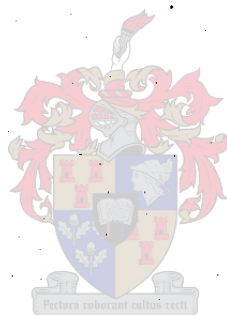


METHODS OF FINANCING UNIVERSITIES WITH
SPECIAL REFERENCE TO FORMULA FUNDING IN
SOUTH AFRICA

ANTONY PATRICK MELCK



Dissertation presented for
the Degree of Doctor of
Commerce at the University
of Stellenbosch

Promotor: Prof. D.G. Franzsen

November 1982

ACKNOWLEDGEMENTS

All research relies to a certain extent on the knowledge and publications of those who have worked in related fields. This is particularly the case with supervised research as, for example, with this dissertation. Although the contributions of such people are acknowledged systematically in the foot-notes to the various chapters, the influence of several persons upon the development of this dissertation has been so pervasive, that they must be mentioned separately.

Prof. D.G. Franzsen, who acted as university supervisor, deserves special mention both for having been the inspiration behind the project, and for countless fruitful hours of discussion, advice and support. Without his insights and encouragement this dissertation would have taken far longer to complete than it did.

Dr. R.H. Venter, of the Department of National Education, played a decisive role in the development of this dissertation, not only in a personal capacity over the course of several years, but also in his capacity as chairman of the 1982 study group that investigated the revision of the university subsidy formula. Through his mediation this dissertation served as a preliminary study for that investigation, and as such, some sections of it were incorporated in the report: An Investigation of Government Financing of Universities, (SAPSE-110, Pretoria, Department of National Education, First Edition). He also enabled the author to be relieved of his university teaching duties for four months, which were spent working in collaboration with the Macro Education Policy Directorate of the Department of National Education.

Dr. G. Erens played the leading role in refining the SAPSE information system for South African conditions, which provided the basic structure for the applied sections of this dissertation. He was also primarily responsible for

determining the parameter values of the proposed UAC Formula, described in Chapter 8 below.

Mr. W. Fouché, of the South African Treasury, and Mr. G.J.J. Steenkamp of the Department of National Education, kindly obtained much of the data used in Chapter 9 from the relevant government departments.

Financial support from the Human Sciences Research Council in respect of the research undertaken for this dissertation is acknowledged. However, the opinions expressed and the conclusions reached are those of the author and must not be attributed to the Human Sciences Research Council.

The dissertation was typed by Mrs. J. Marais and Mrs. R. Molnar. Mrs. G. Melck and Mrs. O. Daneel helped with the final proof-reading of the typescript.

Finally, as was the custom of J.S. Bach, this work commences with the exhortation: SOLI DEO GLORIA.

CONTENTS

	<u>Page</u>
1. <u>INTRODUCTION</u>	1
1.1 Hypothesis	1
1.2 Methodology	2
1.3 Introductory Synopsis	4
(1.4) The Development of South African Universities	6
2. <u>RELEVANT ECONOMIC ASPECTS OF EDUCATION</u>	15
2.1 Introduction	15
2.2 The Public Good Properties of Education ...	15
2.3 Education as Consumption and Investment ...	20
2.4 The Rate of Return on Education	21
2.5 The Demand for Education	24
2.6 Economic Growth and the Optimal Amount of Education	27
2.6.1 Economic Growth	27
2.6.2 The Manpower Approach	30
2.6.3 The Rate of Return Approach	33
2.6.4 Marginal Cost Pricing	35
2.7 Appendix : Principles of Resource Allocation	39
(3.) <u>THE UNIVERSITY AS A PRODUCING UNIT</u>	43
3.1 Introduction	43
3.2 Measuring Inputs	44
3.3 Measuring Outputs	50
3.3.1 Instruction	51
3.3.2 Research	57
3.3.3 Other Outputs	64

	<u>Page</u>
3.4 The Educational Production Function	66
3.4.1 Estimating the Production Function	66
3.4.2 Economies of Scale	76
3.4.3 Joint Production	85
3.4.4 Productivity and Efficiency	88
3.5 From Production Functions to Cost Functions	99
4. <u>PUBLIC OR PRIVATE PROVISION OF HIGHER EDUCATION.</u>	102
4.1 Introduction	102
4.2 The Provision of Higher Education by the Government	102
4.2.1 Market Failure as Justification for the Public Provision of Education	102
4.2.2 Equity as Justification for the Public Provision of Education	107
4.3 The Provision of Higher Education by the Private Sector	111
4.3.1 Decentralization as Opposed to Centra- lization	111
4.3.2 The Potential Advantages of the Private Provision of Education	114
4.3.3 The Necessary Conditions for the Opti- mal Private Provision of Education	116
4.4 Mixed Financing of Higher Education	119
4.4.1 General Considerations	119
4.4.2 Pricing University Instruction	120
4.4.2.1 The Elasticity of Demand for Edu- cation	121
* The Influence of Price	121
* The Influence of Social Class and Income	125

