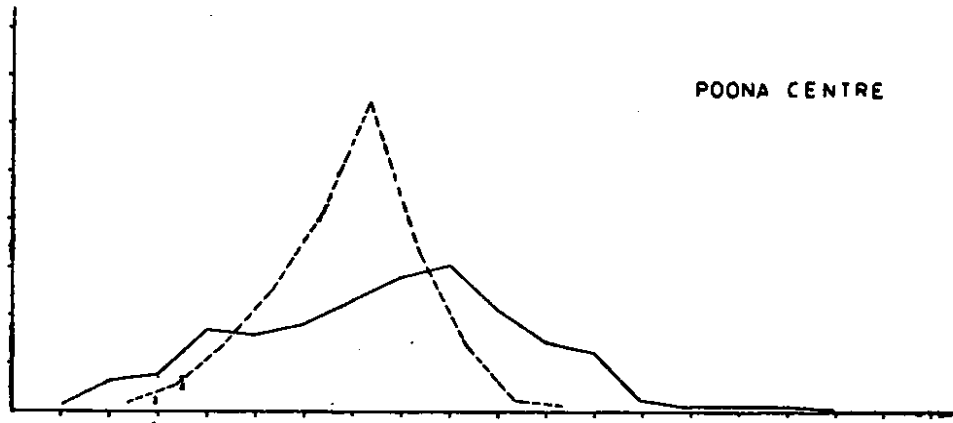
PRE-DEGREE ARTS : ENGLISH

— INTERNAL SCORE
- - EXAMINATION MARKS



PRE-DEGREE ARTS : ECONOMICS

— INTERNAL SCORE
--- EXAMINATION MARKS



in Arts; that is, the average internal scores are greater than the examination marks ($\bar{x} > \bar{y}$) and they are more dispersed ($s_x > s_y$). But there is not much difference between the centres in these respects.

The subjects Modern Indian Language and Additional Arts have many options, and Table 7 gives only those for which there are sizable numbers: Marathi, Hindi, Civics and Sanskrit. Here again we find that the patterns are comparable to the same subjects in Arts although there are also some important differences. The average internal score (\bar{x}) is less than the average examination score (\bar{y}) in most subjects in Poona, and the difference is not very pronounced in the Old Centres; but in the New Centres the average internal score (\bar{x}) is appreciably greater than the examination score (\bar{y}) in all subjects. However, this difference is not as great as in the case of Arts students. This seems to be a characteristic of Science students—that the difference $\bar{x} - \bar{y}$ is not as high for them as for Arts students in the *mofussil* students. (We shall see below that for Science subjects the difference is mostly negative.) So far as the dispersions are concerned, similar to what was found for Arts, the internal scores have a greater dispersion than the examination scores.

It should be mentioned here that the subjects discussed so far for the Pre-Degree Science have identical papers with the same subjects for Pre-Degree Arts. This largely accounts for the similarity between the patterns observed. The difference in pattern where it exists has to be attributed to the difference between the quality of students offering Science and Arts, and to the different orientation of the two courses. It is well known that Science attracts, to a very large extent, the top layer of the students passing the S.S.C. examination. It is also clear that Science students would concentrate their efforts more on Mathematics and the three Science subjects than on languages and the Arts subject. Another factor which makes for difference is that a large majority of Arts students, often as high as 90 per cent,¹⁰ learn their subjects (except English) through the Marathi medium and also write answers in the examination, in Marathi. Science students learn English, Mathematics and the three Science subjects through the English medium and also write answers in English in these papers in the examinations. They can exercise option for the Marathi medium only for the two papers of Modern Indian language and Additional Arts subject.

Let us now consider Mathematics and the three Science subjects of Physics, Chemistry and Biology. (It should be noted that for the Science subjects we are at this stage only comparing the distributions of internal and external examination scores in theory leaving out for the present the marks in the practical examination. See section 2.) All figures in Table 7 are scaled up to denote per cent marks or marks out of 100, so as to make them comparable. Scanning the figures we find that the internal average score (\bar{x}) is less than the examination marks (\bar{y}) in all cases except in Biology in the New Centres.

¹⁰ See Analysis of Failures in Pre-Degree Course of the Poona University, Part II of *Wastage in College Education*, A. R. KAMAT and A. G. DESHMUKH, 1963.

Table 7 : COMPARISON OF INTERNAL AND EXTERNAL ASSESSMENTS FOR PRE-DEGREE SCIENCE

Subject	Centre	Size	\bar{x} Average of internal assessment	\bar{y} Average of external assessment	$\bar{x} - \bar{y}$	t (to test $\bar{x} = \bar{y}$)	s_x Standard deviation of internal assessment	s_y Standard deviation of external assessment	s_x/s_y	r' (to test $s_x = s_y$)	r_{xy} Correlation between internal and external assessment
English	Poona	400	39.1	36.8	2.3	6.68 ***	9.05	6.11	1.482	0.466 ***	0.635 ***
	Old	400	36.2	33.6	2.6	4.97 ***	9.56	7.50	1.274	0.290 ***	0.588 ***
	New	400	36.2	33.6	2.6	5.74 ***	11.08	8.79	1.261	0.278 ***	0.609 ***
Physics	Poona	400	37.2	51.4	-14.2	21.28 ***	17.04	20.41	0.835	0.269 ***	0.761 ***
	Old	400	39.1	51.4	-12.3	15.56 ***	17.95	18.67	0.962	0.056 (N. S.)	0.634 ***
	New	400	41.5	49.5	-8.0	11.58 ***	19.19	17.47	1.098	0.134 **	0.722 ***
Chemistry	Poona	400	32.7	48.3	-15.6	17.39 ***	16.29	19.21	0.848	0.188 ***	0.500 ***
	Old	400	46.6	48.8	-2.2	3.39 ***	17.19	17.41	0.987	0.018 (N. S.)	0.725 ***
	New	400	39.9	42.9	-3.0	3.42 ***	18.45	17.72	1.041	0.063 (N. S.)	0.717 ***
Biology	Poona	400	36.5	42.1	-5.6	10.14 ***	13.95	13.99	0.997	0.003 (N. S.)	0.324 ***
	Old	400	38.8	42.0	-3.2	5.62 ***	14.62	12.95	1.129	0.163 **	0.677 ***
	New	400	42.2	36.7	5.5	8.59 ***	17.39	12.02	1.477	0.463 ***	0.679 ***
Mathe- matics	Poona	400	35.6	41.9	-6.3	8.53 ***	21.29	20.87	1.020	0.031 (N. S.)	0.761 ***
	Old	400	40.0	42.0	-2.0	2.58 *	19.14	19.62	0.976	0.033 (N. S.)	0.678 ***
	New	400	37.6	37.5	0.1	0.13 (N. S.)	21.23	20.24	1.049	0.065 (N. S.)	0.714 ***
Marathi	Poona	265	46.6	44.3	2.3	4.38 ***	10.69	7.44	1.436	0.424 ***	0.608 ***
	Old	348	42.9	43.8	-0.9	1.83 (N. S.)	9.90	6.39	1.549	0.455 ***	0.469 ***
	New	362	46.0	43.0	3.0	6.59 ***	10.78	6.90	1.562	0.501 ***	0.604 ***
Civics	Poona	217	39.1	43.3	-4.2	6.58 ***	11.66	9.64	1.209	0.251 ***	0.618 ***
	Old	182	42.1	36.8	5.3	7.57 ***	9.54	8.14	1.171	0.192 ***	0.440 ***
	New	194	43.2	34.5	8.7	13.51 ***	12.72	8.88	1.432	0.379 ***	0.371 ***
Hindi	Poona	127	41.3	42.3	-1.0	1.55 (N. S.)	8.59	8.78	0.978	0.028 (N. S.)	0.586 ***
	Old	185	42.5	40.7	1.8	2.43 *	10.39	7.62	1.363	0.331 ***	0.469 ***
	New	183	45.8	39.0	6.8	11.04 ***	10.23	6.99	2.143	0.438 ***	0.598 ***
Sanskrit	Poona	65	48.1	48.5	-0.4	0.33 (N. S.)	12.91	9.03	1.429	0.521 ***	0.783 ***
	Old	66	50.4	46.8	3.6	3.48 ***	13.10	9.15	1.432	0.508 ***	0.775 ***
	New	58	51.3	44.9	6.4	3.65 ***	15.48	8.80	1.759	0.578 ***	0.523 ***

(N.B. : Marks in internal and external assessments are both scaled up to 100 so as to make them comparable.)

But so far as the differences between centres are concerned the relative situation is similar to what was found for Arts. That is, the internal scores are relatively higher in the *mofussil* centres than in Poona and more so in the New Centres. Considering the dispersions we find that the dispersion of internal scores (s_z) is not always greater than that for examination marks (s_y). In fact in Poona and the Old Centres it is very often less; it is only in the New Centres that it is greater for all the four subjects but the ratio is not very far from unity.

This is also reflected in the graphical frequency representations of the internal scores and the examination marks, drawn on the same scale. The frequency polygons are given here for Mathematics and Biology on the next two pages. It is found that the shapes of the distributions as well as their relative positions are quite different from the distributions for Arts subjects. Here the distribution of the internal marks appears to lag behind the distribution of examination scores. The zig-zag distributions in Mathematics with far greater spread are also a remarkable feature.¹¹

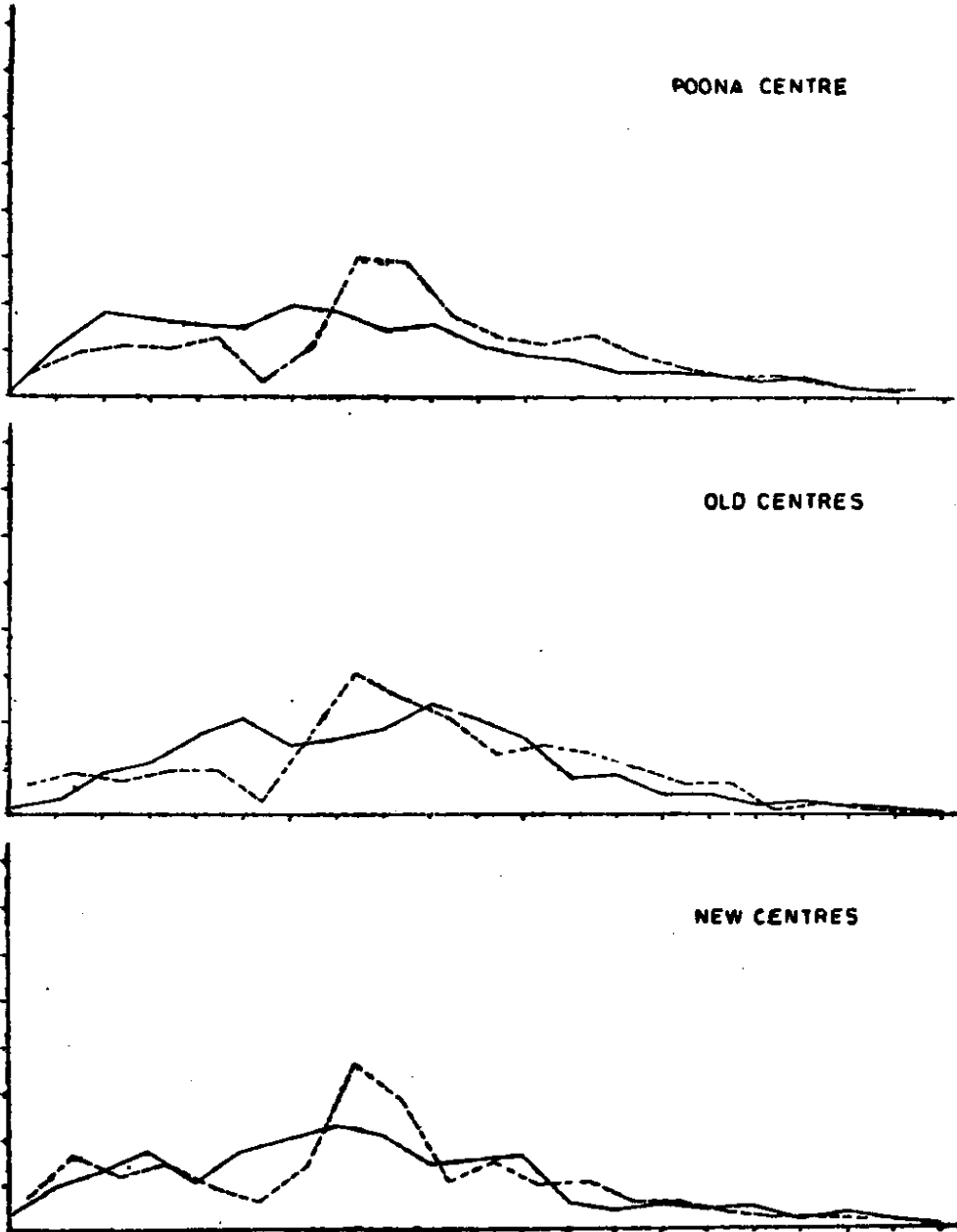
It is clear therefore that the difference between the distributions of the internal scores and the examination marks is not as pronounced for Science subjects as for Arts subjects. Secondly, where it exists it is in the opposite direction. This is perhaps to be explained by the fact that Science students must be finding it difficult to cope with their course in the initial stages because of the difficulties of language, lecturing-method (and, very often, large numbers in the class). As the year progresses, however, especially towards the tail-end of the year, they must be trying their best to make up for this initial handicap. It should also be mentioned here in this connection that the internal score is usually based on the three college-examinations, the last of which would still leave an interval of two months or ten weeks to prepare for the final University examination.

Let us now consider the correlations between the internal scores and the examination marks for Science students. It is found that for all subjects (whether for Science subjects or others) the correlations are much higher than those found in the case of Arts students. The coefficients generally lie between .500 and .750 and thus explain between 25 and 55 per cent of the variability. In other words, for Science students the internal scores have greater predictive value for preceding marks in the final examination. This is due to the greater qualitative homogeneity of the Science students as observed in their high S.S.C. marks, and perhaps also due to the inherent character of Science subjects. Although the correlations in this case are much higher than for Arts students, they are nowhere so high as to provide a really effective prediction; the value of the correlation coefficient has to be as high as .9 or thereabout for this purpose.

¹¹ For additional discussion of the graphs see Appendix 2.

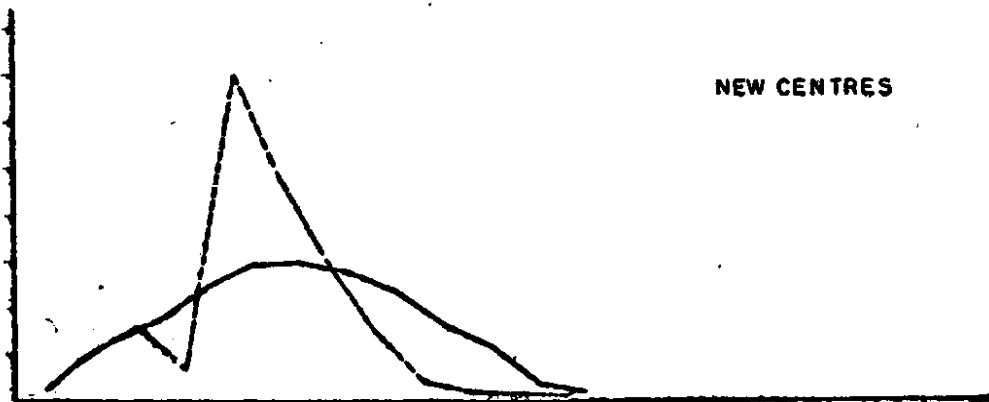
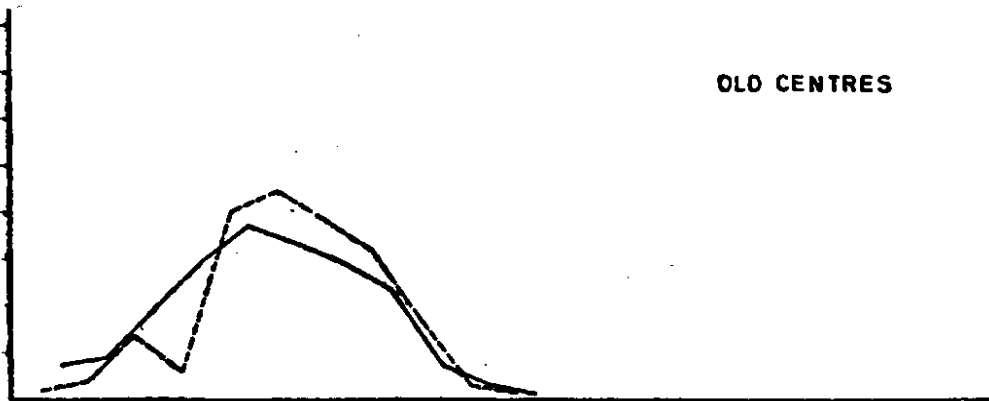
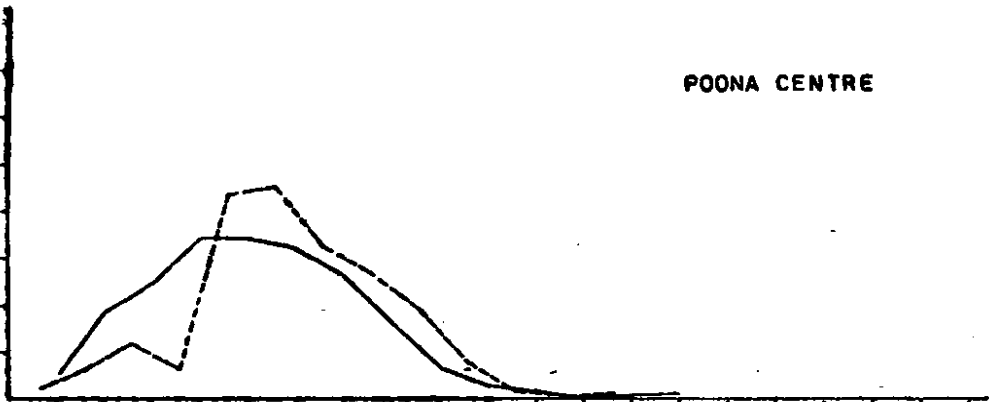
PRE-DEGREE SCIENCE MATHEMATICS

—INTERNAL SCORE
--EXAMINATION MARKS



Pre-DEGREE SCIENCE: BIOLOGY

— INTERNAL SCORE
- - EXAMINATION MARKS



9. Modification of examination marks due to gracing

The analysis and the remarks given above deal with the internal marks and examination marks as recorded in the final results. It must be mentioned, however, that before finalizing them gracing (raising of marks of those students who fail by a narrow margin) was done in two stages. In the first place, the board of examiners in a subject raised to 35 the total of internal marks and examination marks of all those candidates who had a deficiency of a few marks to the over-all passing-score of 35. This was done by raising the examination marks by the required number of marks to make up the deficit, leaving unaffected the internal score. Secondly, when the modified results in all the subjects were assembled, those who failed in one subject were graced up if the failure was by a narrow margin. As mentioned on page 7, we have included the added marks for such students in the examination marks. As a consequence of this two-fold gracing the distribution of the total marks (the internal and external assessments together) show a large concentration of frequency at the passing-level of 35 marks. Tables 8 and 9 give the percentage of students in the sample scoring equal to or less than a specified number of marks in a subject, from 23 marks to 38 marks. This is shown for the five subjects in Arts, viz., English, Marathi, Geography, Civics and Economics, where there were samples of 400 each and for English and Mathematics in Science where the sample size was 400 and where there was no practical examination. From the scrutiny of the figures, it will be seen that the minimum marks, which were raised to the passing-level of 35, are as follows:

Arts—English (30), Marathi (31), Geography (28), Civics (31) and Economics (31).

Science—English (30), Mathematics (24)¹².

There is no doubt that this gracing (the bulk of which is often at the first stage) is quite substantial especially in English, Geography, Economics and Mathematics where the number of failures otherwise would have been very large. As mentioned above, one consequence of this gracing is the large concentration of frequency at 35 (which is given in the last but one row of the tables) in comparison with frequencies at the marks next to it below and above (given in the rows above and below).

This gracing and the manner in which it has been done have clearly modified the distributions of examination marks so as to give us the distributions discussed in sections 7 and 8. It means in effect that the average examination marks considered in these sections are somewhat greater than what they would be for the original (ungraced) examination marks. Hence the difference ($\bar{x} - \bar{y}$) between the internal marks and examination marks, when

¹² There is a very small number of students who have marks between this minimum number of marks and 35 in some subjects and who have not been graced up. The reason appears to be that their examination marks were far too below the prescribed level of 24 for the theory paper. They are ignored for our purpose.

Table 8 : CUMULATIVE FREQUENCY DISTRIBUTIONS (PERCENTAGE) BY TOTAL MARKS IN A SUBJECT — P.D. ARTS EXAMINATION 1962

Subject Centre Marks	English			Marathi			Geography			Civics			Economics		
	Poona	Old	New	Poona	Old	New	Poona	Old	New	Poona	Old	New	Poona	Old	New
23 or less	9.5	21.7	16.0	0.2	1.5	0.5	14.0	9.0	8.5	0.5	3.7	2.7	8.5	7.2	8.2
24 "	12.0	24.7	18.7	0.5	2.2	0.5	16.2	9.7	9.7	0.5	5.7	3.5	10.0	9.0	9.5
25 "	14.7	27.2	23.5	0.7	2.5	0.5	18.2	12.5	10.7	0.7	6.5	4.5	13.0	10.2	9.7
26 "	17.5	32.7	27.0	0.7	2.5	0.7	19.5	16.2	12.0	1.2	8.2	5.2	15.0	13.0	11.0
27 "	22.0	36.5	32.2	0.7	3.0	0.7	23.2	17.7	14.7	1.5	9.5	6.7	19.0	16.2	14.2
28 "	25.5	39.0	35.0	0.7	4.2	1.2	26.5	20.2	17.2	1.5	11.7	8.0	22.2	19.5	17.0
29 "	28.2	41.7	37.0	1.5	5.2	2.0	26.5	20.2	17.5	1.5	13.2	9.2	23.2	21.7	19.2
30 "	31.2	44.5	39.7	1.5	7.5	3.2	26.5	20.2	17.5	2.5	15.7	12.2	26.2	25.0	21.5
31 "	31.5	44.5	39.7	2.2	8.7	5.2	26.5	20.2	17.5	3.0	18.7	14.0	27.5	28.5	22.0
32 "	31.5	44.5	40.2	2.2	8.7	5.2	26.7	20.2	17.5	3.0	18.7	14.0	27.5	28.5	22.0
33 "	31.5	44.5	40.2	2.2	8.7	5.5	27.0	20.2	17.5	3.0	18.7	14.2	27.5	28.5	22.2
34 "	31.5	44.5	40.2	2.2	8.7	5.5	27.0	20.2	17.5	3.0	18.7	14.5	27.5	28.5	22.2
35 "	65.5	79.7	66.0	9.7	20.7	13.0	55.5	43.2	39.0	9.2	38.7	28.5	51.7	52.2	32.5
36 "	72.0	83.2	70.0	12.2	25.7	17.2	60.0	50.0	41.5	12.7	44.5	33.5	58.0	57.2	35.7
37 "	77.0	86.7	72.7	17.2	32.0	21.0	62.5	55.5	48.2	16.2	49.2	40.5	64.0	61.7	40.0
38 "	82.2	91.0	78.5	19.7	38.2	25.7	66.7	60.5	52.5	20.2	55.5	46.2	69.2	65.5	44.2
(i) Last significant frequency at marks below 35	3.0	2.7	2.7	0.7	1.2	0.2	3.2	2.5	2.5	0.5	3.0	1.7	1.2	3.5	0.5
(ii) Frequency at 35	34.0	35.2	25.7	7.5	12.0	7.5	28.5	23.0	21.5	6.2	20.0	14.0	24.2	23.7	10.2
(iii) Frequency at 36	6.5	3.5	4.0	2.5	5.0	4.2	4.5	6.7	2.5	3.5	5.7	5.0	6.2	5.0	3.2

Table 9 : CUMULATIVE FREQUENCY DISTRIBUTIONS (PERCENTAGE) BY TOTAL MARKS IN A SUBJECT — P.D. SCIENCE EXAMINATION 1962

<i>Subject Centre Marks</i>	<i>English</i>			<i>Mathematics</i>		
	<i>Poona</i>	<i>Old</i>	<i>New</i>	<i>Poona</i>	<i>Old</i>	<i>New</i>
23 or less	2.2	10.7	14.2	23.5	19.7	28.0
24 "	3.2	13.7	16.7	25.0	21.2	29.7
25 "	3.7	15.7	18.5	25.0	21.2	30.2
26 "	5.5	19.0	22.5	25.0	21.2	30.2
27 "	8.7	22.5	27.0	25.0	21.2	30.2
28 "	12.0	25.2	28.5	25.0	21.2	30.2
29 "	15.2	26.2	31.2	25.0	21.5	30.5
30 "	20.2	30.5	32.7	25.0	21.5	30.5
31 "	20.7	30.5	33.2	25.0	21.5	30.5
32 "	20.7	30.5	33.5	25.0	21.5	30.5
33 "	20.7	30.5	33.7	25.0	21.5	30.5
34 "	20.7	30.5	34.0	25.0	21.5	30.5
35 "	43.5	62.7	59.0	45.7	39.7	50.2
36 "	54.0	69.2	64.5	48.0	40.7	54.0
37 "	58.7	75.2	69.5	50.2	43.0	55.5
38 "	63.7	78.5	74.5	51.7	47.7	57.0
(i) Last significant frequency at marks below 35	5.0	4.2	1.5	1.5	1.5	0.7
(ii) Frequency at 35	22.8	32.2	25.0	20.7	18.2	19.7
(iii) Frequency at 36	10.5	6.5	5.5	2.2	1.0	3.7

positive, (as in the Arts subjects,) would be, in fact, even greater than what was noted in sections 7 and 8, and when negative, it would be somewhat less in magnitude. Again, it is clear that this raising of the examination marks would in most cases concentrate them in the middle portion thus decreasing the dispersion. The values of s_y considered in sections 7 and 8 would therefore be somewhat less than the values of the standard deviation of ungraced examination marks except in subjects like English where the general examination score is very low. This means that the ratios of the dispersions of the internal assessment and the ungraced examination marks would be somewhat less than those obtained in sections 7 and 8. Finally it is expected that this gracing up would slightly decrease the positive correlation between the internal score and examination marks because of the reverse relationship between grace marks and the internal scores in the case of the candidates who were benefited by gracing. The conclusions drawn in sections 7 and 8 in respect of comparison of the distributions of the internal and examination

marks may therefore be appropriately modified in the light of gracing which has affected the distribution of examination marks. (See also section 14.)

10. Effect of the new scheme on the passes in a subject

How the introduction of the new scheme (of combining internal assessment with examination marks) modified the number of passes in a subject was then studied. This was first done for the five subjects English, Marathi, Geography, Civics and Economics in Arts and for the two subjects English and Mathematics in Science, where there was no practical examination. The introduction of the new scheme had also affected the number of candidates placed in first class and second class. But the latter was not attempted for two reasons. In the first place, it was more complicated because classes are declared on the basis of the total marks in all subjects and not in an individual subject; secondly, because the examination marks were 80 per cent and the internal assessment was only 20 per cent, it was clear that the introduction of the new scheme would affect the candidates on the margin of passing-level to a much greater extent than it would affect the candidates in first or second class.

Tables 10 and 11 give the number of candidates and a percentage in each sample for each of the subjects mentioned above classified into several categories according to the internal assessment (x) and the examination marks (y). Here x lies between 0 and 20 and y between 0 and 80, and y is the recorded figure, that is, the figure obtained after gracing, as considered in sections 7 and 8. It is also necessary to recall the requirements for passing in a subject given in section 2. The different categories in Tables 8 and 9 are as follows :

(a) $y \geq 24$ and $x + y \geq 35$: This is the requirement of passing under the new scheme for the subjects considered in Tables 8 and 9. The percentage of passes under the new scheme is therefore given by this category. (Since it is not our intention in the present study to compare the percentage of passes in different subjects or at different centres, comments are confined only to the effects of the introduction of the new scheme).

(b) $y \geq 28$: This corresponds to the passing-requirement under the old scheme where it was necessary to obtain 35 per cent of marks in the examination and no credit was given for term work. This category therefore represents the number of students in each sample who would have passed under the old scheme.