	<u>Page</u>
4.4.2.2 The Consequences of Changes in Tuition Fees	126
4.4.2.3 The Desirability of Increased Enrolments	131
4.4.2.4 The Determining of Instructional Costs and Prices	134
4.4.3 Pricing Research	138
4.4.4 Pricing Ancillary Services	142
4.5 The Implications for Non-University Post-Secondary Institutions	143
5. <u>FINANCIAL SUPPORT FOR STUDENTS AND UNIVERSITIES.</u>	145
5.1 Introduction	145
5.2 Financial Aid to Students	145
5.2.1 Grants	145
5.2.2 Loans	148
5.2.2.1 General Considerations	148
5.2.2.2 Possible Positive Effects of Loans.	149
5.2.2.3 Possible Negative Effects of Loans.	152
5.2.2.4 Some Possible General Effects of Loans	154
5.2.2.5 The Implementation of Loan Schemes.	155
5.2.3 Vouchers	162
5.2.3.1 Possible Positive Effects of Vouchers	162
5.2.3.2 Possible Negative Effects of Vouchers	164
5.2.3.3 The Use of Vouchers for Financing South African Universities	168
5.2.4 Tax Concessions to Parents	173

	<u>Page</u>
5.3 Financial Aid to Institutions	177
5.3.1 Formulas	177
5.3.1.1 Introduction	177
5.3.1.2 Exogenously and Endogenously Determined Formulas	179
5.3.1.3 Base Formulas and Functional Formulas	183
5.3.1.4 The Basis for the Payment of Uni- versity Subsidies and the Effects upon Efficiency	185
* The Number of Graduated Students ..	186
* The Number of Successfully Com- pleted Credits	187
* The Number of Enrolled Students ...	188
* The Number of Enrolled Students Weighted for Matriculation Grade ..	190
* The Number of Enrolled Students Plus a Penalty for Failure	191
* The Number of Passed Credits Plus a Fraction of Failures	193
* The Number of Students Using Auxiliary Services	195
* Research Outputs and Inputs	196
* Possible Additional Factors	197
5.3.1.5 Procedures for Estimating the Para- meters of a Subsidy Formula	197
5.3.1.6 Staff to Student Ratios	200
* Cost Units	201
* Allowance for Salary Differentials.	202
5.3.1.7 Percentage Contribution by the State	203
5.3.1.8 Enrolment Projections	206

	<u>Page</u>
5.3.1.9 Capital Expenditure	210
* General Approach	210
* Buildings and Other Land Improve- ments	214
5.3.2 Tax Concessions that Stimulate Donations to Universities	219
6. <u>THE SOUTH AFRICAN POST-SECONDARY EDUCATION (SAPSE)</u> <u>INFORMATION SYSTEM</u>	223
6.1 Introduction	223
6.2 Programme Classification Structure	224
6.3 Classification of Educational Subject Matter (CESM)	226
6.4 Formal Degree/Diploma Programme Classifica- tion Structure	226
6.5 Student Statistics	229
6.6 Financial Data	230
6.7 Personpower Resources	231
6.8 Fixed Assets Data	233
6.9 Building and Space Inventory Data	233
6.10 Information Survey Format	233
6.11 Conclusion	234
7. <u>IDENTIFICATION OF THE UNIVERSITY ACTIVITIES TO BE</u> <u>SUPPORTED BY THE GOVERNMENT</u>	235
7.1 Introduction	235
7.2 Instruction Programme	235
7.3 Research Programme	239
7.4 Public Service Programme	240
7.5 Academic Support Programme	241
7.6 Student Services Programme	241
7.7 Institutional Support Programme	244
7.8 Operational and Maintenance of Plant Programme	245
7.9 Bursaries Programme	246

	<u>Page</u>
7.10 Auxiliary Enterprises Programme	247
7.11 Hospitals Programme	248
7.12 Independent Operations Programme	249
 8. <u>ALTERNATIVE MODELS FOR CONSTRUCTING A FORMULA FOR</u> <u>UNIVERSITY SUBSIDIZATION</u>	 250
8.1 Introduction	250
8.2 Residential Universities	251
8.2.1 Model A : The Holloway Formula	251
8.2.2 Model B : The Van Wyk de Vries Formula .	253
8.2.3 Model C.	258
8.2.3.1 University Programmes	258
* Instruction Programme	258
* The Effects of Salary Structure	
Changes	261
* Research Programme	263
* Public Service Programme	266
* Academic Support Programme	266
* Student Services Programme	268
* Institutional Support Programme .	268
* Operation and Maintenance of	
Plant Programme	269
* Bursaries Programme	271
* Auxiliary Enterprises Programme .	271
* Hospitals Programme	271
* Independent Operations Programme.	271
8.2.3.2 An Evaluation of Model C	272
8.2.4 Model D	276
8.2.4.1 Personnel Requirements	276
8.2.4.2 An Evaluation of Model D	279
8.2.5 Model E : The Proposed Universities	
Advisory Council (UAC) Formula	281

	<u>Page</u>
8.2.5.1 General Considerations	281
* Set-up Resource Requirements	282
* Proportional Increase in Resource Use	284
8.2.5.2 The Basis for the Payment of Sub- sidies	286
8.2.5.3 The Subsidization of Current Expenditure	288
* General Approach	288
* Instructional/Research Professionals	289
* Research	293
* Other Personnel	294
* Service Workers	295
* Supplies, Services, Etc.	295
* Auxiliary Enterprises Programme	295
* Hospitals Programme	295
8.2.5.4 The Subsidization of Fixed Asset Expenditure	296
* General Approach	296
* Land	297
* Land Improvements other than Buildings	297
* Buildings	298
* Equipment	298
* Library Collections	299
* Auxiliary Enterprises Programme	299
* Hospitals Programme	300
8.2.5.5 The Percentage Government Contribution	300
8.2.5.6 The Extrapolation of the Factors upon which the Subsidy Formula is Based	300
8.2.5.7 Summary of the UAC Formula	301
8.2.5.8 An Evaluation of the UAC Formula ...	303

	<u>Page</u>
8.3 Correspondence Universities	305
8.3.1 Model F	305
8.3.2 Model G	307
8.4 Conclusions	308
 9. <u>SOME PUBLIC FINANCE CONSEQUENCES OF UNIVERSITY</u>	
<u>SUBSIDIZATION</u>	309
9.1 The State Structure for Financing Education	309
9.2 The Need for Comparable Data	311
9.3 Student Enrolments	314
9.4 Expenditure by Government Departments on Universities	319
9.4.1 Department of National Education	319
9.4.2 Departments of Internal Affairs and Community Development	324
9.4.3 Department of Education and Training and the South African Development Trust	331
9.5 Conclusions	336
 10. <u>SUMMARY AND CONCLUSIONS</u>	337
11. <u>BIBLIOGRAPHY</u>	341

LIST OF TABLES

	<u>Page</u>
TABLE 1 Percentage of Annual Income Payable as Interest and Redemption on a Loan Equal to One Third of Annual Income at Different Rates over 10 Year and 20 Year Repayment Periods Respectively.	153
TABLE 2 University Programme Classification Structure.	225
TABLE 3 SAPSE Classification of Subject Matter into Twenty-Two CESM Categories and Their Division into Human Sciences and Natural Sciences Groups.	227
TABLE 4 Diagrammatical Illustration of the Procedure Used in the U A C Formula for Calculating Subsidies for the Educational and General Programmes in the Human Sciences Group.	290
TABLE 5 Provision of Personnel Cost Units per Effective Subsidy Student (S) in the U A C Formula for the Educational and General Programmes in the Human Sciences Group.	291
TABLE 6 Structure of State Educational Financing in South Africa, 1981.	310
TABLE 7 Numbers of Enrolled Students at the Universities Administered by the Department of National Education, 1971 - 1980.	315
TABLE 8 Numbers of FTE Enrolled Students at the Universities Administered by the Department of National Education, 1981.	316

	<u>Page</u>
TABLE 9 Numbers of Enrolled Students at the Universities Administered by the Department of Internal Affairs, 1971 - 1981. .	317
TABLE 10 Numbers of Enrolled Students at the Universities Administered by the Department of Education and Training, 1971 - 1981.	318
TABLE 11 Total Actual Expenditure by the Department of National Education on Universities, 1970/71 - 1980/81.	320
Table 12 Index of Total Real Expenditure by the Department of National Education on Universities Compared to Index of Enrolled Students, 1970/71 - 1980/81.	323
TABLE 13 Expenditure by the Department of Internal Affairs on the University of the Western Cape Expressed in Nominal and Real Terms and in Index Form together with Enrolled Student Numbers.	325
TABLE 14 Expenditure by the Department of Internal Affairs on the University of Durban-Westville Expressed in Nominal and Real Terms and in Index Form together with Enrolled Student Numbers.	327
TABLE 15 Imputed Interest and Redemption Charges on Capital Amounts Spent by the Department of Community Development on the University of the Western Cape, 1971/72 - 1981/82.	329