(c) *The difference between (a) and (b)* : The difference between (a) and (b) represents the gain in the number of passes due to the introduction of the new scheme. This number is quite substantial for many subjects, reaching 26 per cent in Geography, for the New Centres. Where (b) is large, as in Marathi, (c) is small, but where (b) is small, as in English or Geography, (c) is large. This is as it should be. The marginal cases benefited by the rule are naturally higher when the marks in the examination paper are rela-

Table 10 : CERTAIN CATEGORIES OF CANDIDATES CLASSIFIED BY INTERNAL AND EXTERNAL ASSESSMENTS IN ENGLISH, MARATHI, GEOGRAPHY AND ECONOMICS

($x =$ Internal Assessment out of 20; $y =$ External Assessment out of 80)

Subject Centre Category		English			Marathi			Geography			Economics		
		Poona	Old	New	Poona	Old	New	Poona	Old	New	Poona	Old	New
(a) $y > 24, x + y > 35$	N	274	222	239	391	365	378	292	318	328	290	285	310
	P	68.5	55.5	59.7	97.7	91.2	94.5	73.0	79.5	82.0	72.5	71.2	77.5
(b) $y > 28$	N	216	156	157	377	338	348	240	248	224	228	216	255
	P	54.0	39.0	39.2	94.2	84.5	87.0	60.0	62.0	56.0	57.0	54.0	63.7
(c) $= (a) - (b)$	N	58	66	82	14	27	30	52	70	104	62	69	55
	P	14.5	16.5	20.5	3.5	6.7	7.5	13.0	17.5	26.0	15.5	17.2	13.7
(d) $24 < y < 28$ $x + y > 35$	N	58	67	82	14	28	33	52	70	104	62	71	56
	P	14.5	16.7	20.5	3.5	7.0	8.2	13.0	17.5	26.0	15.5	17.7	14.0
(e) $y > 28$ $x + y < 35$	N	0	1	0	0	1	3	0	0	0	0	2	1
	P	0	0.2	0	0	0.2	0.7	0	0	0	0	0.5	0.2
(f) $y > 24$ $= (a) + (g)$	N	282	245	246	396	377	390	297	324	329	309	305	322
	P	70.5	61.2	61.5	99.0	94.2	97.5	74.2	81.0	82.2	77.2	76.2	80.5
(g) $y > 24, x + y < 35$	N	8	23	7	5	12	12	5	6	1	19	20	12
	P	2.0	5.7	1.7	1.2	3.0	3.0	1.2	1.5	0.2	4.7	5.0	3.0
(h) $x > 7$	N	258	220	261	353	329	372	251	300	360	269	310	338
	P	64.0	55.0	65.2	88.2	82.2	93.0	62.7	75.0	90.0	67.2	77.5	84.5
(i) $x > 11$	N	4	34	81	89	66	133	47	87	157	65	67	151
	P	1.0	8.5	20.2	22.2	16.5	33.2	11.7	21.7	39.2	16.2	16.7	37.7
(j) $x > 11, x + y < 35$	N	0	3	7	0	0	1	0	0	2	2	9	6
	P	0	0.7	1.7	0	0	0.2	0	0	0.5	0.5	2.2	1.5
(k) $x < 4$	N	37	75	42	18	27	5	54	43	13	63	43	24
	P	9.2	18.7	10.5	4.5	6.7	1.2	13.5	10.7	3.2	15.7	10.7	6.0
(l) $x < 4, x + y > 35$	N	12	3	6	13	14	1	16	12	1	12	10	2
	P	3.0	0.7	1.5	3.2	3.5	0.2	4.0	3.0	0.2	3.0	2.5	0.5

N = Number P = Percentage

Table 11 : CERTAIN CATEGORIES OF CANDIDATES CLASSIFIED BY INTERNAL AND EXTERNAL ASSESSMENTS IN CIVICS IN P.D. ARTS AND ENGLISH AND MATHEMATICS IN P.D. SCIENCE.

(x = Internal Assessment out of 20; y = External Assessment out of 80)

Subject Centre Category		P. D. Arts			P. D. Science					
		Civics			English			Mathematics		
		Poona	Old	New	Poona	Old	New	Poona	Old	New
(a) $y > 24,$	N	388	325	340	318	278	265	301	314	277
$x + y > 35$	P	97.0	81.2	85.0	79.5	69.5	66.2	75.2	78.5	69.2
(b) $y > 28$	N	381	286	253	282	224	219	281	282	250
	P	95.2	71.5	63.2	70.5	56.0	54.7	70.2	70.5	62.5
(c) $= (a) - (b)$	N	7	39	87	36	54	46	20	32	27
	P	1.7	9.7	21.7	9.0	13.5	11.5	5.0	8.0	6.7
(d) $24 < y < 28$	N	8	40	87	36	54	46	20	32	27
$x + y > 35$	P	2.0	10.0	21.7	9.0	13.5	11.5	5.0	8.0	6.7
(e) $y > 28,$	N	1	1	0	0	0	0	0	0	0
$x + y < 35$	P	0.2	0.2	0	0	0	0	0	0	0
(f) $y > 24,$	N	394	344	347	340	289	282	301	315	277
$= (a) + (g)$	P	98.5	86.0	86.7	85.0	72.2	70.5	75.2	78.7	69.2
(g) $y > 24, x + y < 35$	N	6	19	7	22	11	17	0	1	0
	P	1.5	4.7	1.7	5.5	2.7	4.2	0	0.2	0
(h) $x > 7$	N	328	303	364	305	266	261	203	250	229
	P	82.0	75.7	91.0	76.2	66.5	65.2	50.7	62.5	57.2
(i) $x > 11$	N	75	62	170	21	16	27	88	95	90
	P	18.7	15.5	42.5	5.2	4.0	6.7	22.0	23.7	22.5
(j) $x > 11, x + y < 35$	N	0	1	4	0	0	0	0	0	1
	P	0	0.2	1.0	0	0	0	0	0	0.2
(k) $x < 4$	N	22	36	12	22	35	49	128	81	101
	P	5.5	9.0	3.0	5.5	8.7	12.2	32.0	20.2	25.2
(l) $x < 4, x + y > 35$	N	20	11	3	7	5	8	51	28	24
	P	5.0	2.7	0.7	1.7	1.2	2.0	12.7	7.0	6.0

N = Number P = Percentage

tively low. Secondly, the rule has been more beneficial to the candidates at the *mofussil* centres, especially to those at the New Centres.

It should not be straightaway concluded, however, that all those included under (c) would not have passed according to the old scheme, since those who failed to reach 35 per cent marks by a narrow margin would have also been benefited by gracing. As mentioned earlier, arbitrary informal gracing is done in a subject before submitting marks in that subject; and the final formal gracing is done on the basis of the total marks of the candidate for the whole examination. This two-stage procedure and the rules of procedure remained the same under the old and new schemes. Even then it is not easy to separate the cases which would have benefited under the old scheme and those which actually benefited under the new scheme.¹³ It will also involve speculation about the extent of gracing which would have taken place under the old scheme. If the previous year's figures are taken as a rough guide, the percentage points by which (b) would have been raised by gracing for all centres taken together would be as follows: English (9), Geography (12) and Economics (9) for Arts, and English (12) and Mathematics (8) for Science.¹⁴

The fact that category (b) contains many cases already graced up according to the new scheme leaves no doubt that the difference between (c) and these figures is quite substantial. For English and Mathematics in Pre-Degree Science although the figures (c) are almost the same as those given above as a result of gracing adopted last year, it must be remembered that categories (a) and (b) would both include many graced cases, and it would not be proper to conclude that there has been no benefit to Science students due to the new scheme. If the percentages of passes (after gracing in a subject) given in (a) are compared with those of the previous year (given below) the benefit of the new scheme appears to be quite substantial.

	English (Arts)			English (Science)			Geo- graphy (All centres)	Mathe- matics (All centres)
	Poona	Old	New	Poona	Old	New		
1961	52	40	29	86	59	41	66	54
1962	68	55	60	79	69	66	78	74

(d) $24 \leq y < 28$ and $x + y \geq 35$: This category represents the candidates who attained the minimum level of 30 per cent in the examination marks in the subject but scored less than 35 per cent, the over-all passing-level, in it, and yet passed in the subject because of the provisions of the new scheme.

¹³ Analysis with ungraced marks is done later in section 15 for a few selected subjects.

¹⁴ See: 'Analysis of Failures in Pre-Degree Course of the Poona University', Part II of *Wastage in College Education* by A. R. KAMAT and A. G. DESHMUKH, 1963.

This covers almost all cases of (c) except a very small number represented by (e) below.

(e) $y \geq 28$, but $x + y < 35$: This category has very few cases but it should not be ignored. They are the candidates who would have passed under the old scheme (without any assistance of gracing) but could not pass under the new scheme because they had very poor marks in the internal assessment. They are in a sense candidates who suffered because of the introduction of the new scheme.

(f) $y \geq 24$: These are the candidates who attained the minimum level of 30 per cent in the examination. However, they include some who have been graced up to attain this figure or the total of 35 because of their good performance in the internal assessment.

(g) $y \geq 24$ and yet $x + y < 35$: This is the part of (f) which represents those who could not pass in the subject in spite of their having attained the minimum level of 30 per cent marks in the examination because they did not have adequate backing in the internal assessment even to come up to the gracing-level. It is interesting to note that the figures are not very large (in no case greater than six per cent). This shows that most of those who could reach 30 per cent level in the examination could get through and the internal assessment did not come in their way.

(h) $x \geq 7$: This category gives the figures of candidates who scored more than 35 per cent in the internal assessment and is to be compared with (b) which gives the figures of those who obtained more than 35 per cent in the examination. In the Arts subjects except in Marathi in Poona and the old centres, and in Civics in Poona, the figures in (h) always exceed (b) and the difference between them in the New Centres is more than 20 per cent for some subjects. This is another confirmation of the fact that the internal assessment in these subjects and at these centres has been substantially higher than the examination marks. In Science we find the same thing in English although not to the same extent, but in Mathematics the figures in (h) are considerably less than those in (b), especially in Poona, confirming what was found in section 7.

(i) $x \geq 11$: This group represents the candidates who had the maximum advantage for passing from the internal assessment since a candidate must have attained the minimum level of 24 in examination marks and he must have a total of not less than 35. The figures show that although in Science there is not much difference between the centres, in Arts the New Centres have relatively a larger number of candidates having this advantage. This has no doubt helped many candidates towards being graced up. This is shown by the category (j).

(j) $x \geq 11$ and yet $x + y < 35$: This is the group of students who failed in spite of their having obtained more than 11 marks in the internal assessment. Their very small number confirms what we have said above.

(k) $x \leq 4$: This category was conceived to examine whether some kind of detention-rule would be advisable on the basis of the internal assessment.

If students who did not score more than 20 per cent ($x \leq 4$) in the internal assessment were not sent up for the university examination this would be the group that would be detained. The figures show that such a rule would detain a large number of students, (more than 20 per cent in mathematics). But perhaps the important point is to consider how many of them have in fact passed the subject in spite of their low performance in internal assessment. This is shown by the category (1).

(1) $x \leq 4$ and still $x + y \geq 35$. This is the group of those who have passed in the subject in spite of their poor performance in college. The numbers are small in most subjects but they are quite large in Mathematics and they can by no means be ignored. It is clear therefore that such detention-rule would be harsh on this group of students. It also means that some students are in fact either slow in tuning themselves up to the course or are able to raise themselves to the required level only during the last few months before the examination.

11. Effect of gracing in Science subjects

In section 9 the modification of the examination marks in a subject due to gracing was considered for English, Marathi, Geography, Civics and Economics in Arts, and for English and Mathematics in Science. In this section it will be considered for the three Science subjects—Physics, Chemistry and Biology. The operation of gracing has already been described in section 9. The main difference between the subjects considered in that section and those considered here is that for the Science subjects the total marks consist of three components : score of the internal assessment, marks in the examination paper and marks in the practical examination. As explained in section 9, wherever gracing has been done at the first stage it is the marks in the examination paper which have been raised so as to bring the total of all the three components to the passing-level of 35.

Table 12 gives the percentage of candidates in the samples (of 400 at each of the three groups of centres) scoring equal to or less than a specified number of total marks in a subject from 23 to 38 marks. As before, the figures show a marked tendency of concentration at 35 but the concentration is much less than that observed in the earlier section for the other subjects in the Science and Arts courses. While in Physics and Biology marks have been raised respectively from 27 and 29 to 35, in Chemistry very little gracing, if at all, appears to have taken place. One reason for this relatively lesser extent of gracing in Science subjects is that the failures (without gracing) are much less in these subjects than in the subjects discussed in section 9 where gracing was quite substantial.

The effect of gracing on the distribution of the examination marks in theory and on their comparison with the internal assessment has been pointed out in section 9. It holds for these three Science subjects as well but to a lesser extent and with due modification.

Table 12 : CUMULATIVE FREQUENCY DISTRIBUTIONS (PERCENTAGE) BY TOTAL MARKS IN A SUBJECT — P.D. SCIENCE EXAMINATION 1962

Subject Centre Marks	Physics			Chemistry			Biology		
	Poona	Old	New	Poona	Old	New	Poona	Old	New
23 or less	6.7	3.0	6.5	3.5	3.2	6.7	5.2	7.2	9.7
24 "	7.5	4.5	6.7	4.2	3.2	7.7	6.0	8.5	10.2
25 "	8.7	5.0	8.0	5.0	3.5	8.0	7.7	9.5	11.7
26 "	10.2	6.7	8.5	5.7	3.7	8.7	8.7	10.2	12.5
27 "	11.5	8.0	9.0	7.7	4.0	9.5	9.7	12.0	13.7
28 "	11.5	8.0	9.0	8.7	4.2	11.5	12.2	13.2	14.5
29 "	11.5	8.2	9.0	9.5	5.0	13.0	13.0	13.5	17.5
30 "	11.5	8.2	9.0	11.2	6.0	13.2	13.2	13.5	17.5
31 "	11.7	8.2	9.2	11.7	7.2	15.5	13.5	13.5	17.5
32 "	11.7	8.2	9.2	12.5	7.7	16.2	13.7	13.5	17.7
33 "	11.7	8.2	9.2	13.7	8.7	16.5	13.7	13.5	17.7
34 "	11.7	8.5	9.2	14.5	9.7	16.5	13.7	13.5	17.7
35 "	21.2	18.2	18.5	19.7	13.0	21.7	25.5	20.5	28.7
36 "	24.5	19.7	19.5	20.5	14.2	23.0	27.7	23.0	33.2
37 "	26.7	22.7	23.0	23.0	15.5	24.7	32.5	26.2	37.7
38 "	28.5	24.2	27.0	26.0	16.5	28.5	34.7	29.7	40.2
(i) Last significant frequency at marks below 35	1.5	1.7	0.5	0.7	1.0	0.7	0.7	1.2	3.0
(ii) Frequency at 35	9.5	9.7	9.2	5.2	3.2	5.2	11.7	7.0	11.0
(iii) Frequency at 36	3.2	1.5	1.0	0.7	1.2	1.2	2.2	2.5	4.5

12. Effect of the new scheme on passes in Science subjects

We shall now examine how the introduction of the new scheme has affected the number of passes in Physics, Chemistry and Biology. Here the analysis is more complicated than for the subjects discussed in section 10 as there are three parts, instead of two, of the total marks in a subject : (i) the internal assessment (x) out of 14 marks, (ii) the examination marks in theory paper (y) out of 56 marks, and (iii) the practical examination marks (z) out of 30. It is necessary to recall the requirements for passing under the old and new schemes described in section 2, which may be displayed as follows.

Old and new rules of passing in Science subjects

	<i>Internal assessment marks</i>	<i>Marks in written paper</i>	<i>Marks in practical</i>	<i>Total</i>
Symbol used	x	y	z	$x + y + z$
Division of marks (old scheme)		70	30	100
Rules of passing (old scheme)	—	≥ 24	≥ 0	≥ 35
Division of marks (new scheme)	14	56	30	100
Rules of passing (new scheme)	≥ 0	≥ 17	≥ 0	≥ 35
35 per cent level	4.9	19.6	10.5	35
Rounded-off figures	5	19	11	35

No explanation is necessary except for the last row where rounded off figures are given for the 35 per cent level. Here the 35 per cent level for marks in the written theory paper is rounded off from 19.6 to 19 (instead of to 20) so as to make the 35 per cent level of the total of internal assessment and theory-paper marks agree with the figure 24 in the Old Scheme.

Table 13 gives the number of candidates in each sample for each of the three Science subjects in several categories conceived in terms of x , y , and z , the internal assessment, marks in theory paper and practical examination marks respectively. They are described and commented on below. (Percentages are not given in the case of small figures.)

(a) $y \geq 17$, $x + y + z \geq 35$: These are the requirements for passing under the New Scheme. This category therefore gives the number of candidates in the sample who actually passed in each of the three subjects.

(b) $y \geq 19$, $y + z \geq 30$: These would be the passing-requirements corresponding to the old scheme where it was necessary to obtain 35 per cent in the theory paper and 35 per cent in the total of theory and practical. This category therefore gives the number of candidates who would have passed under the old scheme.

(c) *The difference (a) — (b)* : The difference is the gain in the number of passes due to the replacement of the old scheme by the new scheme. Although this is quite substantial it is relatively not so high when compared with the corresponding figures in the other subjects represented in Tables 10 and 11, except in Biology in the New Centres where it is as high as 19 per cent. The benefit is greater in the New Centres and for those where the percentage under (b) is low. This was also observed in other subjects considered in section 10. Most of the comments offered in that section under this category

Table 13 : CERTAIN CATEGORIES OF CANDIDATES CLASSIFIED BY INTERNAL AND EXTERNAL ASSESSMENT AND PRACTICAL MARKS IN PHYSICS, CHEMISTRY AND BIOLOGY (x = INTERNAL ASSESSMENT OUT OF 14, y = EXTERNAL ASSESSMENT OUT OF 56, z = PRACTICAL MARKS OUT OF 30)

Subject Centre Category	Physics			Chemistry			Biology			
	Poona	Old	New	Poona	Old	New	Poona	Old	New	
(a) $y > 17, x + y + z > 35$	Number	353	364	363	335	354	328	345	346	328
	Percentage	88.2	91.1	90.7	83.7	88.5	82.0	86.2	86.5	82.0
(b) $y > 19, y + z > 30$	Number	335	332	328	299	329	286	303	318	250
	Percentage	83.7	83.0	82.0	74.7	82.2	71.5	75.7	79.5	62.5
(c) = (a) - (b)	Number	18	32	35	36	25	42	42	28	78
	Percentage	4.5	8.0	8.7	9.0	6.2	10.5	10.5	7.0	19.5
(d) $y = 17$ and 18	Number	18	31	34	36	24	39	40	28	74
	Percentage	4.5	7.7	8.5	9.0	6.0	9.7	10.0	7.0	18.5
(e) $y > 19, x + y + z > 35$ $y + z > 30$	Number	0	0	0	0	0	0	0	0	0
	Percentage									
(f) $y > 17, x + y + z < 35$ $x + y + z < 35$	Number	2	0	3	3	4	4	2	3	4
	Percentage									
(g) $y > 19, x + y + z < 35$	Number	0	0	2	2	1	4	2	0	2
	Percentage									
(h) $y > 17, y + z > 26$ $x + y + z < 35$	Number	0	0	1	3	3	4	2	1	2
	Percentage									
(i) $x > 5$	Number	229	250	269	188	324	247	237	269	281
	Percentage	57.2	62.5	67.2	47.0	81.0	61.7	59.2	67.2	70.2
(j) $y > 19$	Number	335	333	331	302	331	293	307	318	256
	Percentage	83.7	83.2	82.7	75.5	82.7	73.2	76.7	79.5	64.0
(k) $x > 7$	Number	122	132	147	78	193	136	105	128	164
	Percentage	30.5	33.0	36.7	19.5	48.2	34.0	26.2	32.0	41.0
(l) $x > 7, y > 17, x + y + z > 35$	Number	122	131	147	74	192	136	105	128	162
	Percentage	30.5	32.7	36.7	18.5	48.0	34.0	26.2	32.0	40.5
(m) = (k) - (l)	Number	0	1	0	4	1	0	0	0	2
	Percentage									
(n) $x < 3$	Number	103	99	83	145	45	89	95	71	71
	Percentage	25.7	24.7	20.7	36.2	11.2	22.2	23.7	17.7	17.7
(o) $x < 3, y > 17, x + y + z > 35$	Number	61	72	54	105	18	42	54	31	24
	Percentage	15.2	18.0	13.5	26.2	4.5	10.5	13.5	7.7	6.0

also apply to the present case. One should, however, remember that the internal marks in the case of Science subjects have less weight (14 instead of 20) in the total and therefore the new scheme would have somewhat lower potentialities of changing the number of passes.

(d) $y = 17, 18$ and $x + y + z \geq 35$: This category represents the number of candidates who attained the minimum level of 17 in the theory paper (that is 30 per cent instead of 35 per cent in the old scheme) and yet passed in the subject because of the provisions of the new scheme. They were able to wipe out the deficit with the help of marks in internal assessment and practical examination. This category accounts for most of the cases in (c).

(e) $y \geq 19, y + z \geq 30, x + y + z < 35$: There is no candidate in this category, which means that there is none who would have passed under the old rules but has not been able to get through under the new rules. There are no victims of the innovation.

(f) $y \geq 17, x + y + z < 35$: The category consists of those candidates who attained the minimum level of 30 per cent in theory paper according to new rules but could not muster adequate support from internal assessment or practical examination or both for reaching the passing-level of 35 in total. These figures are small, nowhere appreciably greater than one per cent. This means that almost all who reached the minimum level of 30 per cent in theory paper were able to get through. This is no doubt to a very great extent due to gracing (see section 10). A part of this category is (g).

(g) $y \geq 19, x + y + z < 35$: These candidates had obtained 35 per cent in theory paper and yet have failed because of lack of adequate backing in internal assessment or practicals or both. It seems they could not be lifted up by the process of gracing either. They are very few indeed.

(h) $y \geq 17, y + z \geq 26, x + y + z < 35$: This category is another portion of (f) and consists of those who not only attained the minimum level of 30 per cent in theory paper but also in theory and practical together and yet could not pass because of inadequate backing in internal assessment.

(i) $x \geq 5$: This category represents those candidates who obtained 35 per cent in internal assessment and is to be compared with the category (j).

(j) $y \geq 19$: It represents those who obtained 35 per cent in the theory paper. Comparison between these two categories shows that the internal assessment is rather low in Science subjects relative to the external assessment (marks in theory paper) except in Biology in the New Centres. Again the difference (j)—(i) is much smaller for the New Centres than for Poona and the Old Centres. (It is the largest for Chemistry in Poona). These figures confirm what has been already remarked in section 8 for

the relative position of internal and external assessments in the three Science subjects.

(k) $x \geq 7$: It is not easy to determine the level of optimum benefit in internal assessment for passing in Science subjects corresponding to the level of 11 marks for subjects considered in section 10. (See category (i) of that section.) This is because the maximum advantage in these subjects would be $35 - 17 = 18$; but it is to be derived from the combined marks in the internal assessment and the practical examination. However, if 35 per cent level is assumed for practical examination marks (which corresponds to 11 marks out of 30) the level of optimum benefit in internal assessment may be taken as 7.¹⁵ This category represents the candidates who had this optimum advantage from the internal assessment. It is clear that the figures in the *mofussil* centres are higher indicating that the internal assessment in these centres has been substantially higher than in Poona.

(l) $x \geq 7; y \geq 17, x + y + z \geq 35$: These are the candidates who had the optimum benefit in internal assessment and who passed in the subject.

(m) = (k) - (l): The difference represents those who in spite of having optimum benefit from the internal assessment failed in the subject. Their very small number can be explained in the same manner as category (j) of section 10.

(n) $x \leq 3$: Finally one would like to explore whether there could be a detention-level at 20 per cent in internal assessment in Science subjects as was considered for subjects discussed in section 10. The figures show that such a detention-rule would be very severe indeed as it would detain, for instance, more than 36 per cent students in Chemistry in Poona. And the severity of such detention-rule is seen even more clearly by finding the number from amongst them who actually passed the subject. This is given by the category (o).

(o) $x \leq 3, y \geq 17, x + y + z \geq 35$: This shows that a large portion of these do actually pass in the subjects. These two categories (n) and (o) also confirm, as mentioned earlier, that the internal assessment in Science subjects has been relatively rather low and that this is especially true for the Poona Centre.

13. Examination marks without gracing

It has been mentioned in earlier sections that in all this analysis the scores for the external assessment (the examination marks in the theory paper) are those which occur in the final records of examination results. In other words they are the marks arrived at after gracing which added

¹⁵ This would be 9 marks in internal assessment if 30 per cent level is assumed in practical examination. The resulting analysis was similar to what has been attempted here.

the requisite number of marks to the examination marks but left the internal assessment unaffected. This procedure was adopted, firstly, because the analysis should be primarily concerned with the actual passes and failures, and secondly, because the procedure of obtaining original ungraced marks in the examination was more complicated and time-consuming. It has been observed in sections 9 and 11 that there is a large concentration of frequency at the passing-level total of 35 in each subject. It was therefore decided to go to the original ungraced external assessment for a few selected subjects and thus to push this analysis a little further. For this purpose four subjects were selected: English and Economics in Arts, and Mathematics and Biology in Science. The resulting investigations are presented in this and the next two sections.

Table 14(A) gives for each of these four subjects and in each of the samples of 400, the number of candidates who obtained exactly 35 marks in the total without gracing, those who were graced to 35 and the number of candidates who obtained 35 marks after gracing. There is no doubt that the ultimate heavy concentration at 35 is mainly due to gracing. This gracing-effect is indeed very high for English in Arts and comparatively low for Biology in Science, and it depends on the number of failures which would have occurred had there been no gracing.

Table 14(B) displays the number of passes before gracing,¹⁶ the number graced at each of the two stages and the passes after gracing in each of the four subjects and in the relevant sample of 400. A scrutiny of the marks of the candidates who were graced up confirmed the procedure of gracing mentioned earlier. At the first stage the board of examiners in a subject graced up those candidates whose total failed to reach 35 by a narrow margin by increasing their marks in the theory paper. The figures in Table 14(B) show that this has benefited quite a large proportion of candidates (up to 20 per cent in English). The gracing at the second stage is done after the results in all the subjects are assembled, and the candidates who fail only in one subject by a narrow margin are graced up. The figures in Table 14(B) show that the second-stage gracing has helped nine to ten per cent candidates in English, a much smaller proportion in Economics and a negligible proportion in Mathematics and Biology. This reflects the fact that the most difficult subject in Arts is English which accounts for the major part of the single-subject failures by a narrow margin.¹⁷ It is worth noting that the total graced cases are a substantial proportion of the final number of passes in the subject; for instance, in

¹⁶There were a very small number of cases which were graced up although the total marks were 36 or greater because the examination marks were less than 24. They have been included in the number of passes before gracing for the sake of simple presentation.

¹⁷ See: 'Analysis of Failures in the Pre-Degree Course of the Poona University. Part II of *Wastage in College Education* by A. R. KAMAT and A. G. DESHMUKH, 1963.

Table 14 : (A) BREAK-DOWN OF FREQUENCY CONCENTRATION AT THE PASSING-LEVEL 35

(B) BREAK-DOWN OF THE PASSES AFTER GRACING

<i>Centres</i>	<i>English</i>			<i>Economics</i>			<i>Mathematics</i>			<i>Biology</i>		
	<i>Subjects</i>	<i>Poona</i>	<i>Old</i>	<i>New</i>	<i>Poona</i>	<i>Old</i>	<i>New</i>	<i>Poona</i>	<i>Old</i>	<i>New</i>	<i>Poona</i>	<i>Old</i>
(A)												
Frequency at 35 before gracing	20	19	13	21	29	16	9	6	12	9	4	8
Number graced	116	122	90	76	66	25	74	67	67	38	24	36
Frequency at 35 after gracing	136	141	103	97	95	41	83	73	79	47	28	44
(B)												
Passes before gracing	158	100	149	214	219	285	227	247	210	307	322	292
Graced at first stage	79	81	53	61	60	25	73	66	67	36	24	36
Graced at second stage	37	41	37	15	6	—	1	1	—	2	—	—
Total graced	116	122	90	76	66	25	74	67	67	38	24	36
Passes after gracing	274	222	239	290	285	310	301	314	277	345	346	328

English, at the Old Centres they form more than 55 per cent of the passes. It is evident that many of these cases would not be reaching the total above which gracing was applied had the internal assessment not been relatively high (see section 7, section 10(h) above and section 14 below).

14. Comparison of internal assessments and examination marks (ungraced)

It is now proposed to compare the distributions of original (ungraced) marks in the examination in a subject and the internal assessment in that subject in the case of the four subjects, English and Economics in Arts, and Mathematics and Biology in Science. This is done on the same lines as was done in sections 7 and 8, using the same notation and by scaling up the marks to percentage figures. The figures are presented in Table 15 in the same manner as Tables 6 and 7 and they should be studied along with the relevant figures in Tables 6 and 7. The same procedure was followed in analysing these figures.