	<u>Page</u>
TABLE 16 Imputed Interest and Redemption Charges on Capital Amounts Spent by the Depart- ment of Community Development on the University of Durban-Westville, 1971/72 - 1981/82.	330
TABLE 17 Expenditure by the Department of Educa- tion and Training on Black Universities, 1970/71 - 1981/82.	332
TABLE 18 Index of Current Real Expenditure by the Department of Education and Training on the Universities of Fort Hare, Zululand and The North Compared to Index of En- rolled Student Numbers, 1970/71 - 1981/82.	334
TABLE 19 Capital Amounts Spent by the South African Development Trust on Black Universities, 1970/71 - 1976/77.	335

CHAPTER 1

INTRODUCTION1.1 Hypothesis

The subject discussed in this dissertation is that of how universities should best be financed. This appears, prima facie, to be a readily solvable question, but is in fact one that contains innumerable disguised difficulties. Casual observation confirms that resources are allocated, which places the subject undeniably in the realm of economics. Needless to say however, much more is ultimately at stake than just the economic: educationalists, sociologists, business leaders, indeed all who come into contact with the products of universities in their many guises justifiably believe that they have a contribution to make. Nevertheless, the arguments marshalled below are unashamedly taken from the economist's arsenal, although some aspects of a wider nature are included. In particular the analysis will proceed as if economic efficiency, growth and welfare are the primary aims of society; which is not, of course, to imply that other considerations are trivial.

The institutions referred to in the body of the dissertation are those commonly regarded as being the 'white' South African universities. This was necessitated by the division of the universities for administrative purposes between several government departments and the fact that the South African Post-Secondary Education (SAPSE) information system, which forms the basic structure for the empirical sections of the dissertation, has only been introduced for those universities under the jurisdiction of the Minister of National Education. Section 1.4 is devoted to tracing the historical development of this dichotomy and in Chapter 9 some of its implications are investigated. Other institutions for post-secondary education, the Technikons for example, are not dealt with specifically, although much of the analysis could be applied to them as well. As is

emphasized in Section 4.5, the policy implications of this dissertation should ideally be applied to the post-secondary education sector as a whole.

The primary hypothesis of this dissertation is that a system of formula financing for universities can be economically efficient without in any way encroaching upon university autonomy. This implies several subsidiary hypotheses: firstly, that a decentralized procedure for planning university education, whereby the decisions to enrol are largely left in the hands of students, can lead to economically efficient configurations; that those decisions should be made by considering the social and private costs of education, and not simply the benefits; that the private costs of (university) education are best reflected in prices, that is tuition fees; and that the structure of university costs can be discerned by observing the universities' internal optimization processes as revealed in their ex post patterns of expenditures.

1.2 Methodology

The analysis of the hypotheses formulated above is largely based upon the techniques of welfare economics. In an important sense this dissertation can be viewed as an exercise in applied welfare economics, which, as is well-known, is a part of what has come to be known as neoclassical economics. However, a simple delineation in this broad fashion of the field upon which the arguments for and against the various viewpoints will be arranged, requires some justification, because the ranks of economists have been brought into disarray by disagreements on the relevance of neoclassical economics to real world situations. In the analysis below use will be made of part of the neoclassical structure. One may, therefore, well enquire how this is to be justified, especially when its more elegant results are only obtainable under strict and undeniably unrealistic

assumptions.¹⁾

Of possibly greater importance for the purposes of this dissertation are several implicit theoretical problems. The first of these is common to all applications of cost-benefit techniques, in which attempts are made to evaluate public benefits. The problem lies therein that values or shadow prices, that approximate market prices as closely as possible, must be imputed for non-market factors.²⁾ A second problem occurs because educational planning, based upon a rate of return approach,³⁾ loses some of its efficacy, if a relatively price inelastic demand for education is identified, as is done in Section 4.4.2. A third problem is to be found in the general adherence to market orientated procedures despite the many market failures identified, for example, in Sections 2.2 and 4.2. In South Africa, where labour market restrictions and underdevelopment co-exist, exclusive reliance upon the market mechanism could raise some scepticism.

In keeping with the neoclassical tradition, these problems are noted, but without discarding the whole theoretical construction. The reason for so doing is pragmatism.⁴⁾ Despite the cracks in the neoclassical facade, nothing of equal rigour has yet been advanced to surpass it for analysing micro-economic problems. And if the deficiencies are kept in mind, considerable insight is to be gained from the analysis.

-
- 1) Graaff, J. de V.: Theoretical Welfare Economics, Cambridge, Cambridge University Press, 1957, Chapter X.
 - 2) De Wet, G.L.: 'The State of Cost-Benefit Analysis in Economic Theory', South African Journal of Economics, Vol. 44, March 1976, pp. 50-64; and Self, P.: Econocrats and the Policy Process, London, MacMillan, 1975, p. 198.
 - 3) Vide Section 2.6.3.
 - 4) Cf. Turvey, R.: Optimal Pricing and Investment in Electricity Supply, London, Allen & Unwin, 1968 in which a pragmatic approach is advocated.

1.3 Introductory Synopsis

Deliberation on the question of how universities should be financed reveals an extraordinarily complex problem. As an initial simplification one could abstract two polar cases: extremes that may serve well to illustrate some of the major difficulties encountered and which will be discussed in detail in Chapter 4. Let the first case be one of direct control by the state. Assume a situation in which total university funds are provided by the fiscus, the problem therefore becoming one of deciding how large in absolute terms that sum should be. At first, one could be tempted to suggest that the universities assess their needs, and having presented these to the treasury, be imbursed with the required monies. Or in the same vein, a budgetary system could be used with the universities presenting the treasury with their needs, once provision had been made for some maximum percentage increase above the appropriation of the previous year. Alternatively, the central authority administering education could, in conjunction with the treasury, determine the requirements of the universities and issue them with funds accordingly. Unfortunately, analysis shows that if this approach were followed, the standard problems of centralized decision making would appear. Decisions must be made upon relevant information, but it would become almost impossible under such a system to guarantee the accuracy of the information upon which those decisions were in fact to be made.

The other extreme possibility is where universities are privately financed without any assistance from the state. This would imply that the number of university places provided by the system would be determined by the private demand of students in conjunction with the costs of supplying those places. The difficulties in this case arise because the public good qualities of education could lead to a sub-optimal solution, where 'insufficient' education is

provided.

The problems associated with these extreme situations suggest that the correct solution could lie somewhere between them, and it is indeed that solution that this dissertation will seek to illuminate. It is axiomatic that any solution, to be of practical importance, will have to be embodied in some institutional framework. It is, however, necessary to achieve as much clarity as possible on the principles before attempting their institutional embodiment. Chapter 2 is accordingly devoted to an analysis of the economic properties of education, including a discussion of the problems associated with the planning of education. Although of a general nature, the concepts encountered are fundamental and are used throughout the course of the remaining chapters. One may note at this stage that economic theory suggests that goods that are 'correctly' priced are used both effectively and efficiently, and that 'correct' prices are related to marginal costs. The technical aspects of the theory are relegated to an appendix in Section 2.7. However, it is clear that costs must form the starting point of the analysis, even though the peculiarities of education militate against a crude application of the theoretical results.

Chapter 3 describes the 'production' of education. It begins by investigating what is meant by educational inputs and outputs and to what extent these can be quantified. Thereafter it concentrates on the question of whether production functions can effectively be estimated for universities and how these are related to cost functions. Chapter 4 refocuses attention upon the polar cases, outlined above, before moving on to a discussion of the mixed case, which is applicable in a majority of countries. Chapter 5 investigates the possible ways of lending financial support to students and universities. The use of grants, loans, vouchers and tax concessions are discussed, after which the

use of subsidy formulas is analysed in some depth. Chapter 6 is devoted to a discussion of the South African Post-Secondary Education (SAPSE) system, because the data supplied by it form the most satisfactory basis for empirical analysis. On the basis of the university programme structure identified in the SAPSE system, an analysis of which university activities should be supported with public funds is given in Chapter 7.

Chapter 8 is devoted to an analysis of alternative models that could be used for estimating the parameters of a formula for university subsidization. It includes analyses of the Holloway and van Wyk de Vries Formulas as well as the proposals made in 1982, known as the U A C Formula. Chapter 9 is used to investigate some of the public finance implications of university subsidization. Chapter 10 is devoted to drawing conclusions from the arguments put forward in the body of the dissertation.

Throughout the dissertation emphasis is placed upon the universities' current as apposed to capital expenditures, although the principles, upon which subsidization is based, apply to both alike.

1.4 The Development of South African Universities¹⁾

The development of the South African university system can be traced from modest beginnings. These were the founding of the South African College in 1834, which was incorporated as a public institution in 1837. The purpose of the college

- 1) Behr, A.L. and MacMillan, R.G.: Education in South Africa, Pretoria, van Schaik, Ltd., 1971, Chapter 8; Louw, J.B.Z.: Owerheidsbeleid en -Administrasie van Universiteite in Suid-Afrika, D.Phil.Thesis, University of Pretoria, Chapter 2; Report of the Committee of Enquiry into Quinquennial Revision of University Subsidy Formulae, (The Cilliers Report), Pretoria, Government Printer, 1963; Malherbe, E.G.: Education in South Africa, Cape Town, Juta and Co. Ltd., 1925, (Volume I 1652 - 1922) and 1977, (Volume II 1923 - 1975).

was to provide higher education to the young people of the country, who had formerly had no choice but to resort to European institutions in order to further their education.