In English and Economics in Arts the differences $\bar{x} - \bar{y}$ between the average internal assessment and the average examination marks is now greater than what was observed in section 7. In Mathematics and Biology in Science the difference $\bar{y} - \bar{x}$ has decreased when compared with section 8 for Poona Centre and the Old Centres, and the differences $\bar{x} - \bar{y}$ has increased for the New Centres. This is as was anticipated in section 9 where the modifications due to the effect of gracing were discussed. It should also be noted that the results of the tests of significance of the differences $\bar{x} - \bar{y}$ remain the same as before.

The standard deviations s_y have not been greatly affected. They have slightly decreased for English and have slightly increased for the other three subjects. This again confirms what was suggested in section 9 including the consequence of the low-scoring characteristic of English. Again the tests of significance for the differences between s_x and s_y give results almost identical with those obtained in earlier sections.

The correlation coefficient between the internal assessment and the examination marks has increased in all cases except in the case of English at the Old Centres where it has decreased. This again confirms what was indicated in section 9, the exception of English at the Old Centres being probably due to unusually high internal assessment. The increase in correlation coefficients in general indicates that the internal assessments have a better predictive value for predicting the ungraced examination-marks, which is of course as it should be.

The frequency polygons of the two distributions, for Economics in Arts and for Biology in Science, bring out clearly the above aspects of comparison.¹⁸ As mentioned earlier they are drawn to a common scale.

¹⁸ For further comments on these graphs see Appendix 2.

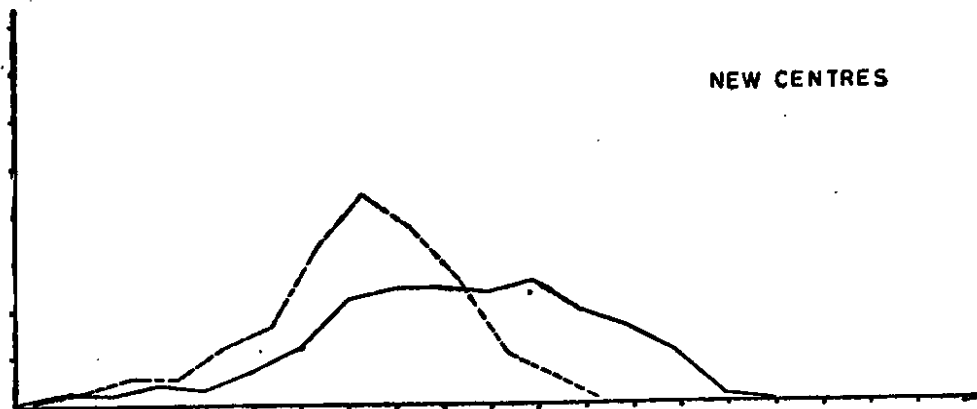
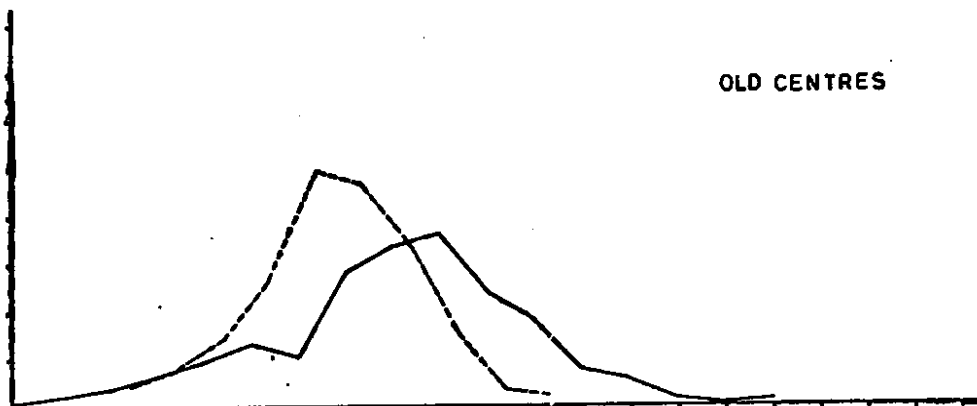
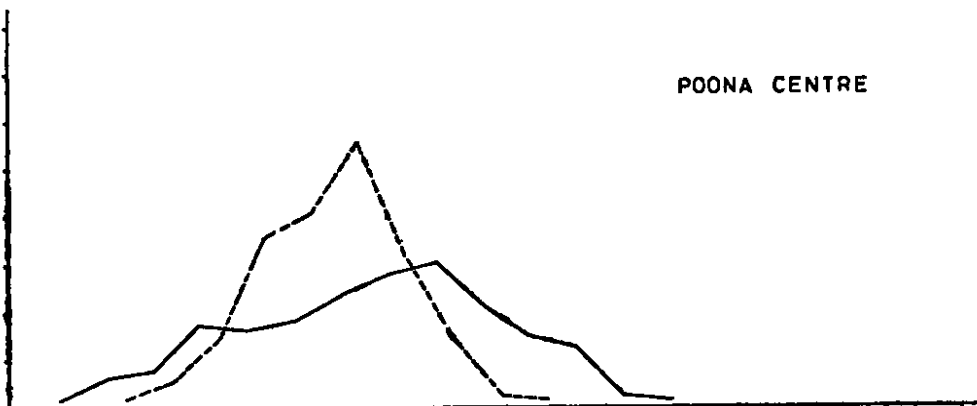
Table 15 : COMPARISON OF INTERNAL AND EXTERNAL ASSESSMENT (WITHOUT GRACING)

Subject	Centre	Size	\bar{x} Average internal assessment	\bar{y} Average external assessment	$\bar{x} - \bar{y}$	<i>t</i> to test $\bar{x} = \bar{y}$	S_x Standard deviation of internal assessment	S_y Standard deviation of external assessment	S_x / S_y	<i>r'</i> to test $s_x = s_y$	<i>r_{xy}</i> Correlation between internal and external assessment
English (Arts)	Poona	400	35.2	31.8	3.4	8.72***	8.69	6.92	1.256	0.253***	0.513***
	Old	400	33.6	28.7	4.9	8.42***	12.50	7.35	1.700	0.518***	0.397***
	New	400	40.2	29.9	10.3	14.00***	16.04	8.60	1.864	0.588***	0.409***
Economics (Arts)	Poona	400	38.7	34.0	4.7	7.47***	14.22	7.62	1.865	0.609***	0.501***
	Old	400	40.4	34.1	6.3	9.88***	13.21	8.45	1.563	0.443***	0.355***
	New	400	46.5	36.5	10.0	12.79***	15.06	10.57	1.425	0.354***	0.296***
Mathema- tics (Science)	Poona	400	35.6	40.6	- 5.0	6.98***	21.29	21.35	0.997	0.004(NS)	0.781***
	Old	400	40.0	41.0	- 1.0	2.58*	19.14	20.10	0.952	0.068(NS)	0.694***
	New	400	37.6	36.4	1.2	0.13(NS)	21.23	20.49	1.037	0.052(NS)	0.728***
Biology (Science)	Poona	400	36.5	41.5	- 5.0	9.04***	13.95	14.43	0.966	0.048(NS)	0.701***
	Old	400	38.8	41.6	- 2.8	5.03***	14.62	13.21	1.107	0.139*	0.684***
	New	400	42.2	36.0	6.2	9.97***	17.39	12.40	1.403	0.434***	0.693***

(N.B. : Marks in internal and external assessment are both scaled up to 100 so as to make them comparable.)

PRE-DEGREE ARTS : ECONOMICS

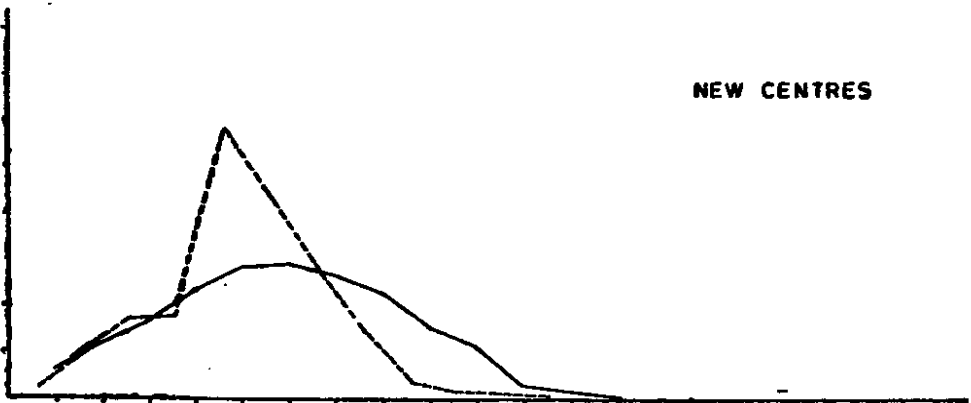
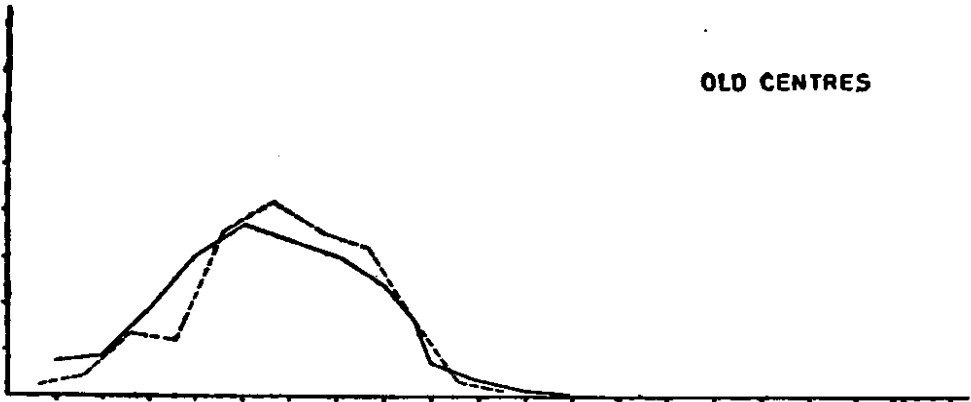
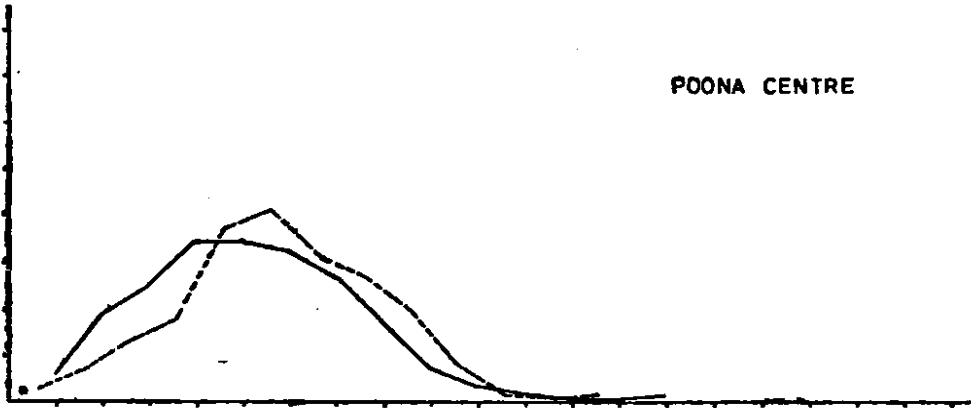
— INTERNAL SCORE
--- EXAMINATION MARKS (UNGRADED)



PRE-DEGREE SCIENCE-BIOLOGY

— INTERNAL SCORE

- - - EXAMINATION MARKS (UNGRADED)



15. Effect of the new scheme on passes (without gracing)

We shall now study how the new scheme would have affected the number of passes in these four subjects had there been no gracing. This is done by constructing some of the categories of section 10 for ungraced marks in English and Economics in Arts and for Mathematics in Science, and by constructing categories of section 12 for Biology in a similar manner. The analysis is presented in Tables 16 and 17.

(A) *English, Economics and Mathematics* : Here the figures in Table 16 should be compared with the corresponding figures of Tables 10 and 11.

(a) $y \geq 24, x + y \geq 35$: This category gives the number of passes under the new scheme had there been no gracing. As noted earlier it is smaller than the number of actual passes after gracing, especially in English.

(b) $y \geq 28$: This gives the number of passes under the old scheme; it is small as compared to the figures in Table 10 and 11 for the same category.

(c) *The difference between (a) and (b)* : This difference represents the gain in the number of passes due to the introduction of the new scheme had there been no gracing. It is observed that in English and Economics the new scheme benefits the New Centres to a much larger extent than the other centres. In Poona the gain is negligible. In Mathematics there is no gain to speak of; actually for Poona the old scheme would have yielded a slightly higher number of passes.

(d) $24 \leq y < 28, x + y \geq 35$: This category gives the number of candidates who are benefited because of the lower minimum level (of 24) in the examination marks under the new scheme. The figures are appreciably lower than the same category in Tables 10 and 11, which had the advantage of gracing. The benefit was relatively less in Mathematics than in English and Economics; in the latter two subjects, the New Centres derived greater benefit than others.

(e) $y \geq 28, x + y < 35$: This category represents the number of candidates who would have passed under the old scheme but would not pass under the new scheme had there been no gracing. The corresponding figures were negligible in Tables 10 and 11 but that is not the case here. They would have been the sufferers due to the introduction of the new scheme had there been no gracing. Again the lower figures for the *mofussil* centres reflect the relatively high internal assessment.

(f) $y \geq 24$: This category represents the number of candidates who attained the prescribed minimum level of 30 per cent in the examination paper. The difference between the corresponding figures of Tables 10 and 11 and the figures here is due to gracing and, as has been noted before, is quite substantial.

(g) $y \geq 24, x + y < 35$: These figures are a great deal higher than the corresponding figures in Tables 10 and 11; this is again due to gracing.

(j) $x \geq 11, x + y > 35$: This represents the number of candidates

Table 16 : CERTAIN CATEGORIES OF CANDIDATES CLASSIFIED BY INTERNAL AND EXTERNAL ASSESSMENT (WITHOUT GRACING) IN ENGLISH, ECONOMICS AND MATHEMATICS IN SCIENCE

(x = Internal assessment out of 20, y = External assessment without gracing out of 80)

Category	Subject Centre	P. D. Arts						P. D. Science		
		English			Economics			Mathematics		
		Poona	Old	New	Poona	Old	New	Poona	Old	New
(a) $y > 24, x + y > 35$	N	158	100	149	214	219	285	227	247	210
	P	39.5	25.0	37.2	53.5	54.7	71.2	56.7	61.7	52.5
(b) $y > 28$	N	157	98	117	207	199	250	232	244	210
	P	39.2	24.5	29.2	51.7	49.7	62.5	58.0	61.0	52.5
(c) = (a) - (b)	N	1	2	32	7	20	35	-5	3	0
	P	0.2	0.5	8.0	1.7	5.0	8.7	-1.2	0.7	0
(d) $24 < y < 28, x + y > 35$	N	14	16	37	27	32	42	9	8	9
	P	3.5	4.0	9.2	6.7	8.0	10.5	2.2	2.0	2.2
(e) $y > 28, x + y < 35$	N	13	14	5	20	11	6	15	5	9
	P	3.2	3.5	1.2	5.0	2.7	1.5	3.7	1.2	2.2
(f) $y > 24$	N	241	194	201	288	297	316	274	285	247
	P	60.2	48.5	50.2	72.0	74.2	79.0	68.5	71.2	61.7
(g) $y > 24, x + y < 35$	N	83	94	52	74	78	31	47	38	37
	P	20.7	23.5	13.0	18.5	19.5	7.7	11.7	9.5	9.2
(j) $x > 11, x + y < 35$	N	0	8	16	4	11	8	2	1	2
	P	0	2.0	4.0	1.0	2.7	2.0	0.5	0.2	0.5

N = Number; P = Percentage.

who would have failed in spite of their securing the maximum advantage in internal assessment (see section 10). The figures here, although small, are larger than the corresponding figures in Tables 10 and 11; it is again due to gracing. But it is interesting to note that the figures in the present category (j) again point towards the relatively high internal assessment in the *mofussil* centres in English and Economics.

(B) *Biology*: In Table 17 are given the number of candidates which fall under categories (a) to (h), and (j) of section 12 had there been no gracing. Comments similar to those above can be offered by comparing these figures with the corresponding figures in Table 13. Since no new point seems to emerge from this comparison it is not elaborated here.

Table 17 : CERTAIN CATEGORIES OF CANDIDATES CLASSIFIED BY INTERNAL AND EXTERNAL ASSESSMENT (WITHOUT GRACING) AND PRACTICAL MARKS IN BIOLOGY

x = Internal assessment out of 14,
 y = External assessment out of 56 (without gracing)
 z = Practical marks out of 30

Category		Centre		
		Poona	Old	New
(a) $y \geq 17, x + y + z \geq 35$	N	307	322	292
	P	76.7	80.5	73.0
(b) $y \geq 19, y + z \geq 30$	N	283	303	239
	P	70.7	75.7	59.7
(c) = (a) - (b)	N	24	19	53
	P	6.0	4.7	13.2
(d) $y = 17 \text{ \& } 18,$ $x + y + z \geq 35$	N	27	21	52
	P	6.7	5.2	13.0
(e) $y \geq 19, y + z \geq 30,$ $x + y + z < 35$	N	3	2	1
	P			
(f) $y \geq 17, x + y + z < 35$	N	17	13	12
	P	4.2	3.2	3.0
(g) $y \geq 19, x + y + z < 35$	N	12	5	6
	P	3.0	1.2	1.5
(h) $y \geq 17, y + z \geq 26,$ $x + y + z < 35$	N	16	12	9
	P	4.0	3.0	2.2
(j) $y \geq 19$	N	292	306	246
	P	73.0	76.5	61.5

N = Number ; P = Percentage

16. Summary of main conclusions

(1) There was a general improvement in the results of the Pre-Degree examination in 1962 after the introduction of the new scheme of giving

partial credit to term work, as compared to the preceding years. This improvement was observed in all the three groups of centres, and was particularly striking in the *mofussil* centres (Section 6).

(2) The internal assessment appeared to be higher than the external assessment (or examination marks) in most of the subjects in the Pre-Degree Arts and at all the three groups of centres. The difference was the least in Poona, larger in the Old Centres and still larger in the New Centres. (Sections 7 and 10).

(3) The internal scores in Arts had greater dispersion than the examination marks. (Section 7).

(4) The correlation coefficients between the internal scores and the examination marks gave definite evidence of association between them. But they were not so high as to be of much predictive value. (Section 7.)

(5) In Mathematics and in the Science subjects of Physics, Chemistry and Biology the internal assessment appeared to be lower than the examination marks except in Biology, in the New Centres. The relative differences between the three groups of centres had the same direction as in Arts. (Sections 8 and 12.)

(6) The dispersion of the internal assessment in Science subjects was not always greater than the dispersion of the examination marks. In Poona and the Old Centres it was very often less. In the New Centres it was always greater. (Section 8.)

(7) The correlation coefficients between the internal and the external assessments in Science subjects were higher than those for Arts subjects, suggesting a better (but not very great) predictive value for the internal assessment in the Science subjects. (Section 8.)

(8) Gracing was done at two stages and was quite substantial. One of its effects was to concentrate the frequencies at and near the passing-level. (Sections 9, 11 and 13.)

(9) The analysis of individual subjects in Arts and Science showed that the new scheme with a lower minimum level of passing (30 per cent) in the examination paper had benefited a large number of students. There was a considerable gain in the results under the new scheme over what the results would have been under the old scheme. The advantage was very often greater for the New Centres where the internal assessment appeared to be more liberal. (Sections 10 and 12.)

(10) A comparison between the internal assessment and the ungraced external assessment in two subjects in Arts and two subjects in Science confirmed the above conclusions with due modifications. The two distributions were then closer than when graced marks were added to the external assessment. (Sections 14 and 15.)

APPENDIX 1

Explanation of Statistical Test Procedures used in
Sections 7, 8, and 14

(1) The test procedure used for testing the difference between the average of the internal assessment and the average of the examination score, both scaled up to marks out of 100, is the paired comparison test which may be briefly described as follows. Let x and y denote the internal scores, \bar{x} and \bar{y} the sample means and let $z = x - y$. Then the test statistic is

$$t = \frac{(\bar{x} - \bar{y}) \sqrt{n}}{s_z}$$

where n is the sample size and s_z is the sample standard deviation of z . For grouped data in x and y a convenient formula for the calculation of s_z is given by

$$(n - 1) S_z^2 = S_x^2 - 2S_{xy} + S_y^2$$

where $S_x^2 = \Sigma (x - \bar{x})^2$, $S_y^2 = \Sigma (y - \bar{y})^2$ and $S_{xy} = \Sigma (x - \bar{x})(y - \bar{y})$, the summations being over the sample. The degrees of freedom associated with t are $n-1$.

(2) The test procedure used for testing the inequality of the standard deviations s_x and s_y for the correlated variables x and y is to test the significance of the correlation coefficient between $z = x - y$ and $w = x + y$. It can be shown that for grouped data in x and y

$$r_{zw} = \frac{S_x^2 - S_y^2}{[(S_x^2 + S_y^2)^2 - 4S_{xy}^2]^{\frac{1}{2}}}$$

where S_x^2 , S_y^2 , and S_{xy} have the same meaning as in the paragraph above.

(3) The symbols *, **, *** and the abbreviation N.S. used in Tables 6, 7 and 15 have the usual statistical meanings. For instance a one-star value of t means that such difference between the sample values can occur with a chance of less than one in twenty without there being a real difference in the corresponding population values. The two-star and three-star values indicate that such differences can occur with a chance of less than one in hundred and one in thousand respectively. In other words, they indicate the degrees of improbability of occurrence of such events. Thus the stars denote the level of significance reached by the corresponding difference in the sample values. The symbol N.S. stands for 'Not Significant' and it means that such difference is statistically not improbable, if it is assumed that differences occurring with a chance greater than one in twenty are not improbable.

APPENDIX 2

Graphs of Internal and External Assessments

In Sections 7, 8 and 14 where the differences in the distributions of the internal assessment and the examination marks were discussed we have illustrated some of the points made there with the help of the frequency polygons of these distributions. In this appendix some more graphs are given and some further observations are offered on these graphs.

There are three sets of figures to be considered. They are: (A) the internal assessment and the examination marks (graced) in English, and Economics (pages 13, 14) at the three groups of centres in Pre-Degree Arts, and in Marathi, Geography and Civics, in this appendix. (B) the internal assessment and the examination marks (graced) in Mathematics and Biology (pages 18, 19) at the three groups of centres in Pre-Degree Science, and in English, Physics and Chemistry in this appendix. (C) the internal assessment and the examination marks (ungraced) at the three groups of centres in Economics in Arts, and Biology in Science (pages 38, 39), and in English in Arts, and in Mathematics in Science in this appendix. It should be remembered that (i) the internal assessment has been scaled up to make it comparable with the examination marks, by taking one unit on the horizontal axis to represent one mark of the internal score and four marks of the external score; (ii) one unit along the vertical axis represents 20 candidates; (iii) both frequency distributions are therefore on the same scale and are plotted together for comparison; and (iv) the maximum external scores obtainable are 56 in Science subjects and 80 in all other subjects.

The frequency distributions for the different subjects are given in Table 18.

Comments

(A) In Pre-Degree Arts most of the graphs of the internal assessment are markedly to the right of the graphs of the examination marks, especially the right-hand tails. This indicates that the internal assessment was more liberal than the external one. This is especially true of the New Centres for which, in Geography, it is quite pronounced even for the left-hand tail. The greater divergence between the right-hand tails in the New Centres is also worth noting. The low-scoring character of the Arts subjects is vividly illustrated by the narrower range (relatively to the Science graphs discussed below) of the distributions. The range is the shortest for English where high scores seem to be altogether ruled out. Again the range of the internal assessment is wider than the range of the examination marks and this divergence is greater for the *mofussil* and particularly the New Centres. The gracing-effect is shown by the pronounced peaks and steep slopes between 20 and 35 marks in the graphs of the examination marks.

Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)

(1) Pre-Degree Arts—Poona Centre

Internal Assessment

Marks	Frequency				
	English	Marathi	Geography	Civics	Economics
0	—	1	3	1	—
1	1	1	3	1	2
2	3	—	7	2	12
3	7	2	15	10	15
4	26	14	26	8	34
5	29	13	45	29	32
6	76	16	50	22	36
7	94	35	52	46	46
8	89	78	53	90	55
9	46	91	62	72	61
10	25	60	37	44	42
11	2	45	20	35	29
12	2	24	10	18	25
13	—	8	9	13	4
14	—	6	3	7	2
15	—	5	4	—	2
16	—	—	—	2	2
17	—	1	—	—	1
18	—	—	1	—	—
Total	400	400	400	400	400

(2) Pre-Degree Arts—Old Centres

Internal Assessment

Marks	Frequency				
	English	Marathi	Geography	Civics	Economic
0	2	1	2	1	1
1	2	2	3	—	4
2	20	2	10	6	7
3	20	11	11	9	12
4	31	11	17	20	19
5	44	15	27	22	26
6	61	29	30	39	21
7	79	55	52	61	56
8	55	75	60	62	67
9	22	71	57	71	72
10	30	62	44	47	48
11	24	47	32	24	36
12	9	10	27	19	15
13	1	7	18	12	11
14	—	2	8	5	3
15	—	—	1	1	—
16	—	—	1	1	2
Total	400	400	400	400	400

Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)

(3) Pre-Degree Arts—New Centres

Internal Assessment

Marks	Frequency				
	English	Marathi	Geography	Civics	Economics
0	—	—	—	—	1
1	3	1	1	—	4
2	3	1	1	—	4
3	12	1	6	8	9
4	24	2	5	4	6
5	38	7	13	12	14
6	59	16	14	12	24
7	61	36	40	22	43
8	55	64	45	56	48
9	42	76	60	55	49
10	22	63	58	61	47
11	25	50	60	62	51
12	9	21	28	40	39
13	9	34	30	24	33
14	15	19	24	24	23
15	12	8	13	15	4
16	10	1	2	4	1
17	1	—	—	1	—
Total	400	400	400	400	400

(4) Pre-Degree Arts—Poona Centre

Examination Marks

Marks	Frequency				
	English	Marathi	Geography	Civics	Economics
0-3	—	—	—	—	—
4-7	1	—	—	—	—
8-11	3	—	3	1	3
12-15	10	—	19	—	10
16-19	39	1	45	1	28
20-23	65	3	36	4	50
24-27	66	19	57	13	81
28-31	161	66	110	61	129
32-35	48	97	62	87	66
36-39	4	91	31	138	27
40-43	3	59	19	65	4
44-47	—	42	12	29	2
48-51	—	17	3	1	—
52-55	—	4	2	—	—
56-59	—	1	1	—	—
Total	400	400	400	400	400

Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)

(5) *Pre-Degree Arts—Old Centres*

Examination Marks

Marks	Frequency				
	English	Marathi	Geography	Civics	Economics
0 - 3	-	-	-	-	-
4 - 7	2	-	1	-	-
8 - 11	18	-	5	1	8
12 - 15	24	-	15	5	13
16 - 19	52	6	28	17	25
20 - 23	59	17	27	33	49
24 - 27	89	39	76	58	89
28 - 31	137	105	102	134	106
32 - 35	17	118	66	79	70
36 - 39	2	84	42	57	30
40 - 43	-	23	25	14	6
44 - 47	-	8	9	2	4
48 - 51	-	-	2	-	-
52 - 55	-	-	2	-	-
Total	400	400	400	400	400

(6) *Pre-Degree Arts—New Centres*

Examination Marks

Marks	Frequency				
	English	Marathi	Geography	Civics	Economics
0 - 3	-	-	-	-	1
4 - 7	5	1	-	1	5
8 - 11	7	-	7	2	11
12 - 15	29	-	16	6	11
16 - 19	58	2	30	15	24
20 - 23	55	7	18	28	26
24 - 27	89	42	105	95	67
28 - 31	104	88	83	108	92
32 - 35	30	127	62	86	75
36 - 39	17	99	41	40	51
40 - 43	5	27	23	16	22
44 - 47	1	6	10	3	13
48 - 51	-	1	3	-	2
52 - 55	-	-	-	-	-
56 - 59	-	-	2	-	-
Total	400	400	400	400	400

**Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)**

(7) Pre-Degree Science—Poona Centre

Internal Assessment

Marks	Frequency				
	English	Mathematics	Physics	Chemistry	Biology
0	—	2	—	2	—
1	—	21	16	26	10
2	—	36	35	49	37
3	5	40	52	68	48
4	17	30	68	67	68
5	25	29	62	56	68
6	48	39	45	54	64
7	59	36	56	38	52
8	97	28	30	14	32
9	75	30	16	15	13
10	53	21	9	5	5
11	14	25	7	4	2
12	6	15	3	2	—
13	1	10	1	—	—
14	—	10	—	—	1
15	—	9	—	—	—
16	—	6	—	—	—
17	—	8	—	—	—
18	—	3	—	—	—
19	—	2	—	—	—
Total	400	400	400	400	400

**Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)**

(8) Pre-Degree Science—Old Centres

Internal Assessment

Marks	Frequency				
	English	Mathematics	Physics	Chemistry	Biology
0	-	2	-	1	-
1	2	6	24	3	15
2	1	17	33	15	18
3	7	22	42	26	38
4	25	34	51	31	60
5	36	40	57	55	74
6	63	29	61	76	67
7	84	32	46	66	59
8	80	36	36	49	47
9	57	47	26	32	14
10	29	40	12	21	6
11	13	32	9	15	2
12	2	15	2	6	-
13	-	16	1	3	-
14	1	8	-	1	-
15	-	8	-	-	-
16	-	4	-	-	-
17	-	5	-	-	-
18	-	4	-	-	-
19	-	2	-	-	-
20	-	1	-	-	-
Total	400	400	400	400	400

Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)

(9) Pre-Degree Science—New Centres

Internal Assessment

Marks	Frequency				
	English	Mathematics	Physics	Chemistry	Biology
0	—	5	1	2	—
1	—	19	11	11	12
2	8	25	32	31	25
3	17	33	39	45	34
4	24	20	48	64	48
5	32	32	70	56	58
6	58	37	52	55	59
7	72	43	47	45	54
8	79	40	34	35	46
9	57	27	27	19	32
10	26	29	15	19	23
11	14	30	10	11	6
12	9	11	8	5	3
13	3	8	6	1	—
14	1	10	—	1	—
15	—	8	—	—	—
16	—	9	—	—	—
17	—	3	—	—	—
18	—	7	—	—	—
19	—	3	—	—	—
20	—	1	—	—	—
Total	400	400	400	400	400

**Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENT:
(Contd.)**

(10) *Pre-Degree Science—Poona Centre*

Examination Marks

<i>Marks</i>	<i>Frequency</i>		<i>Marks</i>	<i>Frequency</i>		
	<i>English</i>	<i>Mathematics</i>		<i>Physics</i>	<i>Chemistry</i>	<i>Biology</i>
0-3	-	10	1-4	8	11	4
4-7	-	18	5-8	14	19	12
8-11	-	21	9-12	11	22	24
12-15	1	20	13-16	12	10	12
16-19	10	25	17-20	51	62	86
20-23	50	5	21-24	54	59	89
24-27	57	20	25-28	53	52	64
28-31	163	60	29-32	51	54	53
32-35	82	57	33-36	35	38	38
36-39	30	34	37-40	39	35	15
40-43	6	25	41-44	31	19	2
44-47	1	22	45-48	25	10	-
48-51	-	26	49-52	15	8	1
52-55	-	17	53-56	1	1	-
56-59	-	12				
60-63	-	8				
64-67	-	9				
68-71	-	5				
72-75	-	3				
76-79	-	3				
Total	400	400	Total	400	400	400

**Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)**

(11) Pre-Degree Science—Old Centres

Examination Marks

Marks	Frequency		Marks	Frequency		
	English	Mathematics		Physics	Chemistry	Biology
0-3	-	12	1-4	5	3	4
4-7	-	17	5-8	6	10	8
8-11	1	14	9-12	18	23	27
12-15	17	18	13-16	6	6	12
16-19	35	19	17-20	54	58	80
20-23	58	5	21-24	59	58	88
24-27	65	33	25-28	57	57	76
28-31	157	60	29-32	53	63	64
32-35	46	49	33-36	39	54	33
36-39	10	40	37-40	43	32	6
40-43	10	25	41-44	29	20	2
44-47	1	29	45-48	20	12	-
48-51	-	26	49-52	10	2	-
52-55	-	20	53-56	1	2	-
56-59	-	12				
60-63	-	13				
64-67	-	1				
68-71	-	4				
72-75	-	2				
76-79	-	1				
Total	400	400	Total	400	400	400

**Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)**

(12) *Pre-Degree Science—New Centres*

Examination Marks

Marks	Frequency		Marks	Frequency		
	English	Mathematics		Physics	Chemistry	Biology
0-3	-	13	1-4	4	9	4
4-7	-	31	5-8	6	22	20
8-11	6	23	9-12	21	22	31
12-15	26	28	13-16	3	15	13
16-19	37	17	17-20	64	85	140
20-23	49	11	21-24	60	67	93
24-27	63	27	25-28	54	52	57
28-31	130	70	29-32	66	52	29
32-35	54	54	33-36	46	29	7
36-39	22	20	37-40	34	26	3
40-43	9	28	41-44	23	14	2
44-47	4	19	45-48	12	2	1
48-51	-	20	49-52	6	3	-
52-55	-	11	53-56	1	2	-
56-59	-	11				
60-63	-	6				
64-67	-	4				
68-71	-	4				
72-75	-	3				
76-79	-	-				
Total	400	400	Total	400	400	400

**Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)**

**(13) Pre-Degree Examination—Poona Centre
Examination Marks (Ungraded)**

Marks	Arts		Mathematics Frequency	Science	
	English Frequency	Economics		Marks	Biology Frequency
0-3	-	-	10	1-4	4
4-7	1	-	18	5-8	12
8-11	3	3	21	9-12	25
12-15	10	10	21	13-16	34
16-19	39	28	29	17-20	73
20-23	106	71	27	21-24	81
24-27	84	81	42	25-28	62
28-31	103	112	33	29-32	53
32-35	47	62	35	33-36	38
36-39	4	27	34	37-40	15
40-43	3	4	25	41-44	2
44-47	-	2	22	45-48	-
48-51	-	-	26	49-52	1
52-55	-	..	17		
56-59	-	..	12		
60-63	-	..	8		
64-67	-	-	9		
68-71	-	-	5		
72-75	-	-	3		
76-79	-	-	3		
Total	400	400	400	Total	400

Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)

(14) Pre-Degree Examination—Old Centres

Examination Marks (ungraded)

Marks	Arts		Science		
	English Frequency	Economics	Mathematics frequency	Marks	Biology frequency
0 - 3	-	-	12	1 - 4	4
4 - 7	2	-	17	5 - 8	8
8 - 11	18	8	14	9 - 12	27
12 - 15	25	15	18	13 - 16	25
16 - 19	58	28	26	17 - 20	72
20 - 23	103	52	28	21 - 24	84
24 - 27	96	98	41	25 - 28	75
28 - 31	79	92	31	29 - 32	64
32 - 35	17	67	40	33 - 36	33
36 - 39	2	30	40	37 - 40	6
40 - 43	-	6	25	41 - 44	2
44 - 47	-	4	29		
48 - 51	-	-	26		
52 - 55	-	-	20		
56 - 59	-	-	12		
60 - 63	-	-	13		
64 - 67	-	-	1		
68 - 71	-	-	4		
72 - 75	-	-	2		
76 - 79	-	-	1		
Total	400	400	400	Total	400

**Table 18 : DISTRIBUTIONS OF INTERNAL AND EXTERNAL ASSESSMENTS
(Contd.)**

(15) *Pre-Degree Examination—New Centres*

Examination Marks (ungraded)

Marks	Arts		Science	
	English frequency	Mathematics	Economics frequency	Marks Biology frequency
0 - 3	-	1	13	1 - 4 4
4 - 7	5	5	31	5 - 8 20
8 - 11	7	11	23	9 - 12 35
12 - 15	29	11	28	13 - 16 37
16 - 19	63	24	25	17 - 20 118
20 - 23	94	32	33	21 - 24 88
24 - 27	85	66	37	25 - 28 56
28 - 31	65	88	42	29 - 32 29
32 - 35	29	74	42	33 - 36 7
36 - 39	17	51	20	37 - 40 3
40 - 43	5	22	28	41 - 44 2
44 - 47	1	13	19	45 - 48 1
48 - 51	-	2	20	
52 - 55	-	-	11	
56 - 59	-	-	11	
60 - 63	-	-	6	
64 - 67	-	-	4	
68 - 71	-	-	4	
72 - 75	-	-	3	
76 - 79	-	-	-	
Total	400	400	400	Total 400

Table 19 : β_1 AND β_2 VALUES FOR THE EXAMINATION MARKS IN SOME SUBJECTS

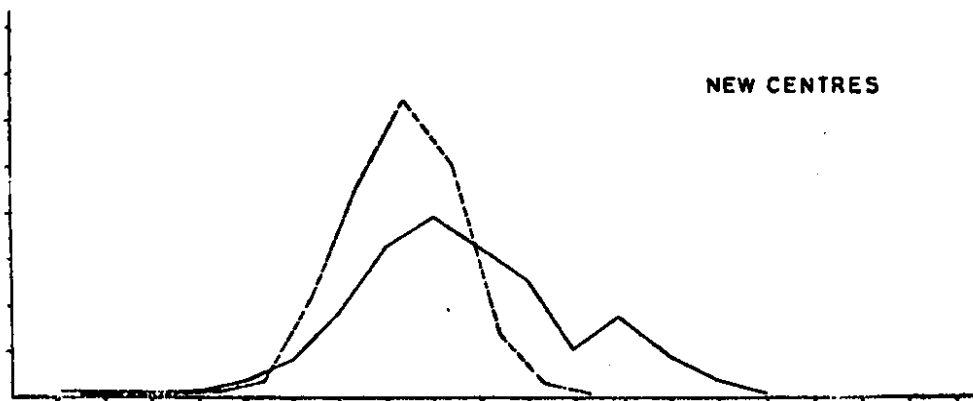
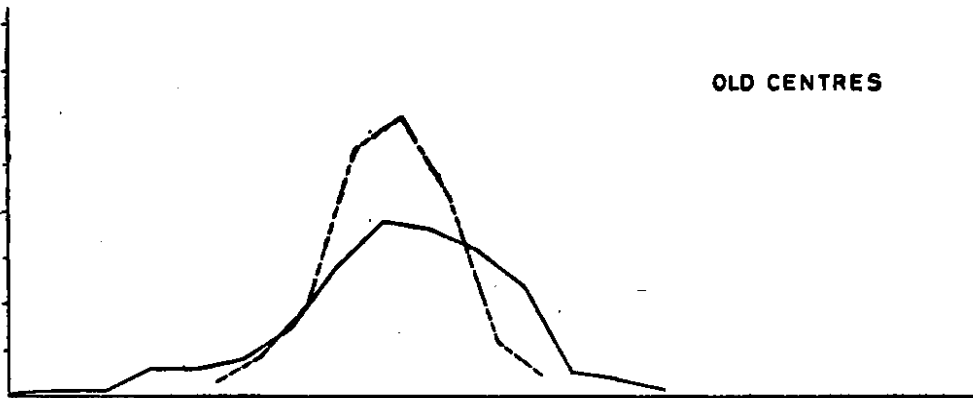
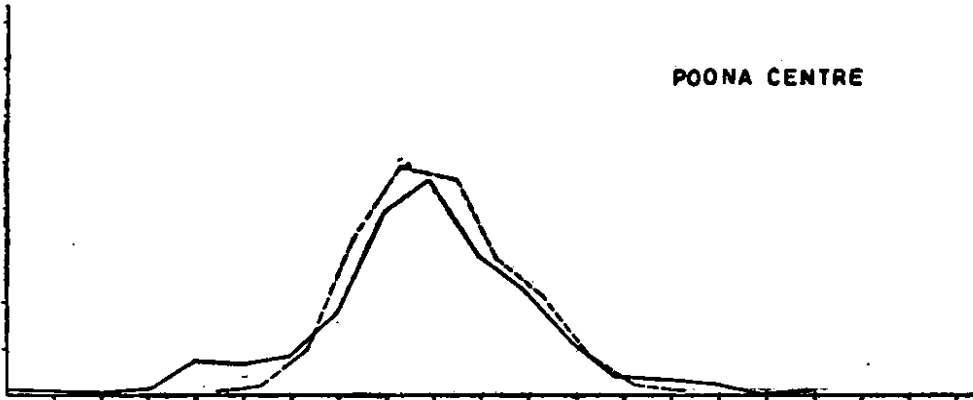
Subject	Centre	For graded marks		For ungraded marks	
		β_1	β_2	β_1	β_2
English	Poona	0.790	3.321	0.024	3.045
	Old	0.327	2.572	0.179	2.844
	New	0.046	2.934	0.014	3.071
	Poona	0.106	3.253	0.020	2.973
Economics	Old	0.107	3.302	0.054	3.133
	New	0.278	3.445	0.239	3.346
	Poona	0.028	2.679	0.093	2.527
Mathematics	Old	0.001	2.594	0.009	2.486
	New	0.050	2.664	0.133	2.582
	Poona	0.013	3.083	0.002	2.794
Biology	Old	0.119	3.055	0.089	2.855
	New	0.000	3.953	0.013	3.597

(B) The distributions in the Science subjects show the opposite tendency. Except in Biology in the new centres (where the graphs are similar to those in the Arts subjects) the graphs of the examination marks in Science are to the right of the graphs of the internal assessment, indicating that the latter was less liberal than the former. Here the divergence between the right-hand tails is much wider for Poona than in other centres, which shows that in Poona high internal scores were less frequent than in other centres. The wider range of marks in the Science subjects underlines their high-scoring character, which is to be particularly observed in the sprawling diagrams for Mathematics. In this respect Physics is closer to Mathematics than it is to Biology, for understandable reasons. Again the high peaks and steep slopes in the interval between 20 and 35 in the graphs of the examination marks indicate the effect of gracing.

(C) In the graphs with ungraded examination marks the peaks and steep slopes mentioned above have disappeared to a very large extent. In

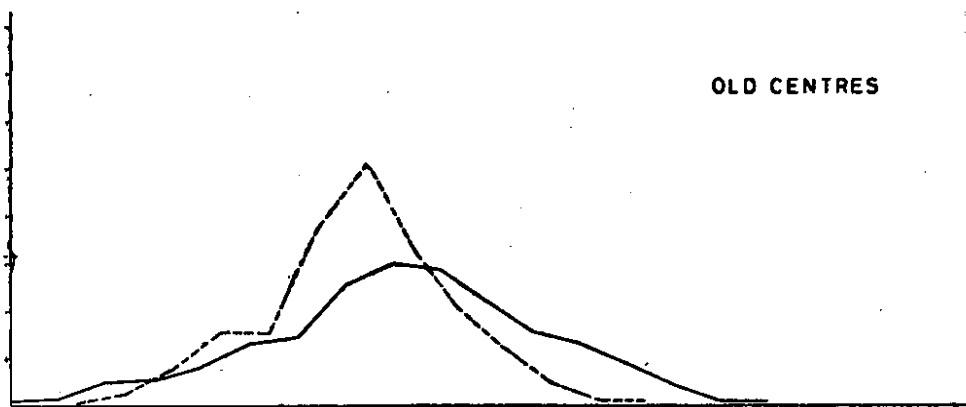
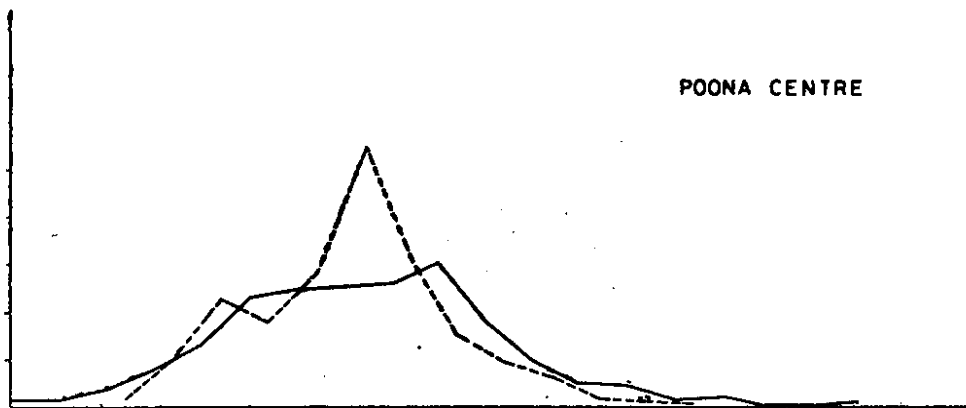
PRE-DEGREE ARTS-MARATHI

— INTERNAL SCORE
--- EXAMINATION MARKS



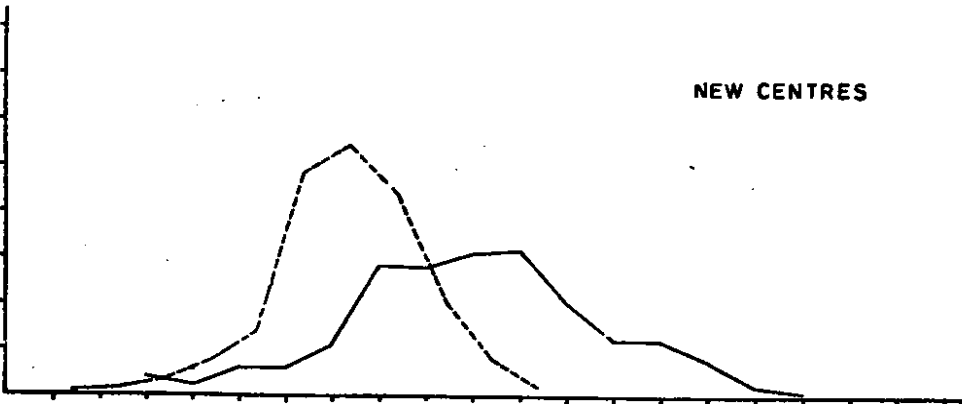
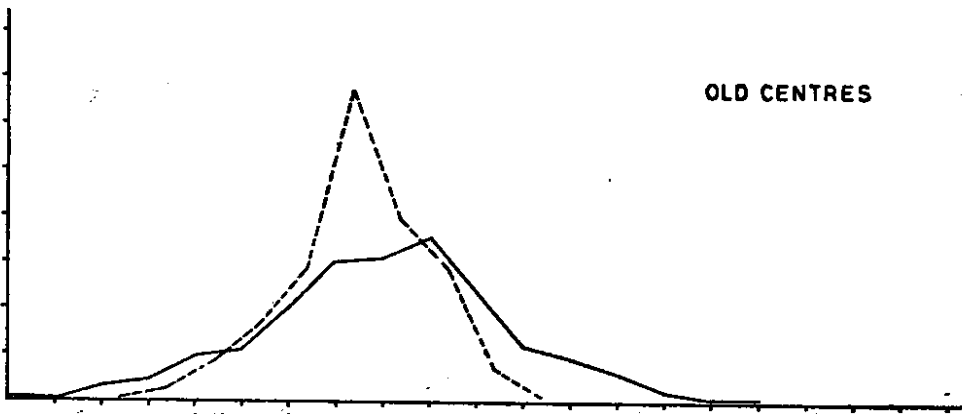
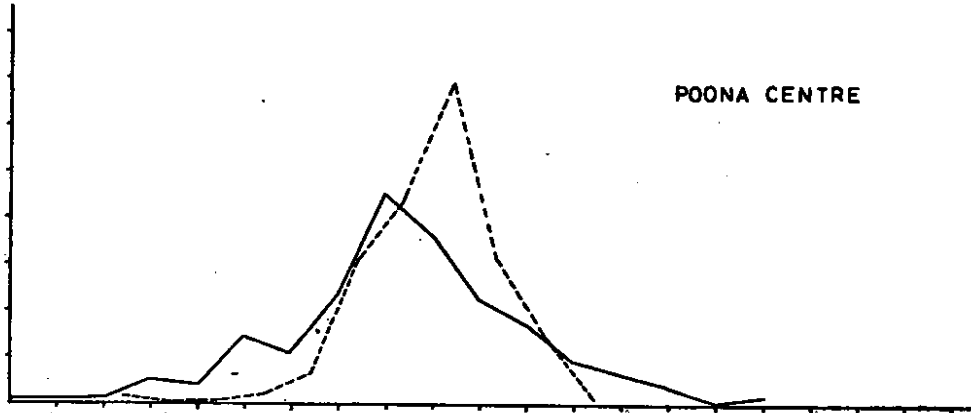
PRE-DEGREE ARTS: GEOGRAPHY

— INTERNAL SCORE
--- EXAMINATION MARKS



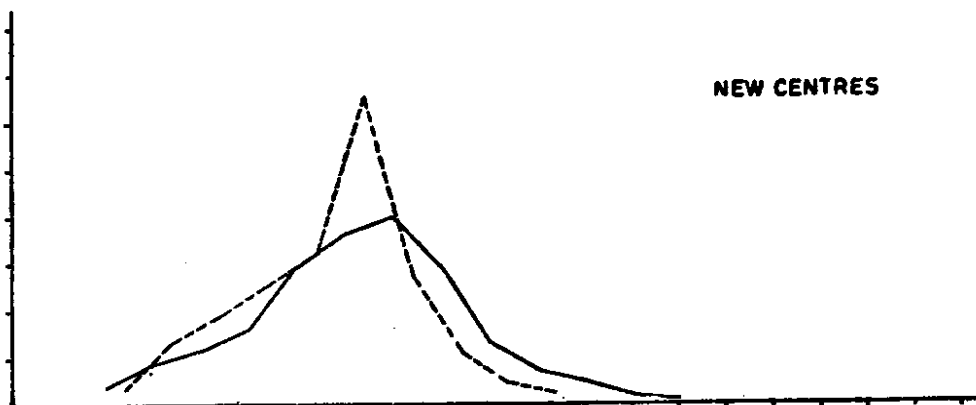
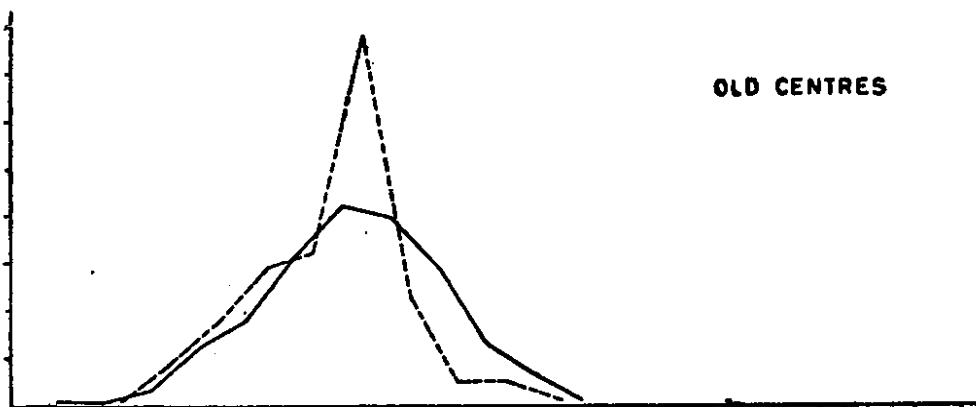
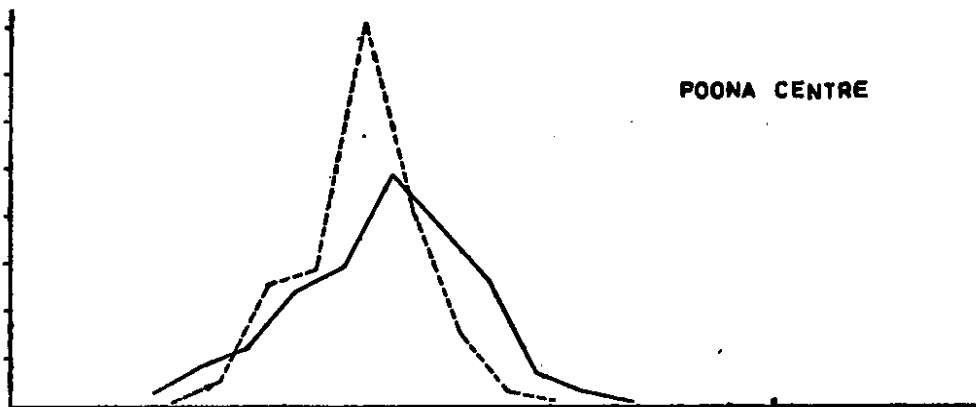
PRE-DEGREE ARTS : CIVICS

— INTERNAL SCORE
--- EXAMINATION MARKS



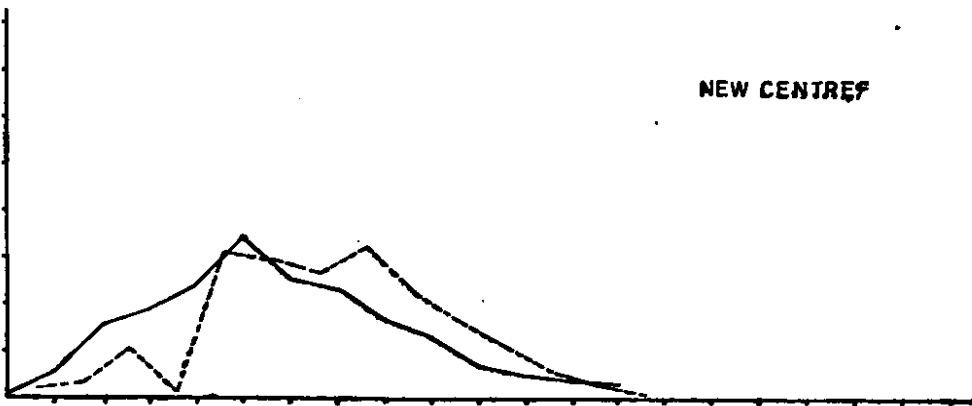
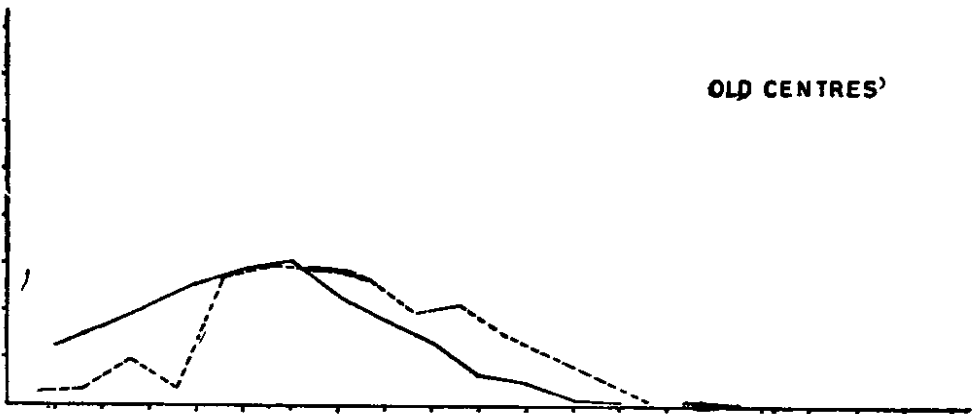
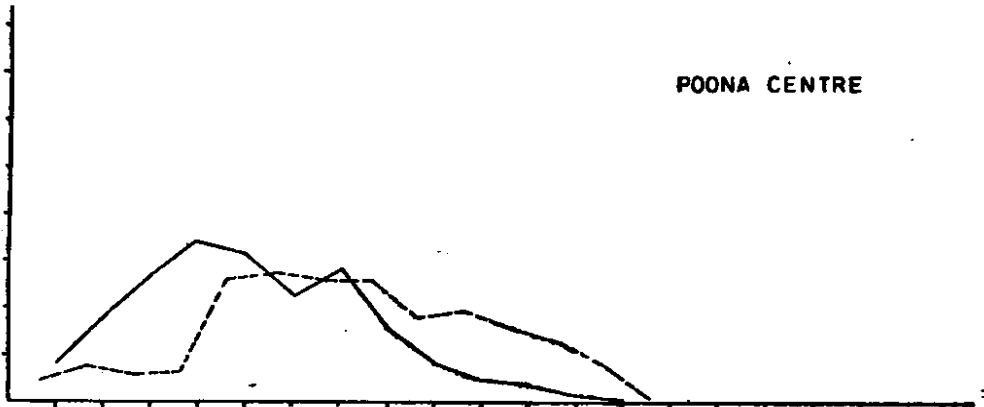
PRE-DEGREE SCIENCE: ENGLISH