The founding of the South African College was followed soon after by the establishment of other institutions, some of which were connected to various Church denominations and all of which offered courses of both a secondary and post-secondary nature. Amongst these institutions were those at Bloemfontein, Grahamstown, Stellenbosch, Pietermaritzburg, Burgersdorp and Wellington. In 1858 a Board of Public Examiners was constituted, which thenceforth conducted the examinations of the various colleges.

In 1874 the Board of Public Examiners was incorporated in a new university, named the University of the Cape of Good Hope, which had been founded the previous year. This university, which was largely modelled on the University of London, as it existed at that time, was solely an examining body; the preparation of candidates for the university's examinations remained the responsibility of the existing colleges.

From the founding of the new university until the First World War considerable development occurred. In particular, the South African College gradually began to turn its attention exclusively to post-secondary work; in 1881 the Stellenbosch College became the Victoria College; and in 1904 Rhodes University College was constituted in Grahamstown. In addition, in 1896 a School of Mines was established in Kimberley and later transferred to the Transvaal, before being divided in 1908 into the South African School of Mines and Technology in Johannesburg and the Transvaal University College in Pretoria. *and so all prior colleges developed into university colleges*

The beginning of the twentieth century was marked by continuous debate on how the South African university system

should be developed further. Some support was to be found for each of a number of conflicting proposals. These included single college universities, a federal university structure, college affiliation to an examining university, and a single national residential university. Despite a donation of R1 000 000 by Messrs. Beit and Wernher for the purpose of establishing a national teaching university in Cape Town, (part of which was initially intended for establishing a university in Johannesburg), no solution could be found, partly because the Victoria College feared losing its identity in the process.

A solution to the dilemma was finally found after a bequest of R200 000 in 1915 by Mr. J.H. Marais had enabled the Victoria College to secure its future by placing it upon a sound financial footing. The opposition to the creation of a teaching university at Cape Town was withdrawn and the basis for further university development in South Africa was consolidated in the three university acts of 1916.

Under these acts the South African College became the University of Cape Town and heir to the Beit-Wernher bequest; the Victoria College became the University of Stellenbosch; and the examining University of the Cape of Good Hope became the University of South Africa, with the remaining university colleges as its constituent parts. These remaining university colleges were represented on the governing bodies of the University of South Africa, and presented their candidates to the university for examination.

This development meant that the newly constituted University of South Africa comprised six colleges, namely those at Wellington, Grahamstown, Bloemfontein, Pretoria and Johannesburg and Natal. Within the next four decades each of these had progressed to independent university status. The requirement set by the government for the granting of full university status, (conferred by the passage of private

University acts through Parliament), was the possession of sufficient funds by the institution to guarantee a measure of financial independence.

The Johannesburg School of Mines was the first to be granted its charter and became the University of the Witwatersrand in 1921. The determination of the local inhabitants to make amends for the lost Beit bequest played an important role in establishing a fully fledged university in the place of the former college.

At approximately the same time the college at Potchefstroom, which had grown out of that at Burgersdorp, was incorporated as one of the constituent colleges of the University of South Africa.

In 1930 the Transvaal University College received its independence from the University of South Africa and became the University of Pretoria; in 1949 the Natal University College followed suit by becoming the University of Natal; in the next year the Huguenot College at Wellington ceased to operate; in 1950 the University College of the Orange Free State, (formerly the Grey University College) was transformed into the University of the Orange Free State; and in 1951 the Universities of Rhodes and Potchefstroom were created out of the colleges that had existed in those towns.

With the independence of its last two constituent colleges the University of South Africa was forced to accept a new role - one which had in fact begun to develop much earlier. This was the teaching of external students by correspondence methods. An internal report of the University had emphasized the importance of this aspect in 1945, and by 1964 all students, who wished to be examined by the university for degree courses, were required to be registered at and taught by the university. The significance of this development is underlined by the very rapid growth rate in enrolments from all population groups at the University of South Africa.

In the ensuing decade competition amongst several local authorities for permission to establish new universities led to the founding of two new institutions. Despite its decision to the contrary during the previous year and protests from Rhodes University, which still had unused capacity, the government granted permission for the founding of the University of Port Elizabeth in 1964. This was followed in 1967 by the founding of the Rand Afrikaans University in Johannesburg.

from 1839-1967
 In total, therefore, ten residential universities and one correspondence university had developed in the process described above. These universities, although autonomous institutions, receive substantial financial support from the government¹⁾ and for administrative purposes fall under the Minister of National Education.

These universities were primarily intended for the use of white students. The demand for university places by students from other race groups was initially accommodated by the so-called 'open' universities and by the establishment in 1916 of the South African Native College, which later became known as the University College of Fort Hare.

The 'open' universities were the Universities of Cape Town and Witwatersrand, neither of which used racial criteria when admitting students to academic activities. In practice, however, segregation often occurred in matters relating to boarding, social and recreational facilities. The University of Natal, which also admitted non-white students, applied segregation in academic activities by repeating lectures for non-white students and from 1950 housed a non-white medical school.

The University College of Fort Hare, which had grown out of

1) Vide Chapter 9.

a missionary institution, was in principle an open institution, but in practice was attended exclusively by non-white students. Although these students sat the examinations of the University of South Africa, the College was not a constituent part of that university, as were the other colleges mentioned above. At the time that the last of the University of South Africa's constituent colleges achieved autonomy in 1951, the University College of Fort Hare became affiliated to Rhodes University.

During the 1950s when the growing demand for university places by non-white students became apparent, the question of how facilities for those students should be provided came to the fore. In accordance with the political conceptions of the government a system of separating universities along ethnic lines was proposed. Despite considerable opposition, notably from the open universities, a bill to that effect was introduced to Parliament and after having been referred to a Select Committee was passed in 1959 as The Extension of University Education Act, (No. 45 of 1959).

In the same year the responsibility for the University College of Fort Hare was transferred by statute to the Minister of Bantu Education, as he was then called. The facilities were designated for use by the Xhosa ethnic group. To complete the provision of ethnically orientated universities, four more institutions were established between 1960 and 1961. These were the University College of the North for the Sotho people; the University College of Zululand for the Zulu people; the University College for Indians; and the University College of the Western Cape, which was intended for Coloured students.

The academic functions of these new university colleges were initially controlled by the University of South Africa in much the same way as that university had nurtured the older South African universities to adulthood. After less than

a decade it was considered that this guardianship, provided by the University of South Africa, could be ended. Therefore, during 1969 several university acts were passed by parliament to confer university status on these non-white institutions. This was done with retention of the original names of the institutions, with the exception of the University College for Indians, which became the University of Durban-Westville. The various acts conferring university status on these institutions came into operation during 1970 and 1971.

Besides creating the new ethnically orientated universities, the Extension of University Education Act introduced a measure of state control over university admissions. The Act requires students who wish to register at a university, other than that designated for the ethnic group to which they belong, to acquire ministerial permission in the form of permits, which are as a rule granted when an intended course of study is not offered by the university of a particular ethnic group. Initially only the formerly open universities were prepared to admit such students, however in recent years almost all the white universities have begun admitting non-white students. This trend is particularly marked in the case of post-graduate courses. The University of South Africa, which by falling under the jurisdiction of the Minister of National Education is classified as a white university, has for many years included a considerable percentage of non-white students amongst its enrolments.

For administrative and financial purposes the various non-white universities fall under the government ministries responsible for the affairs of their particular ethnic group.¹⁾ As such they could be regarded as state universities, their staff appointments being subject to ministerial approval and their financial affairs conducted on a budgetary basis within the relevant state departments. Although the likelihood exists of greater autonomy being granted to

1) Vide Chapter 9.

these institutions in the future, their position is in contrast to that of the white universities, which although largely dependent upon the state for financial support, are essentially autonomous.

The autonomy of the white universities is enhanced by the financial support, received by these universities from the state, being allocated with the aid of a subsidy formula rather than by an administrative process. In addition, the vice-chancellors or principals of these universities form the Committee of University Principals which, besides fostering mutual understanding between these universities, is able to make representations to the authorities on behalf of this section of the university community.

The dichotomy that results from the subdivision of the South African universities into white and non-white sectors has important implications for the financial planning of higher education in South Africa. However, because the primary objective of this dissertation is to investigate the application of formula financing to universities, consideration of the consequences of the dichotomy, mentioned above, is postponed to Chapter 9.

In recent years additional university campuses have been established for non-white students.¹⁾ The University of Fort Hare has founded two branches, one of which has subsequently become the University of Transkei, the other being at Zwelitsha; the University of Zululand has a branch at Umlazi; and the University of the North offers part-time courses at Sibasa in Venda as well as having a branch at Witsieshoek in Quaka. In 1978 the Medical University of South Africa (Medunsa), founded for training black students in a wide spectrum of medical sciences,

1) Department of Education and Training: Annual Reports, Pretoria, Government Printer, RP 101/ 1979, RP 103/1980, RP 72/1981.

began admitting its first students. In addition a university has been founded in the now independent state of Bophuthatswana and a new decentralized university, named Vista, which has been designed to accommodate the needs of urban black students, will enrol its first students in 1983. With the exception of those universities which now fall in independent states, these universities are administered by the Department of Education and Training.