— INTERNAL SCORE
---- EXAMINATION MARKS



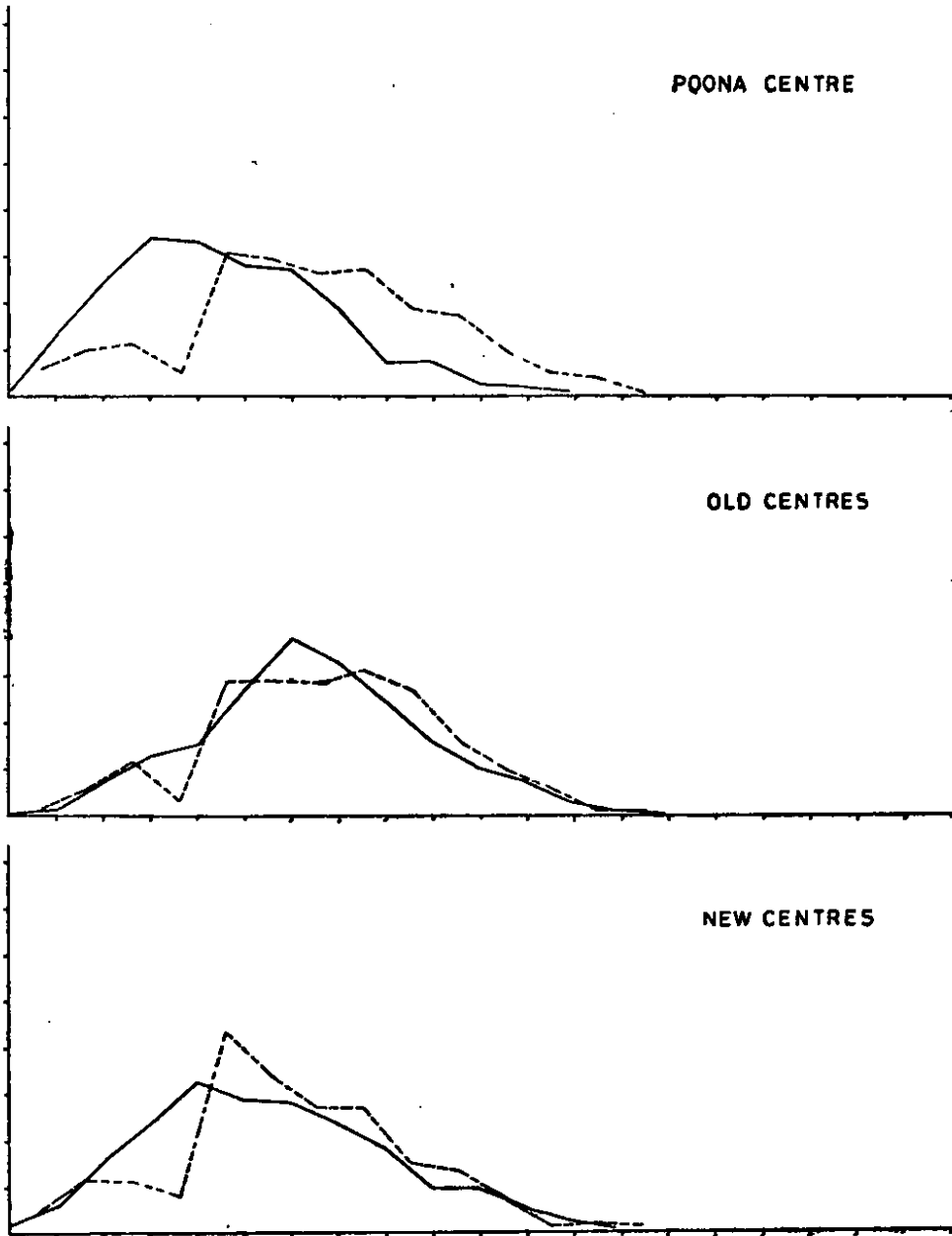
PRE-DEGREE SCIENCE: PHYSICS

— INTERNAL SCORE
- - - EXAMINATION MARKS



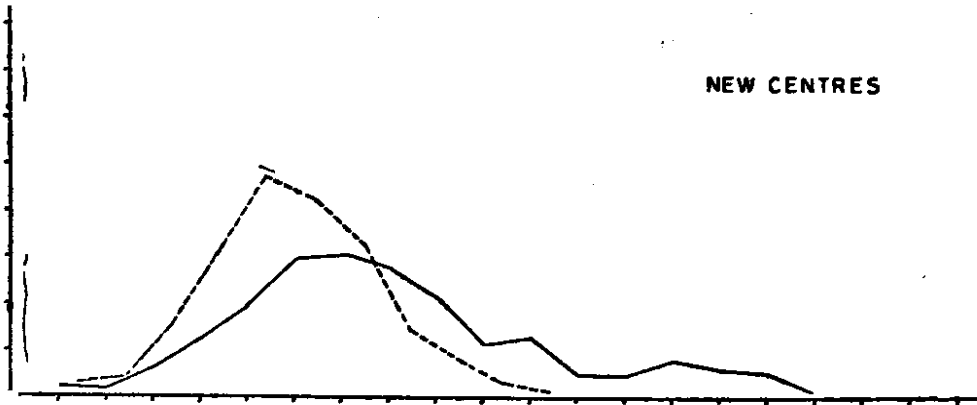
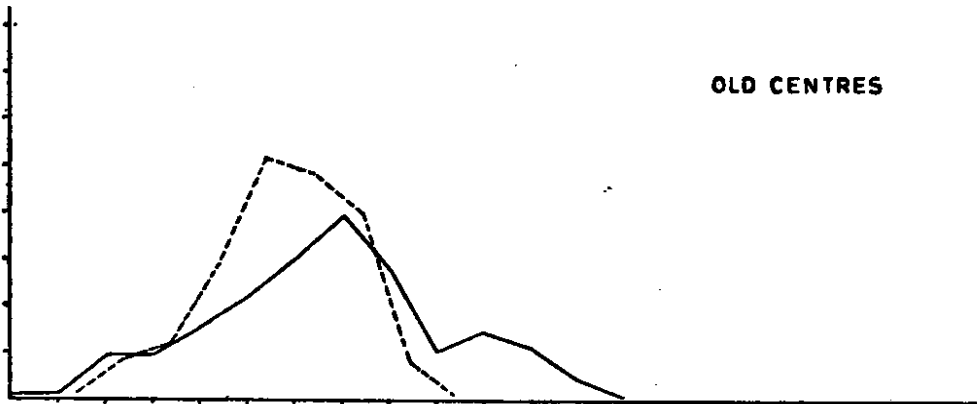
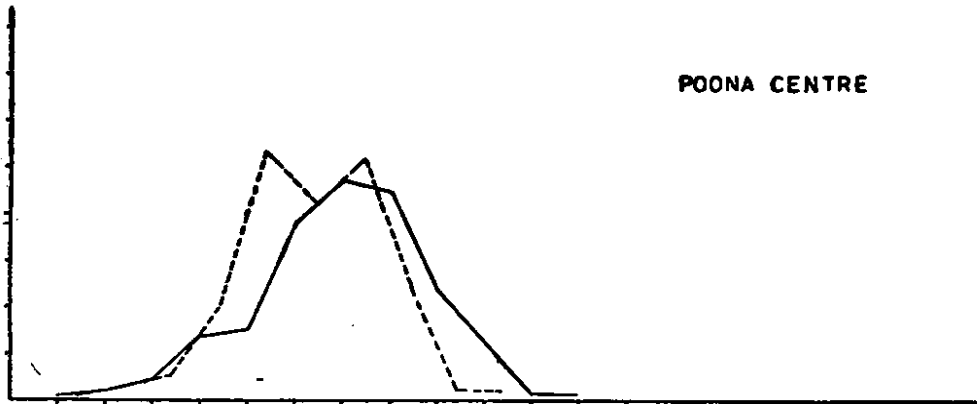
PRE-DEGREE SCIENCE: CHEMISTRY

— INTERNAL SCORE
--- EXAMINATION MARKS



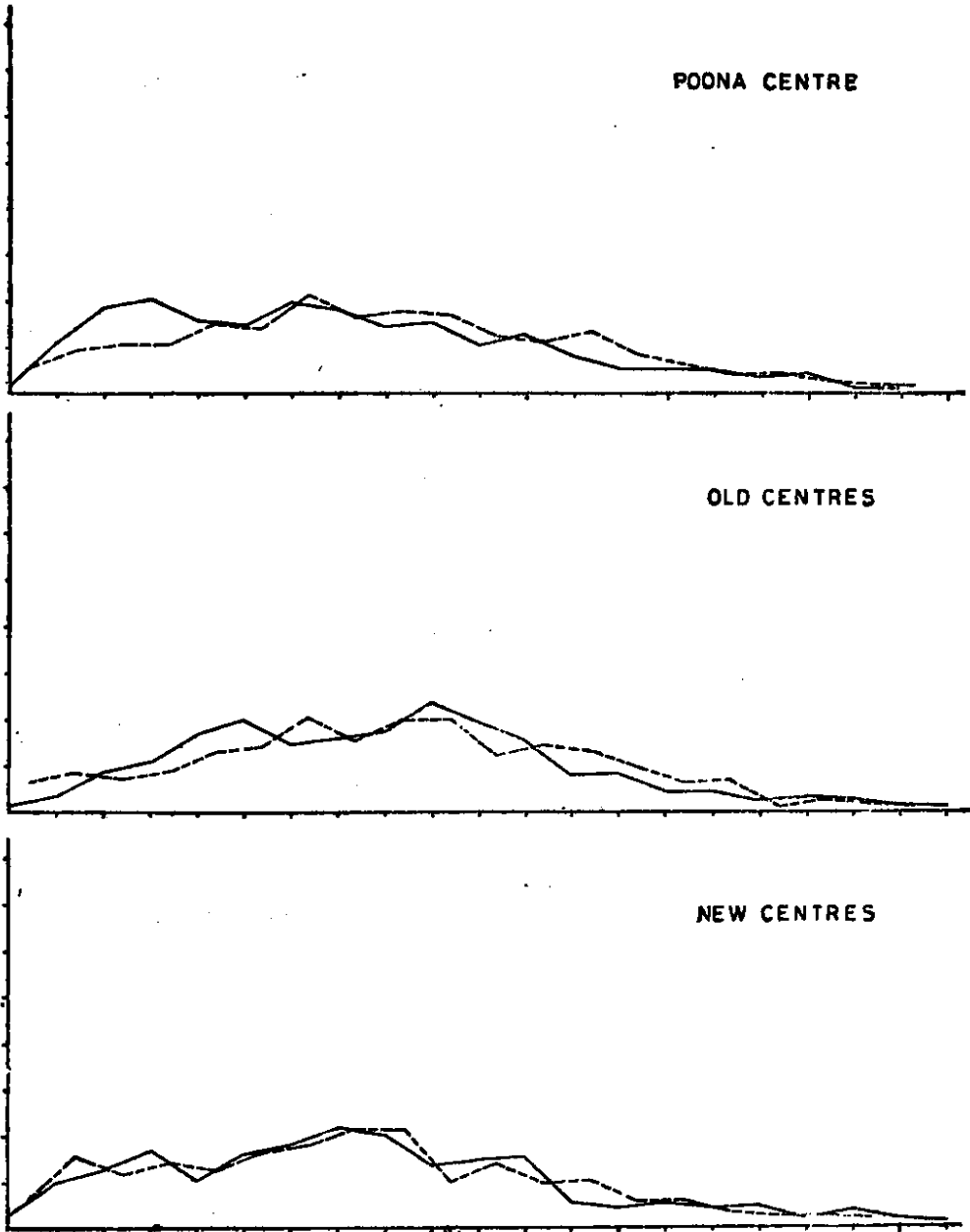
PRE-DEGREE ARTS : ENGLISH

— INTERNAL SCORE
--- EXAMINATION MARKS (UNGRADED)



PRE-DEGREE SCIENCE: MATHEMATICS

— INTERNAL SCORE
--- EXAMINATION MARKS (UNGRADED)



many cases the two graphs have become much similar. The other features described above about the relative positions of the internal and external assessments continue to be in evidence.

General remark

Most of these distributions (when smoothed) will be near-normal. This was checked for some of the distributions of the external assessment by calculating the coefficients of Skewness and Kurtosis. As the values of β_1 and β_2 will show gracing moves them further away from normality for Arts subjects but may not do so for Science subjects. (See Table 19 on page 58.)

APPENDIX 3

A Note on the Predictive Value of Internal Assessment

In sections 7, 8 and 14 reference has been made to the predictive value of internal assessment for predicting the examination marks. Table 20 gives the constants of the estimated linear regression equation $y = a + bx$ where y denotes the examination marks and x the internal score and where both x and y are scaled up to 100. The constants are estimated from the data for the samples of size 400 for English and Economics in Pre-Degree Arts and for Mathematics and Biology in Pre-Degree Science and for both graded and ungraded examination marks. The table also gives the proportion of variation explained by the linear regression (equal to the square of the correlation coefficient), the standard error of the regression coefficient b and the predicted values of the examination marks y for an individual candidate whose internal score is $x = 20$ or $x = 50$. Although the standard errors of b are small this does not mean that x has a high predictive value. The predictive value is indicated by the standard errors of the predicted values of y ; these are given in columns 9 and 11. It is to be noted that these standard errors are slightly smaller for ungraded examination marks than for graded marks when their standard deviations are comparable. (See Table 20 along with Tables 6, 7 and 15.)

The following formulæ in regression analysis have been used. If $(x_1, y_1), (x_2, y_2) \dots (x_n, y_n)$ are the observations in the sample

$$\text{and if } \bar{x} = \sum x_i / n, \bar{y} = \sum y_i / n; S_{xx} = \sum (x_i - \bar{x})^2,$$

$$S_{yy} = \sum (y_i - \bar{y})^2, S_{xy} = \sum (x_i - \bar{x})(y_i - \bar{y}); \text{ and } s^2 = \frac{1}{n-2} \left(S_{yy} - \frac{S_{xy}^2}{S_{xx}} \right);$$

then the estimates a and b are given by

$$a = \bar{y} - b\bar{x}, \quad b = S_{xy} / S_{xx} \quad (1)$$

$$\text{and} \quad \text{S. E. of } b = s / \sqrt{S_{xx}} \quad (2)$$

The estimate of y for $x = x_0$ is given by

$$y_0 = a + bx_0 \quad (3)$$

$$\text{and} \quad \text{S. E. of } y_0 = s \left[\frac{n+1}{n} + \frac{(x_0 - \bar{x})^2}{S_{xx}} \right]^{\frac{1}{2}} \quad (4)$$

Table 20 : CONSTANTS OF REGRESSION EQUATION $y = a + bx$ WHERE y = EXAMINATION MARKS; x = INTERNAL ASSESSMENT (BOTH SCALED UP TO 100)

Subject	Centre		a	b	Standard error of b	r ² Part of variation explained by regression	Predicted y when x = 20	S.E. of y when x = 20	Predicted y when x = 50	S.E. of y when x = 50
English (Arts)	Poona	Graced	19.34	0.389	0.035	0.238	27.12	6.08	38.79	6.08
		Ungraced	17.30	0.411	0.033	0.263	25.52	6.02	37.85	6.01
	Old	Graced	21.39	0.260	0.028	0.177	26.59	6.76	34.39	6.77
		Ungraced	20.82	0.233	0.027	0.157	25.48	6.76	32.47	6.77
	New	Graced	22.81	0.203	0.025	0.139	26.87	8.19	32.96	8.19
		Ungraced	21.04	0.219	0.025	0.167	25.42	7.90	31.99	7.88
Economics (Arts)	Poona	Graced	24.81	0.254	0.023	0.233	29.89	6.57	37.51	6.56
		Ungraced	23.87	0.264	0.023	0.250	29.15	6.65	37.07	6.64
	Old	Graced	25.53	0.222	0.029	0.124	29.97	7.82	36.63	7.80
		Ungraced	25.28	0.227	0.030	0.126	29.82	7.88	36.63	7.86
	New	Graced	27.22	0.202	0.033	0.083	31.26	10.11	37.32	10.10
		Ungraced	26.81	0.208	0.034	0.087	30.97	10.14	37.21	10.11
Mathematics (Science)	Poona	Graced	15.29	0.746	0.032	0.579	30.21	13.65	52.59	13.65
		Ungraced	12.66	0.783	0.032	0.610	28.32	13.38	51.81	13.38
	Old	Graced	14.24	0.694	0.038	0.459	28.12	14.49	48.94	14.48
		Ungraced	11.83	0.729	0.038	0.481	26.41	14.51	48.28	14.51
	New	Graced	11.92	0.680	0.033	0.509	25.52	14.24	45.92	14.24
		Ungraced	9.95	0.703	0.033	0.530	24.01	14.09	45.10	14.09
Biology (Science)	Poona	Graced	16.97	0.689	0.036	0.472	30.75	10.22	51.42	10.12
		Ungraced	15.01	0.725	0.037	0.491	29.51	10.35	51.26	10.35
	Old	Graced	18.68	0.600	0.033	0.458	30.68	9.59	48.68	9.57
		Ungraced	17.65	0.618	0.033	0.468	30.01	9.69	48.55	9.67
	New	Graced	16.86	0.470	0.025	0.461	26.26	8.87	40.36	8.86
		Ungraced	15.17	0.493	0.026	0.480	25.03	8.97	39.82	8.95

Table 22 : FACTOR LOADING FOR THE FIRST THREE FACTORS, F_1 , F_2 , F_3

		PRE-DEGREE				
Subject	Factor	Poona Centre			Old Centres	
		F_1	F_2	F_3	F_1	F_2
1	English	0.6563	-0.1551	0.6914	0.5871	0.7921
2	Marathi	0.8224	-0.0398	-0.1670	0.7729	-0.0745
3	Geography	0.7750	-0.2182	-0.3198	0.7343	-0.1722
4	Economics	0.7672	-0.0948	-0.0264	0.7709	0.0352
5	Civics	0.7298	0.4248	-0.1946	0.7605	-0.0480
6	Sanskrit or Hindi	0.7779	-0.4068	-0.0335	0.7715	-0.2428
7	A.I.C. or M.W.	0.6861	0.5578	0.1744	0.7861	-0.1072
	Variation explained	3.9050	0.7394	0.6783	3.8671	0.7366
	Per cent of total variation explained	55.8	10.6	9.7	55.2	10.5
		PRE-DEGREE				
1	English	0.7499	0.0646	0.3543	0.7181	0.0869
2	Physics	0.8856	-0.2920	-0.1125	0.8655	-0.2551
3	Chemistry	0.8965	-0.1618	-0.1063	0.8442	-0.2954
4	Biology	0.8059	-0.2048	0.1506	0.8139	-0.0298
5	Mathematics	0.8625	-0.2573	-0.1176	0.8150	-0.3459
6	M. I. Language	0.6826	0.5278	-0.0821	0.6529	0.5930
7	Arts subject	0.6746	0.5661	-0.0513	0.7298	0.4477
	Variation explained	4.4647	0.8227	0.5515	4.2632	0.8325
	Per cent of total variation explained	63.8	11.7	7.9	60.9	11.9

Table 22 : FACTOR LOADING FOR THE FIRST THREE FACTORS, F_1 , F_2 , F_3

ARTS						
F_3	New Centres			Pooled sample		
	F_1	F_2	F_3	F_1	F_2	F_3
0.0817	0.6915	-0.4120	-0.4623	0.6618	-0.4099	-0.4365
-0.0151	0.7702	0.0584	-0.2306	0.7933	-0.1878	-0.0584
0.5479	0.7034	-0.3831	0.4629	0.7140	0.5008	-0.2299
0.0350	0.7580	0.4311	0.1800	0.7312	0.3133	0.2337
-0.4848	0.8085	0.2587	0.0981	0.7595	-0.3097	0.2779
0.0666	0.7320	-0.2920	0.1632	0.7657	0.1422	-0.2679
-0.1886	0.7460	0.2509	-0.2192	0.7360	-0.0545	0.4382
0.5834	3.8868	0.7209	0.5979	3.8164	0.6713	0.6425
8.3	55.5	10.3	8.5	54.5	9.6	9.2
SCIENCE						
0.6254	0.8051	0.1878	0.3628	0.7480	0.1777	0.5764
-0.1873	0.8650	-0.2957	0.0627	0.8702	-0.2981	-0.1140
-0.0960	0.8570	-0.2376	-0.2022	0.8672	-0.2452	-0.1098
0.1793	0.8374	-0.1152	0.3009	0.8194	-0.0992	0.2172
-0.1736	0.8109	-0.3473	-0.2213	0.8329	-0.3284	-0.1709
-0.2918	0.7418	0.4933	0.0771	0.6883	0.5121	-0.2902
-0.0272	0.7385	0.4338	-0.4099	0.7096	0.4811	-0.1024
0.5836	4.5853	0.7446	0.4899	4.4113	0.7919	0.5284
8.3	65.5	10.6	7.0	63.0	11.3	7.5

For the purpose of the present analysis we considered only the examination marks and ignored the internal assessment scores as the latter were likely to introduce another source of variation from college to college. Again, in the three Science subjects, Physics, Chemistry and Biology, the marks in the theory paper alone were taken, ignoring the marks in the practical examination. Analysis was first done separately for each of the three groups of centres and then for the pooled sample of 1,200 for the entire university, for Arts and for Science.

The method of Principal Components was used to locate the underlying pattern of factors. For this purpose correlation matrices were obtained for each set and communalities were taken as unity in their analysis. As is customary in such cases, the analysis was continued up to three factors. Correlation matrices for each sample of 400 as well as for the pooled sample of 1,200 for Arts and for Science are given in Table 21. The corresponding values of factor loadings for the seven subjects are given in Table 22 where the percentage of the total variation explained by each of the factors is also given.

The first factor explains about 55 per cent of the total variation in the Arts samples and between 60 and 65 per cent of the variation in the Science samples and there is no difficulty in identifying it, as usual, as the General Ability factor. The loadings also show that the pattern of the first factor is more or less the same for the three centres and for the pooled data, and this is true for Arts as well as for Science.

When we come to the second and third factors, however, the problem of interpretation becomes difficult. Also, the interpretation becomes inevitably different for Arts and Science.

In the first place we see that, while the part of the total variation explained by the first three principal components is of the order of 75 per cent in Arts, in Science it is much higher, as high as 81 to 83 per cent. This perhaps reflects the greater homogeneity among the Science students as well as in the content of the Science syllabus. Secondly, although the variation explained by the second factor is considerably less than that explained by the first, the variation explained by the third factor is of the same order as that explained by the second. This is true both for Arts and for Science. This suggests that the interpretation of these two factors may be taken together.

The seven subjects in Arts include Geography, which is more in the nature of a Science subject, as against the other six which can be further sub-divided into the group of the three languages and the group of the three non-language subjects, namely, Economics, Civics and AIC or MW. Again, most of the candidates ((90 per cent or more) answer all their papers, except English, in the Marathi medium.¹⁹ It seems these two

¹⁹ See A. R. KAMAT and A. G. DESHMUKH, *Wastage in College Education*, Part II, 1963.

acts are reflected in the factor patterns of the second and the third factor or Arts. For instance, the third factor in the Poona group and the second factor in the Old-Centre group clearly reflect the contrast between English and other subjects. Although it does not appear to be identifiable in the New-Centre group, the third factor in the pooled data perhaps indicates the same thing in another form; here the division seems to be broadly along language subjects *versus* non-language subjects. The third factor for the Old-Centre group indicates clearly the contrast between Geography and other subjects. The same perhaps appears in the form of more or less "exact" subjects (Geography and Economics) against other "non-exact" subjects in the second factors for the New-Centre group and for the pooled data. It is, however, difficult to interpret the second factor in the Poona group. Another interesting feature is the low factor loadings for Marathi on the second and third factors in most cases; this perhaps reflects the fact that Marathi being the mother tongue of the candidates, most of its effect is extracted in the first factor of general ability.

In the case of Science it should be observed at the outset that the papers in the first five subjects, which include the three Science subjects and Mathematics, are answered in the English medium by all the candidates, the option of the Marathi medium being available only for the MIL and the Additional Arts subject. (This is exercised in favour of Marathi by about 40 per cent of the candidates in the case of the Additional Arts subject;²⁰ the paper on the MIL is answered in that language). There is no doubt that the second factor in the separate data for the three groups of centres as well as in the pooled data reflects the contrast of the Arts subjects against the Sciences (including Mathematics). From the pattern of signs it appears that the third factor reflects the contrast of the relatively descriptive or "non-exact" subjects (English and Biology) against the non-descriptive or "exact" subjects (Physics, Chemistry and Mathematics) among the first five subjects. This is clear in the case of the pooled data as well as for the Poona and Old-Centre groups but not so clear in the New-Centre group. It is also interesting to note that the loadings in the first factor (for the three separate groups as well as for the pooled data) also point to the dichotomy of subjects; the loadings for the Science subjects, including Mathematics, are as a group higher than those for the three Arts subjects. This indicates that the general ability factor for the Science candidates consists primarily of ability in the Science subjects. This is as should be.

²⁰ See A. R. KAMAT and A. G. DESHMUKH, *op. cit.*

STUDY 2

Unit Institutional Costs in Higher Education

(Based on the University of Poona and its colleges)

1. Introduction

1. Unit cost studies are of great importance in the study of educational finances and are of particular significance in the present period when rapid educational development is taking place in our country. They assume even greater importance for higher education where it is much more expensive to create facilities and to keep them running than at the lower levels of education. The present study is confined to one aspect of the educational cost, the *current institutional cost* per student per year, at the main stages of higher education in the University of Poona, at the undergraduate stage in its colleges, and at the post-graduate stage in its departments. It is estimated on the basis of the figures supplied by the institutions concerned for the academic year 1964-65.

2. The cost of education can be interpreted in two different ways, from two different points of view: (1) Student Cost; and (2) Institutional Cost.

Student Cost: This is the cost which the guardian of a student (or the student himself) incurs in maintaining him in an institution of higher education at a particular stage of education. It may be broadly divided into the following parts: (a) tuition and other fees, (b) cost of books and equipment, (c) cost of maintenance, that is, board and lodging, and (d) other expenses such as cost of clothing, cost of conveyance and similar miscellaneous items of expenditure. Sometimes further refinement can be attempted by introducing a fifth category: (e) the net opportunity cost, which is the income the student foregoes in pursuing his present education—the net income which he would have otherwise earned by working or serving somewhere else instead of getting himself educated. While it should be possible to estimate accurately components (a) and (b) of the Student Cost, the figures for (c) and (d) will widely differ from student to student and no reliable and representative estimates can be constructed without carrying out carefully planned sample surveys. As regards the net opportunity cost, if this component has to be introduced, its proper estimation is extremely difficult in an under-developed economy such as ours with its enormous unemployment and under-employment.

Institutional Cost: The Institutional Cost consists of two parts: (a) non-recurring cost or capital investment such as cost of land, buildings and equipment; and (b) recurring cost, that is, the annual expenditure

for running the institution. While the first part gives the cost incurred in order to *create* a seat of higher education, the second gives the cost of *maintaining* or operating that seat. The non-recurring cost can be worked out by assuming norms or by collecting expenditure figures on the relevant items in the recently started institutions. The recurring cost of maintenance or the operational cost has to be obtained from the recent figures of recurring expenditure of the institutions.

3. It is no doubt important to estimate the *total* cost of higher education to the society, the total national effort invested in higher education. For this purpose the relevant portions of the Student Cost and the Institutional Cost have to be added; care has to be taken to avoid duplication of items such as tuition and examination fees, scholarships, etc. The Institutional Cost, however, assumes particular significance when one wants to estimate the resources which the community has to find in order to provide higher education to its young men and women in the years to come. This study is an attempt at estimating the *recurring* part of the Institutional Cost—the amount which an institution of higher learning spends annually to keep a course of higher education going—on per student basis. These cost estimates and the estimated number of students can provide estimates of the current or recurring expenditure necessary for running different courses of higher education. The estimates of capital or non-recurring expenditure for providing higher-education facilities for a larger number of students or for improving the existing facilities can be worked out from the *non-recurring* part of the Institutional Cost. But no attempt is made in this study to estimate this non-recurring part of the Institutional Cost or to estimate the Student Cost. Also, in estimating the current or recurring costs, no allowance has been made for depreciation on the capital investment.

II. Description of the Structure of the University of Poona

4. A brief description of the structure of different courses in the University of Poona and the institutions teaching them is given here to facilitate the understanding of what is presented in the following pages. In this University all undergraduate education is given by the colleges; the colleges in Poona are called constituent colleges and those outside Poona are called affiliated colleges. There is no University college, and first-degree courses are not run by the University. Students can join a college of Arts, Science, or Commerce, after passing the S.S.C. (Secondary School Certificate) examination. The degree course in Arts, Science or Commerce extends over four years. A few years back most colleges taught both Arts and Science, but there were separate colleges for Commerce. During the last few years, Commerce is also being taught in Arts or Arts-and-Science colleges. The four years of the undergraduate course are divided into two stages, the first year in college is called the Pre-Degree (P.D.) year in

Arts, Science or Commerce, and the next three years constitute the three-year degree course and they are respectively called First Year (F. Y.), Second Year (S. Y.), Third Year (T. Y.) of the B. A., B. Sc. or B. Com. course. Students who wish to join the degree courses in Engineering or Medicine have to pass what is called the Pre-Professional examination at the end of F. Y. B. Sc. (that is, after two years of the Science course). The Pre-Professional course is almost identical with the F. Y. B. Sc. course, and those who are unable to get admission to engineering or medical colleges can continue to study in the S. Y. B. Sc. class. In the case of Agriculture, students can join a college of agriculture immediately after passing the S. S. C. examination and can obtain the B. Sc. in Agriculture in four years. For a degree course in Law and in Education a student must have obtained a first degree (in Arts, Science or Commerce).

5. The situation is rather complicated in post-graduate teaching which is supposed to be the responsibility exclusively of the University. In practice post-graduate courses in Agriculture, Engineering, Medicine, Law and Education are located at the respective colleges in Poona and are managed by them. In Science all post-graduate teaching is done in the Departments of the University. In Arts all post-graduate lectures are held in the University, but University Departments do not exist for all subjects; some of them are located in a few research institutes in Poona. (This introduces difficulties for costing as will be explained later.) No post-graduate work is done in Arts and Science in the colleges in Poona, but senior teachers from the colleges participate in the teaching work at the University, and some of them also guide Ph.D. students. In Commerce the post-graduate work in Poona is located at the Commerce College in Poona and is managed by it. Outside Poona there are a few post-graduate centres located in affiliated colleges where instruction is provided in some subjects in Arts and Commerce, and a solitary subject in Science. Post-graduate work in other faculties is not done outside Poona.

6. Costs for undergraduate courses in Arts, Science and Commerce are worked out for three colleges in Poona in Section IV. They are estimated separately for (i) the P. D. year, (ii) the three-year degree course and (iii) the four-year course taken together. (Actually the teaching is still largely organized on the old pattern of "two plus two" division of the four years. This is especially so in Science and it would have been perhaps more realistic to work out costs for these two stages. It is visualized, however, that the P. D. year will ultimately be absorbed in the higher secondary schools and that the Pre-Professional course will be sooner or later taken over by the engineering and medical colleges. As the three-year degree courses will thus be more or less closely-knit units in future, we have not done this additional exercise.) On account of the manner in which post-graduate education is organized in this university it was convenient to estimate its cost in Commerce, along with the first-degree costs. In Section V the same

exercise is repeated for colleges outside Poona for the undergraduate courses in Arts, Science and Commerce and for the post-graduate courses in Arts and Commerce in Nasik. The costs for both first-degree and post-graduate courses in Law, Education and Engineering are estimated in Section VI. (We regret it was not possible to work them out for Agriculture and Medicine.) The costs of post-graduate education in the Humanities (Arts) and Science are estimated in Section VII by estimating the expenditure on the post-graduate departments of the University. Comments are offered in Sections VIII and IX. Relevant information is attached in the form of comments and tables for each institution.

III. General Principles and Procedure

7. It is necessary to state the general principles and the procedure followed in this exercise.

(i) To reiterate what has been mentioned before this is an attempt to estimate the recurring institutional expenditure per student per annum. Hence all non-recurring expenditure like investment in land, buildings, structures, furniture or equipment (for the introduction of new educational facilities or improvement of old ones) are excluded. Depreciations on these items are also not taken into account for the same reason.

(ii) Rent paid by the institution (either to an outside agency or to the parent society which also manages other institutions) is included in the recurring cost. Interest charges on loans (on buildings etc.) which continue over a long period and are therefore of a recurring nature are also included. The reason for including this interest is that it is almost similar to recurring expenditure on rent. But repayment of loans is excluded from the current cost.

(iii) Administrative charges paid by the institution to its managing society are included in the current cost. They are considered as the cost of a part of the administration of the institution undertaken by the society for convenience.

(iv) Current expenditure on the purchase of equipment such as books and journals for the library or apparatus for the laboratories is included in the recurring cost. Conventionally this should come under capital investment but the present procedure is adopted for two reasons. Firstly, this is a necessary annual expenditure and one cannot think of a college without annual additions to the library or replacements in the laboratory. In a sense they are some of the "raw material" inputs. Secondly, if it is treated as capital investment, allowance has to be made for depreciation and for the wreckage that takes place in the library and laboratory during the year; it is not easy to estimate it. We have, however, excluded all expenditure on these items which was not of the annual recurring type but was of the nature of block expenditures for development or improvement.

(v) Contributions made by the institution towards running a students' hostel, maintaining staff-quarters, etc. (that is, the excess of expenditure over income from them) are included in the current expenditure. The underlying principle is that wherever the amenities provided are either essential or eminently desirable for running an institution, the net cost of providing them should be included in the recurring cost.

(vi) For the same reason scholarships awarded by the institution are included under the current cost. But free-studentships have to be excluded because they do not figure as expenditure in the institution's accounts. Again endowed scholarships, government scholarships and such other awards which merely pass through the institutions but are not actually spent from their budgets are not included in the current cost.

(vii) The examination cost does not figure in the current cost of colleges because examinations at most of the important stages of the undergraduate courses are university examinations and are conducted by the university. The cost of conducting term-end and other internal tests in collegiate institutions is included in the current cost. Usually this figure is not large enough to form a separate head. The cost of the university examinations, however, is a large enough item but it cannot be evaluated for the following reasons. In the first place it is difficult to split the total university expenditure on examinations into separate figures for each examination. This is necessary before they can be further separated out for the candidates sent up by each college. Secondly, because of the dropouts and the repeaters, the candidates who appear for the university examination at the end of a stage of a course are not identical with the students who attend that course in colleges. In any case the fees that the university charges for the various examinations are usually more or less adequate to cover the expenditure in that respect. If it is intended to include the examination cost one may estimate it by the actual examination fees and include it directly under the Student Cost rather than go through the elaborate but approximate estimation procedure in order to include it under the Institutional Cost.

8. The general procedure adopted for obtaining the figures of the current Institutional Cost will now be described; the particular modifications which were found necessary to suit the characteristics of an individual institution will be explained when it is taken up later for individual consideration. The items of expenditure were first separated under two broad categories: (i) Common or Non-divisible Expenditure, and (ii) Divisible Expenditure. The first category includes items of expenditure like the salary of the office staff, expenditure on library, expenditure on amenities provided to the students, etc. These items are common to students of all courses given in the institution and are not divisible. The second category consists items of expenditure like the salary of the teaching staff which can be apportioned between different categories of students, e.g. between Arts and

Science, and between the P.D. class and the three-year degree course. For convenience of identification these two broad categories were sub-divided according to the following scheme which was found suitable for most of the colleges.

Common or Non-divisible Expenditure

- CI : Salaries and allowances of the office staff (and establishment including clerks and other servants).
- CII : Gratuity, pension fund contribution, insurance premia, salaries of the teaching staff on leave and other non-divisible salaries of the teaching and other staff, and similar non-divisible contributions.
- CIII : Current expenditure on library including salaries of the library staff, purchase of books and periodicals, and other related items.
- CIV : Amenities provided to students such as college magazine, gymkhana, hobby workshop, N.C.C., physical training, social functions, contribution towards running a hostel, etc.
- CV : Rent, interest and administrative charges.
- CVI : Rates, taxes, electricity and water charges, building insurance etc.
- CVII : Current repairs to buildings, furniture, etc.
- CVIII : Contingent expenses.
- CIX : Miscellaneous.

Divisible Expenditure

- DI : Salaries and allowances of teaching staff.
- DII : College scholarships.
- DIII : Current expenditure on laboratories.

Out of the divisible items of expenditure, DI was further sub-divided over Arts and Science, and over the P.D. and three-year degree courses in the proportion of the periods engaged. (The method of division followed is explained while considering institutions individually.) The item DII is small and its classwise sub-division was generally available for each institution. It would have been desirable to divide DIII further over the different science classes. But here no method of allocation could be devised unlike the expenditure on salaries. We were therefore left with no other alternative except to spread it uniformly over all the science students. The cost per student on account of divisible expenditure for each category of students was obtained by adding the cost per student for each of these three items of Divisible Expenditure. To the figure thus arrived at for each category of students was added the common cost per student obtained by spreading the total Common Expenditure over all students in the institution to arrive at the final cost per student in each category.

9. A data sheet giving the relevant information was prepared for each college. It lists the number of students in each class, the number of teachers, Common Expenditure classified under the nine categories mentioned above and Divisible Expenditure classified under the three categories mentioned above. The sheet also gives the division of Divisible Expenditure over relevant categories of students and finally records the component costs as well as the total cost per student per annum for different categories of students. All data sheets are given at the end.

IV. Costs in Arts, Science and Commerce Colleges in Poona

10. The following three colleges from Poona, teaching Arts, Science and Commerce, were selected : (i) The Fergusson College, which is an Arts and Science college; (ii) the B. M. College of Commerce, which is exclusively a Commerce college; and (iii) Shri Shahu Mandir Mahavidyalaya, which is an Arts and Commerce college.

11. *The Fergusson College* : This is the oldest Arts and Science college in Poona and is under the management of the Deccan Education Society which is a private educational society. It belongs to the large-size class of colleges. Its total strength was 2,335 in 1964-65, out of which 801 were in Arts classes and 1,534 in Science classes. The detailed break-down is given in the data sheet. The teaching staff consisted of 151 members in 1964-65, of which the lecturing staff numbered 67, the remaining 84 being demonstrators and tutors. The data sheet also gives the actual expenditure for 1964-65 broken down into Common and Divisible item-groups outlined above. The total Common Expenditure of Rs. 3,44,514 was spread over the total number 2,335 of students and the common cost per student came to Rs. 147.54. The expenditure under DI, the salary of the teaching staff, was first spread over the relevant sub-groups of students. For this purpose we had to take into account the fact that some teachers also participated in the post-graduate teaching conducted by the University. The procedure followed is explained with an illustration.* Suppose those of the teachers who taught all the three categories of Arts courses, viz. the P.D. in Arts, the three-year B.A., and the M.A. classes, worked respectively for m , n and p teaching-periods per week for the three categories, and suppose that their total emoluments were Rs. S . Then the share of each sub-group of students in this expenditure could be obtained by dividing S into three parts in the proportion $m : n : p$. (The part spent on the M.A. group was not relevant to the cost of education for undergraduate students in the Fergusson College and was therefore omitted.) It was necessary to make similar apportioning of salaries of teachers who taught both Arts and Science classes (e.g. those who taught English or

* There are three grades in the lecturing staff. A further refinement in the calculations can be made if we take the salaries of the three different grades of teachers separately. But this elaboration was not thought worth while.

Mathematics). In this manner the salary expenditure on each category of teachers was sub-divided over the relevant category of students. Similar procedure was followed for salaries of demonstrators and tutors. Thus the portion of the divisible expenditure under DI relevant for each category of students was determined and it was then divided by the number of students in that category to obtain the cost per student in that category under the component DI of the divisible part of the expenditure. The classwise expenditure on DII, the expenditure on college scholarships, was available so that the same procedure could be followed for this component. For instance, the amounts of divisible expenditure assigned to the P.D. class in Science from DI and DII were Rs. 77,912 and Rs. 3,055 respectively. When spread over 645 students of the class the costs per student under DI and DII were Rs. 120.79 and Rs. 4.74 respectively. Since DIII, the expenditure of Rs. 1,21,635 on laboratories could not be so sub-divided, it was spread over all the Science students numbering 1,534. This gave Rs. 79.29 as laboratory cost per Science student. All these figures put together, the cost per student in the P.D. Science class became Rs. 147.54 + Rs. 120.79 + Rs. 4.74 + Rs. 79.29 = Rs. 352.36. Other figures given on the data sheet were similarly worked out. The final figures were as follows :

Annual cost per student (in rupees)

	<i>P. D.</i>	<i>Three-year course</i>	<i>Four-year course</i>
Arts	268.52	342.05	318.92
Science	352.36	400.35	380.17

The last column gives the cost per student per year in Arts and Science if the P.D. year and the next three years are not considered as separate courses but are taken together as one continuous course of four years for a degree in Arts or Science.

12. *The B. M. College of Commerce* : This is the oldest and the largest Commerce college in the Poona University and it is conducted by the D. E. Society. The post-graduate teaching in Commerce in Poona is also located in this college. The post-graduate course is of two years leading to the M.Com. degree. In 1964-65 there were 1,463 students in this college including 100 M.Com. students. Out of 43 persons on the teaching staff, the lecturing staff numbered 33, and tutorial and similar staff, 10. Expenditure figures under various C and D heads for the year 1964-65 are given on the data sheet. The procedure described above was followed in apportioning the divisible expenditure over the P.D., the three-year B.Com., and the M.Com. students. But there is one important difference. As all post-graduate teaching in Commerce was done in this college, the M.Com. portion of the

Divisible Expenditure gave us the annual cost of the M.Com. course when it was added to the common cost per student in the calculation of which the M.Com. students were also included. The final cost figures were as follows :

Annual cost per student in Commerce (in rupees)

<i>P. D.</i>	<i>Three-year B.Com.</i>	<i>Four-year B.Com.</i>	<i>M.Com.</i>
246.67	224.32	231.71	266.78

13. *Shri Shahu Mandir Mahavidyalaya* : This college is one of the two recently started colleges in Poona. It was started in 1960, as an Arts college, and is managed by Akhil Bharatiya Maratha Shikshan Parishad which is a private educational society. Recently the College started courses in Commerce but it had not reached the T.Y. stage in B.Com. in 1964-65. In that year the College had 371 Arts students and 192 Commerce students and there were 19 members on its teaching staff. Figures are given in the data sheet. The procedure outlined above was followed in apportioning the items of divisible expenditure over Arts and Commerce courses. There is, however, one important difference. There are subjects in which there are identical courses for Arts and Commerce students and it is therefore possible to arrange common lectures where Arts and Commerce students can sit in the same class. A consequent modification in the procedure was necessary. The final cost figures are given below :

Annual cost per student (in rupees)

	<i>P. D.</i>	<i>Three-year Course</i>	<i>Four-year course</i>
Arts	202.67	255.65	235.94
Commerce	221.75	285.07	249.45

V. Costs in Arts, Science and Commerce Colleges Outside Poona

14. *The Hansaraj Pragji Thakersy College, Nasik* : This is the oldest college of Arts and Science affiliated to the University of Poona from outside Poona and is conducted by a private society named the Gokhale Education Society. With 548 students in Arts and 627 in Science during 1964-65 it may be described as a middle-size college. A post-graduate-teaching centre of the University, in Arts, is located in this college which had 12 students in the M.A. class during that year. There were 53 members on the teaching staff

in 1964-65 of which the lecturing staff numbered 36, and 17 were demonstrators. Expenditure for the year 1964-65 classified as in the previous cases is given on the data sheet. The various components of expenditure were spread over the relevant categories of students. Except for the post-graduate stage the structure of the college is the same as the Fergusson College. Similar procedure was therefore followed to calculate the costs for various courses. But in the present case the cost of the M.A. students is also relevant. The final figures for the Institutional current cost per student per annum were as follows :

Annual cost per student (in rupees)

	<i>P. D.</i>	<i>Three-year course</i>	<i>Four-year course</i>	<i>M.A.</i>
Arts	347.76	455.57	408.70	888.55
Science	448.47	520.75	486.29	—

15. *The B. Y. K. College of Commerce, Nasik* : This college is exclusively a Commerce college. It is the oldest Commerce college in the University of Poona from outside Poona and is conducted by the same education society which conducts the H.P.T. College. With 569 students in 1964-65 it may be said to belong to the middle-size group. The college has a centre for M.Com. teaching, and there were 61 students reading for the M.Com. during that year. The staff consisted of 21 members of which 17 constituted the lecturing staff and the remaining four were tutors. All the relevant figures including those for classified expenditure for 1964-65 are given in the data sheet. The method followed for the Commerce College in Poona was followed for calculating the current cost for this college. It gave the current cost as follows :

Annual cost for Commerce students (in rupees)

<i>P. D.</i>	<i>Three-year B.Com.</i>	<i>Four-year B.Com.</i>	<i>M.Com.</i>
322.98	308.52	314.04	288.40

16. *The R. B. Borawake College, Shrirampur* : This college of Arts and Science was started only five years ago by the Rayat Shikshan Sanstha, an education society which conducts several schools and colleges in western Maharashtra. This college may be considered representative of some of the newer colleges which are being established during this decade at several

smaller taluka towns in this part of Maharashtra. It belongs to the small-size group. Its strength in 1964-65 was 133 Arts students and 149 Science students. There were 29 professors and lecturers, and 10 demonstrators and tutors, on its staff. The classified expenditure figures are given in the data sheet. The situation was similar to the undergraduate courses in the two Arts-and-Science colleges considered above. Similar procedure was therefore followed to arrive at the annual cost per student in the different categories which are listed below :

Annual cost per student (in rupees)

	<i>P. D.</i>	<i>Three-year course</i>	<i>Four-year course</i>
Arts	453.68	587.23	538.17
Science	597.76	813.74	700.68

17. *The C. D. Jain College of Commerce, Skrirampur* : This college is exclusively a Commerce college conducted by the Rayat Shikshan Sanstha. It was started a year after the Borawake College. The college had 139 students in 1964-65 which shows that it belonged to the small-size group. The teaching staff in 1964-65 consisted of 14 members of which the lecturing staff numbered 12 and tutors, two. The college did not offer post-graduate instruction. So the question of the division of expenditure over the M.Com. students in the case of the two Commerce colleges does not arise. All the relevant figures including classified expenditure for 1964-65 are given in the data sheet. The annual costs per student were as follows :

Annual cost per student in Commerce (in rupees)

<i>P. D.</i>	<i>Three-year course</i>	<i>Four-year course</i>
364.98	532.30	444.42

VI. Costs in Professional Colleges in Poona (Law, Education and Engineering)

18. *The Law College* : This is one of the oldest institutions of higher education in Poona and is conducted by the Indian Law Society which is a private educational society. The College runs the two-year course of LL.B. and the post-graduate course of LL.M. which also extends over two years.

A student who wishes to read Law must have obtained a degree in Arts, Science or Commerce. In 1964-65 the College had 445 students in the LL. B. and 28 in the LL. M. classes. The staff consisted of 12 members of which seven worked on part-time basis. These figures as well as those for the classified expenditure for 1964-65 are given in the data sheet. By applying our procedure of apportioning the various items of expenditure over the two categories of students the annual costs were obtained. They are as follows :

Annual cost per student in Law (in rupees)

<i>LL. B.</i>	<i>LL. M.</i>
301.98	590.32

19. *The Tilak College of Education* : There is only one college of Education in Poona and it is conducted by the Shikshan Prasarak Mandali, a private educational society which also conducts many other educational institutions. The College provides instruction for B.Ed. which is a one-year course after a first degree in some other faculty, and for M.Ed. which is a one-year course after B.Ed. While the B.Ed. course is a full-time one, the M.Ed. course can be pursued by part-time students. The college provides two types of courses for M.Ed. : (i) the Regular Course, and (ii) the Vacation Course. The former consists of lectures throughout the year for one academic year, but held in the morning to suit the convenience of students, and the latter consists of lectures spread only over two successive summer vacations, in which case a student takes two years to complete the course. (The fees are the same for both the courses.) In 1964-65 there were 151 students for B.Ed., 35 for the Regular Course in M.Ed., and 41 for the Vacation Course in M.Ed. There were 22 members of the teaching staff of which four worked in an honorary capacity. Classified expenditure for the year 1964-65 is given in the data sheet. The usual method of spreading the expenditure over the different categories of students was followed. Two estimates were obtained under two different assumptions. Under Assumption I it was assumed that the Vacation Course was not a necessary activity of the college but a sort of a desirable afterthought. Hence, under this assumption, the Vacation-Course students and the extra expenditure incurred on them were both removed before applying our procedure. Under Assumption II it was assumed that the Vacation-Course students were a third category of students served by the College as a regular activity. Therefore, under this assumption, they should share the common expenditure with the B.Ed. students and the divisible expenditure with the Regular M.Ed. students. (This assumption was suggested to us by the authorities of the College who maintained that the entire staff was available to these students for consultation during the vacation.) But

since the Vacation course extends over two years and is held only during the short period of vacations, it was thought reasonable to suppose that two students of the Vacation Course are equivalent to one student of the Regular Course. Calculations were made on this basis. The annual costs per student under the two assumptions are given below as Estimates I and II :

Annual cost per student in Education (in rupees)

	<i>B. Ed.</i>	<i>M.Ed. (Regular)</i>	<i>M.Ed. (Vacation)</i>
Estimate I	781.66	543.19	—
Estimate II	750.93	486.19	243.10

20. *The College of Engineering Poona* : The College of Engineering, Poona, is the oldest Engineering College in this part of the country; it celebrated its centenary a few years back. It is run by the Government of Maharashtra State. The College offers three-year courses in different branches of Engineering leading to the B.E. degree. An entrant must have completed the first two years of the course in a Science college after the S.S.C. examination. The M.E. course extends over 1½ to 2 years after B.E., depending on the branch selected by the student. The following specializations are available for the B.E. students : Civil Engineering, Mechanical Engineering, Electrical Engineering, Tele-Communications and Metallurgy. In 1964-65 there were 1,197 students in the B.E. classes and 32 in the M.E. class. (There were a few students (24) doing the Diploma courses in Metallurgy and Tele-Communications but they were ignored for our purpose.) There were 338 members on the staff of which 325 belonged to the categories of professors, readers, assistant professors, lecturers and assistant lecturers and 13 in the categories of demonstrators and draughtsmen.

The procedure of apportioning expenditure followed here is the same as for other colleges. But three points need mention : (1) It was not possible to make separate computations of cost for different branches of the B.E. course. (2) A notional division of salaries was thought necessary in the case of those staff members who were teaching only the M.E. classes but who, being heads of departments, were looking after the general administration of the department for both the B.E. and M.E. classes in that subject. We divided them half and half over the B.E. and M.E. classes. (3) For all the colleges considered so far only the college scholarships were included in the expenditure. Other scholarships and fee concessions such as government scholarships which a college does not spend from its funds but which merely pass through it were not included. Here in the case of the B.E. students

there was no difficulty in following the same procedure, because the scholarships were, in fact, college scholarships, although technically this expenditure was borne by the State Government which runs the College. But in the case of the M.E. students there was a large amount shown as scholarships all of which were actually awarded by the Central Government. We were told that a large number of the M.E. students would not pursue the course unless some such scholarships were available. Therefore this expenditure could be looked upon as a necessary cost of the course. We have therefore constructed two estimates of the annual cost for the M.E. students (i) including this amount, and (ii) excluding it. All the relevant figures are given in the data sheet. The resulting costs are as follows :

Annual cost per student in Engineering (in rupees)

B. E.	M. E.	
1,524.90	2,363.19	Estimate I
—	2,081.47	Estimate II

VII. Cost in Post-graduate Departments of the University

21. As mentioned earlier the University of Poona is statutorily charged with the responsibility of conducting all post-graduate education. In practice the professional colleges look after the post-graduate instruction in their specific fields. Thus the university is directly responsible for the post-graduate effort only in the Humanities (Arts) and in Science. Even in these faculties the University has placed a few centres of post-graduate instruction in specified subjects, mostly in Arts, in colleges outside Poona, and they are run by the local colleges. In Poona, University Departments manned by the University staff on its own campus have been established in some subjects. Lectures in these subjects as well as in many others for which there are no University Departments are held in the University campus. College teachers who are called contributed teachers and who are drawn from the senior staff of the local colleges and recognized institutions also participate in the post-graduate instruction. There are University Departments in seven subjects in Arts (including Modern European Languages) and in six subjects in Science on the campus. Three Departments—Ancient Indian History including Archaeology, Linguistics and Geology—are financed by the University but are located in other institutions. For the subjects Philosophy and Persian-Urdu there were no University Departments in 1964-65. And finally, for two other subjects (Economics, and Sociology-Anthropology) two recognized

institutions, not financed by the University, are deemed as Departments for all practical purposes, although formal registration of students is done in the University. This information is summarized below classified by subjects giving post-graduate students in each case. For simplification of procedure, students enrolled in Mathematics-Statistics and Geography Departments are considered as Science students whether they are enrolled for M.A. or M.Sc. The first figure in the bracket is the number of M.A. or M.Sc. students and the second figure is that of Ph.D. students for the year 1964-65. M.A. students can offer eight papers in one subject or four papers each in two subjects; in the latter case their numbers are divided half and half for purposes of counting. Wherever necessary rounding is done to avoid fractions.

University Departments on campus or elsewhere

Science : (i) Chemistry (123,17); (ii) Physics (52,10); (iii) Botany (36,10); (iv) Zoology (23,7); (v) Mathematics and Statistics (79,9); (vi) Geography (24,3); and (vii) Geology, located at Fergusson College (24,3).

Arts : (i) Sanskrit and Prakrit (13,8); (ii) Marathi (49,23); (iii) Experimental Psychology (41,6); (iv) Politics and Public Administration (35,18); (v) Hindi (27,20); (vi) English (32, -); (vii) Archaeology and Ancient Indian History (including History), located at Deccan College (26, 6); and (viii) Linguistics, located at Deccan College (11, 32).

Arts subjects for which there were no Departments : (ix) Philosophy (10, -); and (x) Persian-Urdu (2, -).

Arts Departments for which there are recognized research Institutions : (xi) Economics (74, 12) in Gokhale Institute of Politics and Economics; and (xii) Sociology-Anthropology (31, 18) in Deccan College Research Institute.

University Department not included above : (xiii) Modern European Languages (5, -).

Students in Economics, Sociology-Anthropology and Modern European Languages had to be excluded from this exercise in costing as the expenditure incurred on their teaching could not be extracted even approximately. In the case of the first two subjects it was difficult to estimate the cost incurred for this purpose by the two institutions recognized for them. In the case of the third subject which had only five M.A. students, the same University Department also runs under-graduate courses as well as largely attended evening diploma-courses in French, German and Russian. It was therefore not easy to separate the part of the expenditure spent only on post-graduate students.

This information was consolidated as follows, separating the Arts subjects for which costing was attempted from those for which it was not attempted because of the difficulties described above.

Post-graduate students in Arts and Science

	<i>Departments considered for costing</i>		<i>Other Departments</i>		<i>Total</i>	
	<i>M.A./M.Sc.</i>	<i>Ph.D.</i>	<i>M.A./M.Sc.</i>	<i>Ph.D.</i>	<i>M.A./M.Sc.</i>	<i>Ph.D.</i>
Arts	246	113	110	30	356	143
Science	361	59	-	-	361	59
Total	607	172	110	30	717	202
Grand total : 919						

Among the total 717 M.A./M.Sc and 202 Ph.D. students studying under the post-graduate scheme during 1964-65, there were 361 M.Sc. students and 59 Ph.D. students in Science. Of the Arts students, 246 M.A. and 113 Ph.D. students belonged to the Departments where costing was possible. Costs were estimated separately for these students in Arts and all students in Science. Since actual expenditure figures for 1964-65 were not available when this study was made, we used the revised estimates for the year given by the University. We verified that they were close to the actuals.

The data for these University Departments, including their expenditure, are presented in the table on the next page. The figure for the Departmental expenditures includes the salaries of the teaching and other staff in the Department and other expenses, such as those on laboratories, which were spent exclusively on that Department. Expenditure on special research-projects which cannot be considered as regular recurring expenditure is not included in this figure. It should be stated that the Departmental expenditure figures for Arts (or Science) Departments do not include the University contribution towards the Provident Fund of the Departmental staff. To obtain the total expenditure incurred on the Departments one has to add to the figure of expenditure given in this table the University's contribution to the Provident Fund. This will account for the difference in figures given in this table and the total expenditures on the Departments given in the data sheet.

22. The University pays a certain amount annually to the constituent colleges and recognized institutions for the part of the teaching done by members of their staff in the post-graduate scheme. The portion of this amount which should be included in the expenditure on the teaching of the subjects mentioned above and its division over Arts and Science subjects was done on the basis of the hours of lecturing-work in each category. These amounts are added to the expenditure of the Arts and Science Departments. The University also pays annually some grants to these colleges

and institutions for strengthening the post-graduate sections of their libraries. This amount is small but is shown along with the expenditure on the University library. The expenditure on scholarships and free studentships was available separately for M.A./M.Sc. and Ph.D. students. All these amounts are shown in the data sheet.

23. So far there was no great difficulty in estimating the expenditure relevant to the various categories of students mentioned above although we had to use a few approximations and adjustments at places. When we begin to consider the items of common expenditure on post-graduate instruction in the University corresponding to those of Common Expenditure in the case of colleges we run into formidable difficulties. Some research workers try to seek a way out by spreading all other University expenditure over

Poona University : students, staff and expenditure during 1964-65

Name of the Department	No. of students		Teaching staff		Expenditure (Revised estimates) (in rupees)
	M.A.	Ph.D.	Univer- sity	Contri- buted	
Arts					
Sanskrit and Prakrit Languages	13	8	2	13	23,945
Marathi	49	23	3	6	28,734
Experimental Psychology	41	6	2	1	35,960
Politics & Public Administration	35	18	3	3	42,590
Hindi	27	20	3	2	33,260
English	32	-	1	9	15,696
Department of History and Archaeology	26	6	2	6	80,280
Department of Linguistics	11	32	7	6	1,80,433
Science					
Chemistry	123	17	10	5	2,82,708
Physics	52	10	6	6	1,24,685
Botany	36	10	8	3	1,46,730
Zoology	23	7	4	4	96,842
Geology	24	3	2	2	33,494
Mathematics and Statistics	79	9	11	10	1,26,405
Geography	24	3	4	-	47,500

all students of the University including the under-graduate students studying in colleges in the University town as well as in the affiliated colleges situated elsewhere. We do not think that this is a proper procedure and it would certainly not be so in the case of the Poona University. Facilities like the gymkhana facilities, students' health centre and hobby workshop are exclusively used by the post-graduate students in Poona, and the expenditure is clearly for the post-graduate education. But other items are not so clearly assignable, and it is necessary to consider each item separately. Let us first consider the University Library. In theory all students and teachers (and also other scholars and interested persons) can use the facilities provided by the University Library. But in practice it is only the post-graduate students and staff in Poona who avail themselves of these facilities and it will be most inappropriate to apportion the expenditure on the Library uniformly over all students of the University studying in colleges spread over seven districts of Maharashtra. In fact we think it far more reasonable to include the whole of it as expenditure on post-graduate education in Poona.

Most of the buildings on the Poona University campus are Departmental buildings, and it is clear that a large portion of the expenditure on items such as maintenance and repairs, municipal taxes, water and electricity rates must be put to the account of post-graduate education in Poona. Even in the case of the establishment charges (salary of the office staff) it was the view of some responsible officers of the University (whom we consulted) that a part of the expenditure must also be put to that account since a sizable part of their working time is taken by matters relating to post-graduate instruction in Poona. It is, however, difficult to determine with any precision, or by means of an objective criterion, the portion of expenditure assignable to post-graduate instruction in Poona for each of these items of expenditure and we have to resort to notional apportionment. We therefore consulted responsible officers of the University, went through each of these items with them and fixed the notional share of the expenditure on each of them which could be reasonably assigned towards the organization of the post-graduate instruction in Arts and Science in Poona. For instance, it was thought reasonable to assign 75 per cent of the total expenditure on maintenance and repairs, 50 per cent of the salaries of the engineering and sanitary staff and 80 per cent of the conveyance charges towards post-graduate instruction. (The last because the bulk of this expenditure is spent over the transport of contributed teachers.) These amounts were then consolidated under broad classifications and they are given under item CI to CIX under the Common or Non-divisible expenditure in the data sheet. (As mentioned earlier in section III we have not included in these items the expenditure on university examinations which has been left out for the reasons given in that section.) There are thus four broad categories of expenditure : (a) non-divisible common expenditure

(except that on Library), (b) expenditure on the University Library (including grants to college libraries), (c) expenditure of University Departments (including payments in respect of contributed teachers), and (d) scholarships. All these are given for reference in the data sheet.

24. These amounts were then spread over the relevant number of students as follows: Expenditure under (a) on common non-divisible items totalling Rs. 4,26,614 was spread equally over the total number 919 of post-graduate students giving Rs. 464.21 per head per annum. Expenditure (d) on scholarships was available separately for M.A. and M.Sc. students and for all Ph.D. students. When divided by the respective number of students (M.A. 356, M.Sc. 361 and Ph.D. 202), the annual cost per student, on this account, worked out at Rs. 14.08, Rs. 39.44 and Rs. 445.73 respectively.

25. For the expenditure (c) on University Departments the following three assumptions were tried:

Assumption A: It was assumed that one Ph.D. student takes one lecturing-period per week of the teacher who guides him. (This convention is accepted in many Indian universities.) The total expenses on the Departments and subjects considered for costing (corresponding to the 607 M.A./M.Sc. students and 172 Ph.D. students) were first divided in the ratio of the time-units spent on them by the teaching staff separately for Arts and Science and the separated amounts were then spread evenly on the M.A. (or M.Sc.) and Ph.D. (Arts or Science) students. It gave the following costs per student (in rupees) on account of (c):

M.A.	M.Sc.	Ph.D. (Arts)	Ph.D. (Science)
1,095.85	2,139.09	2,025.92	2,719.05

Assumption B: One Ph.D. student was considered equivalent to two M.A. or M.Sc. students so far as the teacher's effort and departmental expenses are concerned. The expenditure on item (c) was then spread over the post-graduate students separately for Arts and Science. The costs arrived at (in rupees) under (c) were as follows:

M.A.	M.Sc.	Ph.D. (Arts)	Ph.D. (Science)
1,056.16	1,947.05	2,112.33	3,894.10

Assumption C: It was assumed that some research would be done by post-graduate teacher and that he would devote one-third of his working

time to it, another third to M.A./M.Sc. teaching, and the remaining third to guiding Ph.D. students. This may not be true of each teacher, for a junior teacher would perhaps devote more time to teaching than to research guidance. If this assumption is reasonable, the total expenditure under (c) can be divided first into three equal parts in both Arts and Science. The portion corresponding to individual research is then taken out and the other two portions are spread uniformly over the relevant number of students. The method of calculation will be clear from the figures given in the data sheet for this assumption. The annual costs (in rupees) on account of (c) were :

<i>M.A.</i>	<i>M.Sc.</i>	<i>Ph.D. (Arts)</i>	<i>Ph.D. (Science)</i>
675.49	861.16	1,470.53	5,269.12

26. In the case of expenditure (b) on library facilities the following two assumptions were tried :

Assumption D : It was supposed that this expenditure equally benefited all the post-graduate students in Arts and Science. The University library is used mainly by the post-graduate students in Arts and Science and their teachers, and it is but rarely used by the under-graduate students and staff in the constituent or affiliated colleges, or by the post-graduate students and staff in other faculties. The total expenditure of Rs. 2,35,337 was therefore spread over the total 919 post-graduate students. The annual cost thus obtained under this head per student was Rs. 256.08, whether M.A., M.Sc. or Ph.D.

Assumption E : This assumption is similar to Assumption C, viz., that the total benefit of the library facilities is equally shared (one-third each) by the three groups—the staff, the M.A./M.Sc. students (717), and the Ph.D. students (202). This means that the total expenditure under this head should first be divided into three equal parts. The portion corresponding to the staff is then left out and the other two are spread uniformly on the relevant number of students. The annual costs (in rupees) found in this manner under this head were :

<i>M.A./M.Sc.</i>	<i>Ph.D. (Arts and Science)</i>
109.41	388.34

27. Combining the assumptions from A to E and adding the relevant costs per student under the four heads we get six different estimates corresponding to the following six combinations :

Estimate I	:	Assumptions A and D
" II	:	" B and D
" III	:	" C and E
" IV	:	" A and E
" V	:	" B and E
" VI	:	" C and D

Of these the first three are more meaningful than others because when one accepts the one-third principle for expenditure on teaching one should reasonably adopt the same principle for library expenditure and *vice versa*. The final current costs (in rupees) per student per year for these three estimates are given below :

Annual cost for post-graduate students in Arts and Science (in rupees)

	<i>M.A.</i>	<i>M.Sc.</i>	<i>Ph.D. (Arts)</i>	<i>Ph.D. (Science)</i>
Estimate I	1,683.55	2,752.15	3,324.20	4,017.33
Estimate II	1,643.86	2,560.11	3,410.61	5,192.38
Estimate III	1,409.86	1,620.89	2,636.55	6,435.14

VIII. Comments on Costs in Degree Courses

28. In this section and the next we shall consider the current institutional unit costs worked out in the earlier sections to see whether we can arrive at some broad conclusions about them. Let us first consider the undergraduate costs. The annual current costs per student for the first degree courses in Arts, Science and Commerce, are brought together in the consolidated table given on the next page. The table gives, for each of the colleges under study, the annual cost per student in rupees (rounded off to the nearest rupee) for the P.D. year, for the three-year degree course and for the entire four-year college course in Arts, Science and Commerce. It also gives the number of students in each category and the student-staff ratio both excluding and including tutors and demonstrators, (the last figure is given in bracket). In the case of colleges with more than one faculty the same figure is given for student-staff ratio under each faculty.

Comparing the annual costs per student in Arts, Science and Commerce in similarly situated institutions we find that the cost of the Commerce course is the lowest, the Arts costs are higher than the Commerce costs and the Science course has the highest cost. The main reason for the high cost of the Science course is obviously the laboratory expenditure. This can be seen from the following figures for the teaching and laboratory costs

Annual cost per student in under-graduate courses (in rupees)

	Cost in rupees			Number of students			Student-staff ratio with (without) demonstrators and tutors
	P. D.	3-year degree course	4-year degree course	P. D.	3-year	Total	
Arts							
1. Fergusson College, Poona	269	342	319	252	549	801	35 (15)
2. Shri Shahu Mandir College, Poona	203	256	236	138	233	371	31 (30)
3. H. P. T. College, Nasik	348	456	409	233	303	536	33 (22)
4. R. B. Borawake College, Shrirampur	454	587	538	49	84	133	9 (7)
Science							
1. Fergusson College, Poona	352	400	380	645	889	1,534	35 (15)
2. H. P. T. College, Nasik	448	521	486	299	328	627	33 (22)
3. R. B. Borawake College, Shrirampur	598	814	701	78	71	149	9 (7)
Commerce							
1. B. M. College of Commerce, Poona	247	224	232	451	912	1,363	44 (34)
2. Shri Shahu Mandir College, Poona	222	285	249	108	84	192	31 (30)
3. B. Y. K. College of Commerce, Nasik	323	309	314	194	314	508	33 (27)
4. C. D. Jain College, Shrirampur	365	532	444	73	66	139	12 (10)
Law							
		<i>LL.B.</i>				<i>LL.B.</i>	
1. Law College, Poona	—	302	—	—	—	445	47 (39)
Education							
		<i>B.Ed.</i>				<i>B.Ed.</i>	
1. Tilak College of Education, Poona	—	725	—	—	—	151	18 (10)
Engineering							
		<i>B.E.</i>				<i>B.E.</i>	
1. College of Engineering, Poona	—	1,525	—	—	—	1,197	3.8 (3.6)

per student (corresponding to items DI and DIII in the data sheets) for the four-year course in Arts and Science of the three Arts-and-Science colleges.

Teaching and Laboratory costs (in rupees) per student

College	Arts	Science	
	DI	DI	DIII
Fergusson College, Poona	167	148	79
H. P. T. College, Nasik	185	188	72
Borawake College, Shirampur	298	339	121

Secondly, the costs for the Arts and Commerce courses may be considered comparable at the P.D. level, but at the three-year degree stage the Arts course has a much higher cost than the Commerce course. This is mainly due to the wider choice of optional subjects provided in the B.A. (and B.Sc.) courses than in the B.Com. course, especially in the last two years of the three-year degree courses, with a consequential rise in the expenditure on the teaching staff. This also accounts to a certain extent for the fact that the annual cost is higher at the three-year degree stage than at the P.D. stage in Arts and Science but the reverse seems to hold in the case of Commerce. (Both these points are dealt with in detail later in the Appendix.) The case of Shri Shahu Mandir Mahavidyalaya is exceptional and is commented on later. But comparing similarly placed institutions it appears that the costs in Science are 20 to 30 per cent higher than those in Arts, and that the costs in Commerce are 20 to 25 per cent lower than those in Arts.

Size or the number of students studying in an institution is another important factor affecting its operating-cost. Generally speaking, a larger size means fuller utilization of the teaching and non-teaching facilities and a consequent lowering of costs for both. This can be clearly seen from the following short table which gives for the three Arts-Science colleges and the three Commerce colleges in Poona, Nasik and Shirampur, the annual cost per student for the four-year course by way of common or non-divisible expenditure (item C of the data sheet) and on teachers' salaries (item DI of the data sheet) and the relevant number of students.

29. Actually several factors simultaneously affect the operating-costs of an educational institution. We have so far discussed only two of them, faculty (Arts, Science or Commerce) and size (the number of students) on the basis of the figures obtained in this investigation. The others are briefly mentioned indicating the direction in which they may operate. One of the important factors is whether the college has already established itself and

Number of students and costs per student under Items C and D I

Item C				
College	Arts-Science		Commerce	
	Total No. of students	Cost (Rs.)	Total No. of students	Cost (Rs.)
Poona	2,335	148	1463	148
Nasik	1,175	213	569	182
Shrirampur	282	240	139	239

Item D I						
College	Arts		Science		Commerce	
	No. of students	Cost (Rs.)	No. of students	Cost (Rs.)	No. of students	Cost (Rs.)
Poona	549	167	889	148	1,363	117
Nasik	536	185	627	188	508	125
Shrirampur	133	298	149	339	139	204

has achieved its potential growth or whether it has yet to do so. This can affect both ways. An old and established college with its saturated capacity can utilize its teaching and non-teaching facilities more or less fully and bring down the costs on that account. On the other hand in virtue of its tradition it is likely to provide for many more optional subjects especially at the third-year and fourth-year levels and also be liberal in providing academic as well as extracurricular facilities to students. Secondly, not only the large number of students for the P.D. course but also their ratio to those in the three-year degree course (or more realistically the ratio of the number of students in the first two years and those in the two final years of the four-year degree course) will also affect the cost. While the class divisions in the lower classes will be working in fuller strength the sizes of the higher classes will be relatively rather small. (See Appendix where this is illustrated.) Again, the University has stipulated that the P.D. classes must not have more than a hundred students in each division, while the number in the higher classes is restricted to 150. (This is perhaps one reason why the P.D. costs are higher than the costs in the three-year course in Commerce.) There is also a restriction on the maximum number of periods (usually 15 periods a week) to be assigned to a teacher. Both these factors will obviously affect the costs for the entire course or its two stages, depending on the total strength of the

college and the strength in different classes. Having more than one faculty (e.g. Arts and Science, or Arts and Commerce, or all the three together) will generally tend to work towards reduction of cost (its non-divisible component) by greater utilization of the available facilities. Finally, the grant-in-aid code of the government is usually more liberal towards newly started institutions and institutions of smaller size.* Although this is meant to assist them in their budget it is also sometimes likely to operate against the exercise of strict economy in expenditure. All these factors operate simultaneously and it is difficult to isolate them unless one studies a larger number of institutions and in greater detail. (Perhaps some of the figures obtained in these institutions can be interpreted as pointing towards one factor or the other but we do not want to indulge in hazardous guesswork.) One would expect, however, that as the institution grows older, both its size and its pattern will more or less stabilize, its running will be more and more 'economic' and the institutional costs will tend to stabilize in relation to the given period and the given local situation.

30. It is only fair to say something about the representative character of the institutions which we have studied. The Fergusson College which is managed under the life-member system may be considered as typical of the large-size Arts-and-Science colleges in Poona. The B. M. College of Commerce, which is its sister institution, is the only exclusively Commerce college in Poona. The H. P. T. College of Nasik is another institution having life-members and may be considered representative of middle-size colleges in the *mofussil*. The B. Y. K. Commerce College of Nasik, again a single-faculty college, is a sister institution of the H.P.T. College. The two colleges at Shirampur have been started very recently by the Rayat Shikshan Sanstha which runs a number of schools and colleges in Maharashtra. They were very small in size at the time of this investigation. Shri Shahu Mandir Mahavidyalaya is typical of some of the newer institutions. At the time of the investigation it appeared to be between a small-size institution and a middle-size institution. As is obvious from the cost figures it is run with strict economy, and the combination of two faculties (Arts and Commerce) has certainly helped it in this respect. A smaller relative strength of Commerce students and a less wide choice of subjects at B.A. have, unlike other colleges, rendered the cost of Arts course slightly lower than that of the Commerce course.

Taking into consideration these and all other relevant factors, which need not be detailed out here, we feel that the cost in the Fergusson College may

* During the last decade several new colleges have been started in smaller towns of Maharashtra. Although this development is chiefly due to the spread of secondary education and local enthusiasm there is no doubt that the liberal policy about grants and the Economically Backward Class fees concessions under which the government pays fees of those students whose guardians have annual incomes below Rs. 1200 (now Rs. 1800) have considerably helped this process.

be considered as representative of the large-size colleges both in Poona and outside Poona. (Costs may be slightly lower but in any case will not be appreciably higher in similar institutions.) The same applies to the B. M. College of Commerce of Poona. The cost figures for the Nasik Colleges (H. P. T. and B. Y. K. Commerce College) are about 25 to 30 per cent higher. This is no doubt partly due to their smaller size, but it is felt that these costs perhaps are a little towards the high side. It is believed that costs in most colleges of middle-size and large-size classes in the *mofussil* will be of the same order as the Fergusson College and the B. M. College of Commerce, perhaps somewhat higher, but not very much, in middle-size colleges. The costs in the two Shirampur colleges are about 75 per cent higher than those of the Poona colleges. This is no doubt due to their recent origin, and smaller size; the student-staff ratio is about one-third to one-fourth of the other colleges. But here again, it is felt that these costs are on the high side and reflect, at least to some extent, the financing-capacity of the society which manages them. Many colleges in the *mofussil* belonging to the small-size group must be managing themselves with severe economy like Shri Shahu Mandir Mahavidyalaya in Poona and the costs are expected to be appreciably lower than those obtained for the Shirampur institutions. It may therefore be said in conclusion that the costs may in general be appreciably higher for small-size and recently-started institution. But when they grow, the costs should reduce and are eventually expected to be stabilized at the level of the Fergusson College and the B. M. Commerce College for large-size colleges, and a little lower than the Nasik colleges for middle-size institutions for Arts, Science and Commerce.

31. Let us now consider the professional colleges. The cost for the Law course (the LL.B. degree) appears to be comparable with that for Arts (or Commerce). But it should be noted that the teaching-cost is rather low (Rs. 53 per student) while the non-teaching-cost is high (Rs. 245). The college has the highest student-staff ratio (47) in spite of the fact that many members of the staff are part-time teachers. It is likely that the second component may be appreciably smaller for Law colleges elsewhere in the University of Poona. The B.Ed. course given in the Tilak College of Education, Poona, costs almost double the costs in Arts (or Commerce). This is of course understandable in view of the small number of students and relatively larger requirement in staff necessitated by the nature of instruction a vital part of which is supervision of lessons. This is also borne out by the low student-staff ratio (17). Turning to the B.E. course in Engineering, we find that the annual cost is very high indeed, almost three to five times the annual cost in Arts or Science. Here both the staff and the equipment (as observed in the common expenditure) cost very much more than the other courses. It is interesting to note that the student-staff ratio is very low indeed, one teacher for every three or four students. As mentioned earlier, the College of Engineering, Poona, is one of the oldest in India and the costs here may

perhaps be representative of old established colleges of engineering in India. (It is worth investigating how they compare with the costs in other colleges of engineering elsewhere.)

32. Finally, we conclude this section by giving figures for the total institutional costs for the entire duration of the various degree courses considered in this study. The figures are rounded to indicate the approximate range of costs in the institutions which are by and large stabilized.

Approximate institutional costs for the entire duration of degree courses

<i>Course</i>	<i>Duration</i>	<i>Total Institutional Cost</i>
Arts (B.A.)	Four years	Rs. 1,200 to 1,600
Science (B.Sc.)	Four years	Rs. 1,600 to 2,000
Commerce (B.Com.)	Four years	Rs. 1,000 to 1,300
Law (LL.B.)	Two years (after a first degree)	Rs. 600
Education (B.Ed.)	One year (after a first degree)	Rs. 750
Engineering (B.E.)	Three years (after two years in a Science college)	Rs. 4,500 to 5,000

IX. Comments on Costs in Post-graduate Courses

33. The annual costs per student for the post-graduate courses in Arts (M.A.), Science (M.Sc.), Commerce (M.Com.), Law (LL.M.), Education (M.Ed.), and Engineering (M.E.) are summarized in the following table. The following observations may be made on the consolidated summary.

The costs for post-graduate courses (except Engineering which is considered below) for which there are no University Departments, that is, which are given in colleges, are very much less than the costs for those given in the University Departments. The costs in Commerce (M.Com.) are the lowest; then we have Education and Law, and then the Arts course (M.A.) given in Nasik. The costs for the last are high on account of the very small number (12) of students for that course as compared with the much larger numbers of M.Com., LL.M. or M.Ed. students.

In Commerce the costs for the post-graduate course are comparable to the costs for the under-graduate course; in Law they are almost double;

Cost of post-graduate education

<i>Annual cost per student (in rupees)</i>		
I : Arts	<i>M.A.</i>	<i>Ph.D. (Arts)</i>
(i) University Departments		
Estimate I — Assumptions A & D	1,684	3,324
Estimate II — Assumptions B & D	1,644	3,411
Estimate III — Assumptions C & E	1,410	2,637
(ii) Nasik	889	
II : Science		
University Departments		
Estimate I	<i>M.Sc.</i>	<i>Ph.D. (Science)</i>
Estimate II	2,752	4,017
Estimate III	2,560	5,192
	1,621	6,435
III : Commerce	<i>M.Com.</i>	
Poona	267	
Nasik	288	
IV : Law	<i>LL.M.</i>	
	590	
V : Education	<i>M.Ed. (Regular Course)</i>	
Estimate I	543	
Estimate II	486	
VI : Engineering	<i>M.E.</i>	
Estimate I	2,363	
Estimate II	2,081	

but in Education they are about 25 to 30 per cent less. The reduction in the last is mainly due to the fact that the B.Ed. course involves a large number of practice lessons which need guidance and supervision and a consequent requirement in staff which the M.Ed. course does not need.

The costs for the post-graduate Engineering course (M.E.) are the highest among the post-graduate courses given in colleges. However, they are only about 50 per cent higher than the costs for the under-graduate Engineering course (B.E.). The reason for the high costs for this post-graduate course as compared to the other courses given in colleges is therefore to be found in the high costs of technological education in general,

34. Let us now consider the costs for the post-graduate courses in Arts and Science (M.A., M.Sc. and Ph.D.) in the University Departments. As mentioned above they are high as compared with those for the other courses. Scrutinizing the four components of expenditure given in Section VII we find that the costs are high in all the three main components: (a) administrative, (b) library, and (c) departmental or teaching-expenses. Comments on (a) will not be meaningful because as explained in that section the expenditure figures taken there are notional for many items. So far as (b) and (c) are concerned these costs will always be high. First, the purpose of the University Library is not merely to serve the post-graduate students (and staff), although we had to make this assumption for our purpose. It has to purchase many more books and research journals than those which are strictly required for immediate needs of the students and staff. Secondly, the expenditure will always be higher in a good University Department where the staff members are not only expected to teach but also to do substantial research work on their own. Compared to the college teachers their teaching-load is low, salary scales are high and departmental facilities are liberal and substantial. The student-staff ratio is very low; for the subjects considered in the table given in Section VII it is 15 for Arts and 9 for Science if we do not include contributed teachers, and it is 5 and 6 respectively if we include them. There is no doubt that if University Departments are established to teach courses which are now being taught in colleges (as, for instance, is being contemplated for Law, Education and Commerce in the Poona University) the costs of running them will rise to the same level as in other University Departments.

The costs for Ph.D. are substantially higher than for the Master's degree in both Arts and Science. The figures for the Ph.D. courses in other fields were not available.

35. Finally, a few words about the three different estimates given for the costs for the M.A./M.Sc. and Ph.D. students. Estimates I and II are comparable because the only difference between them is in calculating the teachers' efforts on the Ph.D. students for which there is no information available. (See Section VII). Estimate I may be taken as standard since it is more or less an accepted convention in most University Departments all over India that a Ph.D. student ordinarily meets his teacher guide once a week for an hour or so. Estimate III is computed to show what figures one may obtain if the individual research of the teachers is separately costed. (If this approach is thought reasonable it opens up a line of research for the costing of research although the problems to be faced there are by no means easy to overcome.) Once this principle is accepted for departmental expenditure it is only fair to apply it also to the library expenditure, and hence other possible estimates based on other combinations mentioned in Section VII do not become meaningful,

APPENDIX

Further Analysis of Costs : Effect of Specialization

36. It was mentioned in Section VIII that providing for specialization—greater option in the choice of subjects—increases the cost. This point is examined here in greater detail; the Fergusson College and the B.M. College of Commerce provide an illustration. An attempt is also made to find the cost differentials in different subjects at the under-graduate stage in colleges and in the University Departments at the post-graduate stage. Their implications are pointed out towards the end.

Let us first consider the structure of the B.A., B.Sc. and B.Com. courses of the Poona University in the Second Year (S.Y.) and the Third Year (T.Y.) of the three-year degree courses, that is the last two years of the under-graduate courses provided in college, as they existed in 1964. (Minor changes have been introduced recently.) In B.A. a student had to offer two papers each in three subjects of his choice at, what is described, the General level in the S.Y. and this was to be followed in the T.Y. by a compulsory paper in English and either four papers from one of the three subjects already selected at, what is called, the Special level, or two papers each in two other subjects at the General level. Thus a B.A. student had to offer in the S.Y. and T.Y. together a compulsory paper in English and ten more papers: either (i) two plus two plus six in three subjects, or (ii) two each in five subjects. Science students had to choose two subjects at the Subsidiary level in the S.Y. with three units (papers and practicals together) each to be followed by five more units in a third subject at the Principal level and a compulsory paper in English in the T.Y. In Commerce there were five papers in the S.Y. all compulsory and in the T.Y. there were four compulsory papers and two optional papers in a subject of the student's choice. There were some restrictions on the choice of optional subjects in all the three courses, and the actual options available to students vary from college to college. But it is clear from the very structure of the courses that there is much more scope for exercising option in the B.A. and B.Sc. courses than in the B.Com. course.

37. To illustrate how it works in practice, in 1964-65 the Fergusson College had provided for instruction (and actually had students) in the following 17 subjects at the General level, and in the first 10 among them at the Special level, in the B.A. course: (1) Sanskrit, (2) Marathi, (3) English, (4) German, (5) Mathematics, (6) Statistics, (7) Philosophy, (8) History, (9) Economics, (10) Politics, (11) Psychology, (12) Sociology, (13) Pali, (14) Ardhamagadhi, (15) Hindi, (16) Gujarati and (17) French.

In Science the College gave instruction in the following seven subjects both at the Principal and Subsidiary levels at the B.Sc.: (1) Mathematics,

(2) Statistics, (3) Physics, (4) Chemistry, (5) Botany, (6) Zoology and (7) Geology.

The B. M. College of Commerce provided instruction in the following four optional groups (two papers each) at the T.Y. B.Com. in 1964 : (1) Advanced Accounting and Auditing, (2) Banking, (3) Statistics and (4) Advanced Cost Accounting.*

It is interesting to see this in terms of teaching-effort. The Fergusson College arranged to teach during the last two years of the B.A. course one paper in English, 34 papers in different subjects at the General level and 40 at the Special level. It also provided for 21 units (papers and practicals) in the B.Sc. course at the Subsidiary level and 35 more at the Principal level. (Some papers in Mathematics and Statistics in the B.A. and B.Sc. courses can be taught together; same is the case with some papers at the Subsidiary and Principal levels in the same subject; but this does not make much difference.) On the other hand the B. M. College of Commerce provided for nine compulsory papers and eight optional papers.*

It is now easy to see why the teaching-costs in Commerce are appreciably lower than those in Arts. This also explains why the costs for the three-year degree course in Arts are higher than those for the P.D. course. The reason for the lower costs for the three-year course in Commerce as compared to the P.D. year is to be found in the restrictions on the size of a class division : 150 for the degree classes and 100 for the P.D. classes.

35. We found it interesting to push this analysis a step further and work out the teaching-costs per student in different optional subjects in the B.A., B.Sc. and B.Com courses for comparison. This is confined only to the optional papers in the final year at the Fergusson College and the B. M. College of Commerce, since the analysis becomes rather complicated at the S.Y. B.A. with its very large number of criss-cross combinations. The following procedure was followed. Identifying the teachers who taught special papers in a given subject to the T.Y. students, we calculated the proportionate part of the salary of each one of them on the basis of the total number of lectures given by him and the number of lectures given to the T.Y. class. These amounts were added to obtain the total teaching-cost for the total teaching-effort in that subject for the benefit of the T.Y.

* A similar situation existed in the H. P. T. College of Arts and Science in Nasik in 1964. The College provided for the following eight subjects for B.A. at the General level and the first five amongst them at the Special level : (1) Sanskrit, (2) Marathi, (3) English, (4) Politics, (5) Economics, (6) Arudhamagadhi, (7) Hindi and (8) Psychology. In B.Sc. the College taught the following five subjects at the Subsidiary level and the first two of them at the Principal level : (1) Chemistry, (2) Physics, (3) Mathematics, (4) Botany and (5) Zoology. The number of students at the Special B.A. in 1964 were : Sanskrit 4, Marathi 7, English 4, Politics 6, and Economics 28; and those at the Principal B.Sc. were : Chemistry 20, and Physics 3.

The B. Y. K. College of Commerce provided for only one special group at the T.Y. B.Com. in 1964.

students offering it at the Special or Principal level. This was then divided by the number of T.Y. students offering that subject to get the cost per student. The following points should be mentioned in this connection. Some subjects have been dropped because of difficulties of separating out the relevant expenditure; this does not adversely affect the analysis which should be regarded as illustrative rather than exhaustive. Subjects which are taught in common to the B.A. and B.Sc. classes (e.g. Statistics) are shown in the B.Sc. list and the corresponding students are added. It should be noted that the figures correspond to four papers in the Special subject in the case of the T.Y. B.A. class, two papers in the case of the T.Y. B.Com. class and two papers in the case of the T.Y. B.Sc. class. The last needs some explanation : For Science students, out of the five units of the Principal subject, two constitute practical work (for which costing is not attempted

Teaching cost per student (in rupees) in different subjects at T. Y. B. A., B.Sc., and B.Com.

<i>Subject</i>	<i>No. of students</i>	<i>Total teaching-cost (Rs.)</i>	<i>Cost per student I (Rs.)</i>	<i>Cost per student II (Rs.)</i>
<i>B.A. (Four Papers)</i>				
Sanskrit	9	10,153	1,128	642
Marathi	18	5,366	298	321
English	17	7,044	414	340
Philosophy	18	3,384	188	321
History	5	5,831	1,166	1,156
Economics	62	4,701	76	93
Politics	28	3,966	142	206
<i>B.Sc. (Two Papers)</i>				
Statistics	7	1,799	257	272
Physics	30	2,066	69	63
Chemistry	62	1,375	22	31
Botany	5	1,446	289	380
Zoology	8	2,109	264	238
Geology	12	2,619	218	159
<i>B.Com. (Two Papers)</i>				
Advanced Accounting and Auditing (two divisions)	194	6,278	32	29
Banking	7	3,478	497	397
Statistics	4	1,364	341	695

here); one unit is a paper of Subsidiary level taught in lectures which are common to students offering the Principal or Subsidiary courses in that subject, thus leaving only two papers which are taught exclusively to the T.Y. students in that subject. The difference in costs in different subjects considered here naturally depends on the difference in the number of students offering that subject as well as on the inevitable variation in salaries of different teachers. To remove the latter source of variation we averaged the teaching-costs over the subjects and then divided this average teaching-cost by the number of students. The cost per student so derived is given in the last column in each case. Thus there are two figures for cost per student, designated Cost I and Cost II. Figures are rounded to the nearest rupee.

It is certainly rather expensive to run the optional groups which attract very few students. Mathematics and German had even fewer students for the B.A. Special course. Some of the subjects taught at the General level in B.A. (e.g. Ardhamagadhi, Pali, French and Mathematics) attract only a student or two. It must not be concluded, however, that an institution should cease to teach these subjects because of costs. Facilities must exist for their teaching without which higher learning in these subjects will just stop, and this is far from desirable. On the other hand, in a place like Poona with its many colleges it may be economic to decide by mutual agreement that facilities for such a subject will be available only in one of the colleges. (This understanding already exists in a few subjects.)

36. Similar analysis was also done for the University Departments considered in Section VII. The procedure outlined there was used to obtain the teaching-cost (expenditure on the Department and contribution on account of college teachers participating in the post-graduate teaching of that subject) with recourse to the convention that the Ph.D. students on an average claim one hour a week of their guides. The teaching-costs per student in different Arts and Science Departments are given for comparison (see next page). Figures are rounded to the nearest rupee. The costs depend on three factors: the number of University staff, the number of contributed staff drawn from colleges, and the number of students served by the Department. It should be noted that the teaching-expenses considered here include the salaries of the teaching-staff of the Department, contribution on account of contributed teachers, and office and laboratory expenses of the Department.

It is clear from the figures that though the development of the University Departments as such is desirable, from the point of view of costs it is profitable to utilize, wherever possible, the services of qualified contributed teachers from colleges. Secondly, in the Departments like Sanskrit-Prakrit, Archaeology-History and Linguistics in Arts, and Botany and Zoology in Science, where the costs are quite high, the existing facilities will have much scope for greater utilization. The educational authorities like the

Teaching cost per student for M.A., M.Sc. and Ph.D. courses given in the University Departments

Subject	Staff in the Department	Contributed Teachers	M.A. (M.Sc.) students	Ph.D. students	Total teaching cost		Cost per student	
					M.A. (M.Sc.) students (Rs.)	Ph.D. students (Rs.)	M.A. (M.Sc.) (Rs.)	Ph.D. (Rs.)
<i>Arts</i>								
1. Sanskrit and Prakrit	2	13	13	8	28,380	7,829	2,183	979
2. Marathi	3	6	49	23	9,872	25,288	201	1,097
3. Experimental Psychology	2	1	41	6	25,510	12,755	622	2,126
4. Politics and Public Administration	3	3	35	18	18,760	28,140	536	1,563
5. Hindi	3	2	27	20	18,164	18,164	673	908
6. English	1	9	32	—	24,152	—	755	—
7. Ancient Indian History and Archaeology	2	6	26	6	64,511	24,192	2,481	4,032
8. Linguistics	7	6	11	32	21,428	171,425	1,948	5,357
<i>Science</i>								
1. Chemistry	10	5	123	17	191,910	108,749	1,560	6,397
2. Physics	6	6	52	10	107,737	29,927	2,072	2,993
3. Botany	8	3	36	10	129,116	27,471	3,587	2,747
4. Zoology	4	4	23	7	82,845	23,197	3,602	3,314
5. Geology	2	2	24	3	32,811	4,687	1,367	1,562
6. Mathematics and Statistics	11	10	79	9	136,700	13,038	1,730	1,454
7. Geography	4	—	24	3	45,037	4,358	1,877	1,453

University Grants Commission should therefore think twice before permitting similar Departments to be opened in other recently started neighbouring Universities. It will be financially (and even academically) more desirable to send their students to the already established Departments, by giving them stipends if necessary, rather than going in for costly repetition of these Departments in newer Universities, where they will have to face the problems of staffing, accommodation and equipment.

Data-Sheets

The Fergusson College : Figures for 1964-65

<i>Number of students</i>						
<i>Class</i>	<i>P. D.</i>	<i>F. Y.</i>	<i>S. Y.</i>	<i>T. Y.</i>	<i>3-year course</i>	<i>4-year course</i>
Arts	252	198	185	166	549	801
Science	645	569	189	131	889	1,534
					Grand total	2,335
<i>College staff</i>						
<i>Teaching-staff</i>		<i>Demonstrators and Tutors</i>			<i>Total</i>	
67		84			151	
<i>Expenditure (in rupees)</i>						
<i>Non-Divisible Expenditure</i>				<i>Divisible Expenditure</i>		
C I		65,339		D I	4,02,895	
C II		66,992				
C III		79,079		D II	11,147	
C IV		46,032				
C V		41,017				
C VI		11,845				
C VII		13,546		D III	1,21,635	
C VIII		11,078				
C IX		9,586				
	Total	3,44,514		Total	5,35,677	
					Grand total	8,80,191

The Fergusson College (Contd.)

Division of Divisible Expenditure (in rupees)

Class	Arts			M. A.	Science			M. Sc.	Total
	P. D.	3-year B. A.	4-year B. A.		P. D.	3-year B. Sc.	4-year B. Sc.		
D I	29,510	1,04,524	1,34,034	20,849	77,913	1,49,417	2,27,330	20,682	4,02,895
D II	979	2,263	3,242	—	3,055	4,850	7,905	—	11,147
D III	—	—	—	—	—	—	—	—	1,21,635

Annual cost per student (in rupees)

	Arts			Science		
	P. D.	3-year B. A.	4-year B. A.	P. D.	3-year B. Sc.	4-year B. Sc.
C	147.54	147.54	147.54	147.54	147.54	147.54
D I	117.10	190.39	167.33	120.79	168.07	148.19
D II	3.88	4.12	4.05	4.74	5.45	5.15
D III	—	—	—	79.29	79.29	79.29
Total	268.52	342.05	318.92	352.36	400.35	380.17

The Brihan Maharashtra College of Commerce, Poona : Figures for 1964-65

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TWO STUDIES IN EDUCATION

<i>Number of students</i>										
<i>P. D.</i>	<i>F. Y.</i>	<i>S. Y.</i>	<i>T. Y.</i>	<i>3-year B. Com.</i>	<i>4-year B. Com.</i>	<i>M. Com. I</i>	<i>M. Com. II</i>	<i>T. M. Com.</i>	<i>Grand total</i>	
451	362	338	212	912	1,363	83	17	100	1,463	
<i>College staff</i>										
<i>Teaching-staff</i>				<i>Tutors and others</i>		<i>Total</i>				
33				10		43				
<i>Expenditure (in rupees)</i>										
<i>Non-Divisible Expenditure</i>					<i>Divisible Expenditure</i>					
<i>C I</i>				52,492	<i>D I</i>				1,29,684	
<i>C II</i>				27,920	<i>D II</i>				5,630	
<i>C III</i>				40,830						
<i>C IV</i>				19,369						
<i>C V</i>				38,000						
<i>C VI</i>				8,899						
<i>C VII</i>				15,586						
<i>C VIII</i>				8,413						
<i>C IX</i>				4,426						
Total				2,15,935	Total				1,35,314	
									Grand total	3,51,249

The Brihan Maharashtra College of Commerce, Poona (Contd.)

<i>Division of Divisible Expenditure (in rupees)</i>						
	<i>P. D.</i>	<i>3-year B. Com.</i>	<i>4-year B. om.</i>	<i>M. Com.</i>	<i>M. A.</i>	<i>Total</i>
D I	42,770	66,476	1,09,246	11,688	8,750	1,29,684
D II	1,910	3,490	5,400	230	—	5,630

<i>Annual cost per student</i>				
	<i>P. D.</i>	<i>3-year B.Com.</i>	<i>4-year B. Com.</i>	<i>M. Com.</i>
C	147.60	147.60	147.60	147.60
D I	94.83	72.89	80.15	116.88
D II	4.24	3.83	3.96	2.30
Total	246.67	224.32	231.71	266.78

Shri Shahu Mandir College, Poona : Figures for 1964-65

<i>Number of students</i>						
<i>Class</i>	<i>P. D.</i>	<i>F. Y.</i>	<i>S. Y.</i>	<i>T. Y.</i>	<i>3-year course</i>	<i>4-year course</i>
Arts	138	88	104	41	233	371
Commerce	108	42	42	—	84	192
Grand total						563
<i>College staff</i>						
		<i>Teaching-staff</i>	<i>Tutors and others</i>	<i>Total</i>		
		18	1	19		
<i>Expenditure (in rupees)</i>						
<i>Non-Divisible Expenditure</i>			<i>Divisible Expenditure</i>			
C I		9,979				
C II		—				
C III		21,092				
C IV		13,670		D I	65,942	
C V		4,840				
C VI		413				
C VII		4,140				
C VIII		5,560		D II	6,020	
C IX		5,165				
Total		64,859		Total		71,962
Grand total					1,36,821	

Shri Shahu Mandir College, Poona (Contd.)

Division of Divisible Expenditure (in rupees)

	<i>Arts</i>				<i>Commerce</i>			<i>Total</i>
	<i>P. D.</i>	<i>3-year B. A.</i>	<i>4-year B. A.</i>	<i>M. A.</i>	<i>P. D.</i>	<i>3-year B. Com.</i>	<i>4-year B. Com.</i>	
D I	11,271	29,305	40,576	1,389	10,968	13,009	23,977	65,942
D II	800	3,420	4,220	—	540	1,260	1,800	6,020

Annual cost per student

	<i>Arts</i>			<i>Commerce</i>		
	<i>P. D.</i>	<i>3-Year B.A.</i>	<i>4-year B. A.</i>	<i>P. D.</i>	<i>3-year B. Com.</i>	<i>4-year B. Com.</i>
C	115.20	115.20	115.20	115.20	115.20	115.20
D I	81.67	125.77	109.37	101.55	154.87	124.88
D II	5.80	14.68	11.37	5.00	15.00	9.37
Total	202.67	255.65	235.94	221.75	285.07	249.45

The Hansraj Pragji Thakersey College, Nasik : Figures for 1964-65

<i>Number of students</i>								
<i>P.D.</i>	<i>F.Y.</i>	<i>S.Y.</i>	<i>T.Y.</i>	<i>3-year course</i>	<i>4-year course</i>	<i>Post-graduate course</i>	<i>Total</i>	
Arts	233	126	128	49	303	536	12	548
Science	299	263	42	23	328	627	—	627
Grand total								1,175
<i>College staff</i>								
<i>Teaching-staff</i>		<i>Tutors and Demonstrators</i>		<i>Total</i>				
36		17		53				
<i>Expenditure (in rupees)</i>								
<i>Non-Divisible Expenditure</i>				<i>Divisible Expenditure</i>				
C I	36,920			D I	2,25,551			
C II	20,442			D II	13,005			
C III	28,504			D III	45,246			
C IV	31,948							
C V	79,289							
C VI	14,811							
C VII	17,072							
C VIII	4,123							
C IX	17,714							
Total	2,50,823			Total	2,83,802			
Grand total								5,34,625

The Hansraj Pragji Thakersey College, Nasik (Contd.)

<i>Division of Divisible Expenditure (in rupees)</i>								
	<i>Arts</i>			<i>Science</i>			<i>Total</i>	
	<i>P.D.</i>	<i>3-year B.A.</i>	<i>4-year B.A.</i>	<i>M.A.</i>	<i>P.D.</i>	<i>3-year B.Sc.</i>		<i>4-year B.Sc.</i>
D I	28,989	70,435	99,424	8,101	45,252	72,774	1,18,026	2,25,551
D II	2,300	2,920	5,220	—	3,440	4,345	7,785	13,005
D III	—	—	—	—	—	—	—	45,246

<i>Annual cost per student</i>								
	<i>Arts</i>			<i>Science</i>				
	<i>P.D.</i>	<i>3-year B.A.</i>	<i>4-year B.A.</i>	<i>M.A.</i>	<i>P.D.</i>	<i>3-year B.Sc.</i>		<i>4-year B.Sc.</i>
C	213.47	213.47	213.47	213.47	213.47	213.47	213.47	213.47
D I	124.42	232.46	185.49	675.08	151.34	221.87	188.24	188.24
D II	9.87	9.64	9.74	—	11.50	13.25	12.42	12.42
D III	—	—	—	—	72.16	72.16	72.16	72.16
Total	347.76	455.57	408.70	888.55	448.47	520.75	486.29	486.29

The B. Y. K. College of Commerce, Nasik : Figures for 1964-65

<i>Number of students</i>									
<i>P.D.</i>	<i>F.Y.</i>	<i>S.Y.</i>	<i>T.Y.</i>	<i>3-year B.Com.</i>	<i>4-year B.Com.</i>	<i>M.Com. I</i>	<i>M.Com. II</i>	<i>T.M.Com.</i>	<i>Grand total</i>
194	144	106	64	314	508	40	21	61	569
<i>College staff</i>									
<i>Teaching-staff</i>			<i>Tutors and others</i>			<i>Total</i>			
17			4			21			
<i>Expenditure (in rupees)</i>									
<i>Non-Divisible Expenditure</i>					<i>Divisible Expenditure</i>				
<i>C I</i>			16,920						
<i>C II</i>			7,039		<i>D I</i>			74,642	
<i>C III</i>			23,775						
<i>C IV</i>			15,088						
<i>C V</i>			24,476						
<i>C VI</i>			1,481						
<i>C VII</i>			1,331						
<i>C VIII</i>			4,668						
<i>C IX</i>			8,545		<i>D II</i>			4,240	
Total			1,03,323					Total	78,882
								Grand total	1,82,205

The B. Y. K. College of Commerce, Nasik (Contd.)

<i>Division of Divisible Expenditure</i>							
	<i>P.D.</i>	<i>3-year B.Com.</i>	<i>4-year B.Com.</i>	<i>M.Com.</i>	<i>B.A.</i>	<i>M.A.</i>	<i>Grand total</i>
D I	25,570	37,695	63,265	6,295	929	4,153	74,642
D II	1,860	2,160	4,020	220	—	—	4,240

<i>Annual cost per student</i>				
	<i>P.D.</i>	<i>3-year B.Com.</i>	<i>4-year B.Com.</i>	<i>M.Com.</i>
C	181.59	181.59	181.59	181.59
D I	131.80	120.05	124.54	103.20
D II	9.59	6.88	7.91	3.61
Total	322.98	308.52	314.04	288.40

The R. B. Borawake College, Shirampur : Figures for 1964-65

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TWO STUDIES IN EDUCATION

<i>Number of students</i>						
<i>Class</i>	<i>P. D.</i>	<i>F. Y.</i>	<i>S. Y.</i>	<i>T. Y.</i>	<i>3-year course</i>	<i>4-year course</i>
Arts	49	48	21	15	84	133
Science	78	59	4	8	71	149
Grand total						282
<i>College-staff</i>						
<i>Teaching-staff</i>		<i>Demonstrators and Tutors</i>		<i>Total</i>		
29		10		39		
<i>Expenditure (in rupees)</i>						
<i>Non-Divisible Expenditure</i>				<i>Divisible Expenditure</i>		
C I	12,011		D I	90,134		
C II	7,930					
C III	5,608					
C IV	10,172					
C V	18,400		D II	—		
C VI	884					
C VII	4,362					
C VIII	4,059					
C IX	4,381		D III	18,017		
Total	67,807		Total	1,08,151		
Grand total						1,75,958

The R. B. Borawake College, Shrirampur (Contd.)

<i>Division of Divisible Expenditure</i>							
	<i>Arts</i>			<i>Science</i>			<i>Total</i>
	<i>P. D.</i>	<i>3-year B. A.</i>	<i>4-year B. A.</i>	<i>P. D.</i>	<i>3-year B. Sc.</i>	<i>4-year B. Sc.</i>	
D I	10,448	29,129	39,577	18,439	32,118	50,557	90,134
D II	—	—	—	—	—	—	—
D III	—	—	—	—	—	—	18,017
<i>Annual cost per student</i>							
	<i>Arts</i>			<i>Science</i>			
	<i>P. D.</i>	<i>3-year B.A.</i>	<i>4-year B. A.</i>	<i>P. D.</i>	<i>3-year B. Sc.</i>	<i>4-year B. Sc.</i>	
C	240.45	240.45	240.45	240.45	240.45	240.45	
D I	213.23	346.78	297.72	236.39	452.37	339.31	
D II	—	—	—	—	—	—	
D III	—	—	—	120.92	120.92	120.92	
Total	453.68	587.23	538.17	597.76	813.74	700.68	

The C. D. Jain College of Commerce, Shrirampur : Figures for 1964-65

<i>Number of students</i>					
<i>P. D.</i>	<i>F. Y.</i>	<i>S. Y.</i>	<i>T. Y.</i>	<i>3-year B. Com.</i>	<i>4-year B. Com.</i>
73	38	18	10	66	139
<i>College staff</i>					
<i>Teaching-staff</i>		<i>Tutors and others</i>		<i>Total</i>	
12		2		14	
<i>Expenditure (in rupees)</i>					
<i>Non-Divisible Expenditure</i>			<i>Divisible Expenditure</i>		
C I		4,674			
C II		1,608			
C III		7,689			
C IV		3,621	D I	28,386	
C V		5,500			
C VI		108			
C VII		4,614			
C VIII		1,524			
C IX		3,932	D II	120	
Total		33,270	Total	28,506	
				Grand total	61,776

The C. D. Jain College of Commerce, Shrirampur (Contd.)

Division of Divisible Expenditure (in rupees)

	<i>P. D.</i>	<i>3-year B. Com.</i>	<i>4-year B. Com.</i>
D I	9,141	19,245	28,386
D II	30	90	120

Annual cost per student

	<i>P. D.</i>	<i>3-year B. Com.</i>	<i>4-year B. Com.</i>
C	239.35	239.35	239.35
D I	125.22	291.59	204.21
D II	0.41	1.36	0.36
Total	364.98	532.30	444.42

The Law College, Poona : Figures for 1964-65

<i>Number of students</i>					
<i>LL. B. I</i>	<i>LL. B. II</i>	<i>2-year LL. B.</i>	<i>LL. M.</i>	<i>Total</i>	
296	149	445	28	473	
<i>College staff</i>					
<i>Teaching-staff</i>		<i>Tutors and others</i>	<i>Total</i>		
10		2	12		
<i>Expenditure (in rupees)</i>					
<i>Non-Divisible Expenditure</i>			<i>Divisible Expenditure</i>		
<i>C I</i>	25,175				
<i>C II</i>	—				
<i>C III</i>	8,146		<i>D I</i>	32,524	
<i>C IV</i>	25,488				
<i>C V</i>	51,432				
<i>C VI</i>	1,174				
<i>C VII</i>	581		<i>D II</i>	2,670	
<i>C VIII</i>	3,234				
<i>C IX</i>	491				
<i>Total</i>	1,15,721		<i>Total</i>	35,194	
				<i>Grand total</i>	1,50,915

The Law College, Poona (Contd.)

<i>Division of Divisible Expenditure</i>			
	<i>LL. B.</i>	<i>LL. M.</i>	<i>Total</i>
D I	23,555	8,969	32,524
D II	1,960	710	2,670
<i>Annual cost per student</i>			
	<i>LL.B.</i>	<i>LL.M.</i>	
C	244.65	244.65	
D I	52.93	320.31	
D II	4.40	25.36	
Total	301.98	590.32	

The Tilak College of Education, Poona : Figures for 1964-65

<i>Number of students</i>			
<i>B.Ed.</i>	<i>M.Ed. (Regular course)</i>	<i>M.Ed. (Vacation course)</i>	<i>Total</i>
151	35	41	227
<i>College staff</i>			
	<i>Teaching-staff</i>	<i>Masters of Method</i>	<i>Total</i>
	13	9	22
<i>Expenditure (in rupees)</i>			
<i>Non-Divisible Expenditure</i>		<i>Divisible Expenditure</i>	
C I	15,733		
C II	6,533		
C III	11,781		
C IV	3,166	D I	81,273
C V	10,940		
C VI	836		
C VII	355		
C VIII	2,441	D II	2,120
C IX	4,954		
Total	56,739	Total	83,393
			Grand total 1,40,132

The Tilak College of Education, Poona (Contd.)

<i>Division of Divisible Expenditure</i>				
	<i>B.Ed.</i>	<i>M.Ed. (Regular course)</i>	<i>M.Ed. (Vacation course)</i>	<i>Total</i>
D I	70,247	7,936	3,090	81,273
D II	—	—	—	2,120
<i>Annual cost per student</i>				
<i>I : M.Ed. Vacation Course students not included :</i>				
	<i>B.Ed.</i>	<i>M.Ed.</i>		
C	305.05	305.05		
D II	465.21	226.74		
D II	11.40	11.40		
Total	781.66	543.19		
<i>II : M.Ed. Vacation Course students included :</i>				
	<i>B.Ed.</i>	<i>M.Ed. (Regular course)</i>	<i>M.Ed. (Vacation course)</i>	
C	275.43	275.43	137.71	
D I	465.21	200.47	100.24	
D II	10.29	10.29	5.15	
Total	750.93	486.19	243.10	

Note : The cost of the M.Ed. (Vacation course) students has to be spread over two years.

The College of Engineering, Poona : Figures for 1964-65

<i>Number of students</i>					
<i>F.E.</i>	<i>S.E.</i>	<i>B.E.</i>	<i>3-year B.E.</i>	<i>M.E.</i>	<i>Total</i>
426	383	388	1,197	32	1,229
<i>College staff</i>					
<i>Teaching-staff</i>		<i>Demonstrators and Draughtsmen</i>		<i>Total</i>	
325		13		338	
<i>Expenditure (in rupees)</i>					
<i>Non-Divisible Expenditure</i>			<i>Divisible Expenditure</i>		
<i>C I</i>	68,240				
<i>C II</i>	—				
<i>C III</i>	47,944				
<i>C IV</i>	67,402		<i>D I</i>	12,35,122	
<i>C V</i>	—				
<i>C VI</i>	54,126				
<i>C VII</i>	1,78,882		<i>D II</i>	20,965	
<i>C VIII</i>	7,500				
<i>C IX</i>	2,20,753				
<i>Total</i>	6,44,847		<i>Total</i>	12,56,087	
				<i>Grand total</i>	19,00,934

The College of Engineering, Poona (Contd.)

<i>Division of Divisible Expenditure</i>			
	<i>B.E.</i>	<i>M.E.</i>	<i>Total</i>
D I	11,85,305	49,817	12,35,122
D II	11,950	9,015	20,965
<i>Annual cost per student</i>			
	<i>B.E.</i>	<i>M.E.</i>	
C	524.69	524.69	
D I	990.23	1,556.78	
D II	9.98	281.72	
Total	1,524.90	2,363.19	Estimate I
		2,081.47	Estimate II

The Poona University : Figures for 1964-65

<i>Number of students</i>						
	<i>Departments on the University Campus</i>		<i>Departments not on the University Campus</i>		<i>Total</i>	
	<i>M.A./M.Sc.</i>	<i>Ph.D.</i>	<i>M.A./M.Sc.</i>	<i>Ph.D.</i>	<i>M.A./M.Sc.</i>	<i>Ph.D.</i>
Arts	246	113	110	30	356	143
Science	361	59	—	—	361	59
Total	607	172	110	30	717	202
					Grand total : 919	

Expenditure on Post-graduate Teaching (see text for explanation)

<i>(a) Non-divisible Common Expenditure (Except that on Library)</i>		<i>Rs.</i>
<i>Heads of Expenditure</i>		
C I	Establishment — salaries and allowances	1,34,840
C II	Contingent Expenses	21,900
C III	Amenities to students	74,913
C IV	Additional facilities for research not covered by Departmental Expenditure such as University journal etc.	28,000
C V	Current repairs to Building and Furniture	25,294
C VI	Furniture and Office Equipment	26,920
C VII	Gratuity etc.	16,734
C VIII	Rates, taxes, insurance and other services	42,513
C IX	Miscellaneous	25,500
Total		4,26,614

*The Poona University (Contd.)***(b) Expenditure on the University Library (including grants to college libraries) : in rupees**

(a) Salaries and allowances	1,03,687
(b) Books and other expenses	1,21,550
(c) Payments to colleges for post-graduate sections of library	10,100

Total 2,35,337 .

(c) Expenditure of University Departments (including payments in respect of contributed teachers) : in rupees

	<u>Arts</u>	<u>Science</u>	<u>Total</u>
(i) Departmental Expenses	4,58,493	8,92,619	13,51,112
(ii) Payments for contributed staff	40,016	40,016	80,032
Total	4,98,509	9,32,635	14,31,144

(d) Scholarships (in rupees)

<i>M.A.</i>	<i>M.Sc.</i>	<i>Ph.D. (Arts & Science)</i>	<i>Total</i>
3,465	14,240	90,037	1,07,742

The Poona University (Contd.)

<i>Division of Departmental Expenses (in rupees)</i>								
	<i>Arts</i>				<i>Science</i>			
	<i>M.A.</i>	<i>Ph.D.</i>	<i>Teachers' own research</i>	<i>Total</i>	<i>M.Sc.</i>	<i>Ph.D.</i>	<i>Teachers' own research</i>	<i>Total</i>
Assumption A	2,69,580	2,28,929	—	4,98,509	7,72,211	1,60,424	—	9,32,635
Assumption B	2,59,816	2,38,693	—	4,98,509	7,02,884	2,29,751	—	9,32,635
Assumption C	1,66,160	1,66,170	1,66,170	4,98,509	3,10,878	3,10,878	3,10,878	9,32,635

Division of Library Expenses

Assumption D: Rs. 2,35,337 divided equally over 919 students.

Assumption E:

<i>M.A./M.Sc.</i>	<i>Ph.D.</i>	<i>Teachers' own research</i>	<i>Total</i>
78,445.66	78,445.66	78,445.66	2,35,337

The Poona University (Contd.)

<i>Annual cost per student (in rupees)</i>				
	<i>Arts</i>		<i>Science</i>	
	<i>M.A.</i>	<i>Ph.D.</i>	<i>M.Sc.</i>	<i>Ph.D.</i>
(a) Non-Divisible Expenditure	464.21	464.21	464.21	464.21
(b) Expenditure on University Departments				
Assumption A	1,095.85	2,025.92	2,139.09	2,719.05
Assumption B	1,056.16	2,112.33	1,947.05	3,894.10
Assumption C	675.49	1,470.53	861.16	5,269.12
(c) Library Expenditure				
Assumption D	109.41	388.34	109.47	388.34
Assumption E	256.08	256.08	256.08	256.08
(d) Scholarships	14.08	445.73	39.44	445.73
Total				
Estimate I : Assumptions A and D	1,683.55	3,324.20	2,752.15	4,017.33
Estimate II : Assumptions B and D	1,643.86	3,410.61	2,560.11	5,192.38
Estimate III : Assumptions C and E	1,409.86	2,636.55	1,620.89	6,435.14
Estimate IV : Assumptions A and E	1,830.22	3,191.94	2,898.82	3,885.07
Estimate V : Assumptions B and E	1,790.53	3,278.35	2,706.78	5,060.12
Estimate VI : Assumptions C and D	1,263.19	2,768.81	1,474.22	6,567.40

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