CHAPTER 2

RELEVANT ECONOMIC ASPECTS OF EDUCATION2.1 Introduction

The way economists have come to analyse resource allocation is deceptively simple when highly formalized under certain assumptions. National welfare is taken to be maximized subject to the constraints of the production possibilities of the economy. The maximization procedure chosen, whether it be marginal analysis, la Grange multipliers or linear programming, yields the necessary conditions for achieving the best results under the circumstances. And when resources are allocated in compliance with those conditions, they are said to be optimally allocated. The appendix to this chapter specifies a formalized version of a model commonly used in economics for this purpose. It concludes that a group of equalities between certain marginal rates in the economy may be interpreted as 'rules' for optimal resource allocation. The complications, of course, only come to light once the more stringent assumptions have been relaxed to give a model that more closely approximates reality, as for instance happens, if education is introduced as one of the 'goods' in the system; in which case one is faced with many of the difficulties that shackle the elegance of the results. Nevertheless, it is clear that educational planners must in some sense seek such an optimum, as will be discussed below in Section 2.5 after several relevant aspects of education have been considered.

2.2 The Public Good Properties of Education

Education is often considered to be a 'public good'. In the pure case of a public good the 'exclusion principle' does not hold, meaning that the consumption of that good is open to all who wish to avail themselves of the opportunities.¹⁾ Furthermore, the enjoyment of the benefits

1) Consider, for example, the services of a lighthouse or the provision of national defence.

of a pure public good by, say, person A, does not preclude the enjoyment of the same benefits by person B, and so forth. These qualities provide the rationale for state financing, because in the absence of provision by the state the good will, in all probability, not be produced at all. Theoretically, it can be demonstrated that optimal provision for a public good is made, when production is set so that the summation (over all persons) of the ratios of each person's marginal utility from that public good, to his marginal utility from some private good, equals the corresponding ratio of marginal costs in production.¹⁾ The practical problem of getting consumers to reveal their preferences for the public good, however, remains.

Now, despite the traditional categorization of education as a good with public good properties, it is clear that exclusion of consumers may indeed be applied. A seat in a lecture hall occupied by one student cannot simultaneously be occupied by someone else. Education cannot, therefore, be an example of a pure public good. A plausible explanation of why it has come generally to be regarded as such, is that education generates strong 'externalities', that is, incidental, unpriced advantages or disadvantages to third parties, in that the benefits of education accrue not only to the immediate person being educated, but permeate society at large. Which is to say that when person A 'consumes' a certain quantity of education, he benefits therefrom, but that simultaneously persons B and C gain from the fact of A's consumption; and what is more they cannot, reasonably, be excluded from those gains. In this sense, therefore, it is evident that public goods may be regarded as forming a special case of the broader category of externalities, and that the distinguishing feature is that, with the consumption of pure public goods, all the benefits thereof are still available to other

1) Samuelson, P. : 'The Pure Theory of Public Expenditure', Review of Economics and Statistics, Vol. XXXVI, no. 4, Nov. 1954, pp. 387-389.

consumers, whereas in the case of goods said to exhibit externalities, only some of those benefits accrue to others.

The fact that benefits are dispersed through the economy in this way, complicates the optimization process. In a free market economy it implies that the private benefits of the individual maximizer will be less than the total benefits and, as it is the former that he will equate to marginal costs, the consumption of education could be suboptimal. Unfortunately, the consequences of such an eventuality for the 'rules', formulated for optimality in the appendix to this chapter, are dire. The mechanics of the optimization process remain, but the presence of an additional constraint negates the elegance of the results. Indeed, no general conclusion can be predicted other than that the 'second best' solution will in all likelihood be totally different from the initial one.¹⁾

From an analytical point of view the public good properties of say, education, may be likened to the phenomenon of joint production, although the latter term will reappear in the analysis below in a slightly varied guise. However, because joint production defines a process where the production of one commodity implies the simultaneous production of some second commodity, an affinity between the concepts exists. Let the production of education be regarded as the first good and the resulting externalities as the second good of the joint production process, in which case the similarities become self-evident.

At this juncture it becomes necessary to specify the externalities that are relevant in education, so that some estimate of their importance, relative to private benefits, can be attempted. Various categories have been distinguished in

1) Lipsey, R.G. and Lancaster, K. : 'The General Theory of the Second Best', in Farrell, M.J. (Ed.) : Readings in Welfare Economics, London, MacMillan, 1973.

the literature.¹⁾ These include the pecuniary advantages to those who are not the direct beneficiaries of the education, including subsequent generations who benefit from current educational expenditure; the provision of a suitable environment for the development of intellectual potential; the provision of occupational flexibility in the labour force; and, of particular interest to higher education, the creation of favourable conditions for research. Now, in practice it is extremely difficult to measure these possible side-effects. In addition, care must be exercised not to include under the heading of externalities effects that are in fact attributable to other economic forces. For example, expenditure on education may, ceteris paribus, induce a narrowing of pay differentials because of shifts in the supply of skilled and unskilled workers. These economic forces are undoubtedly to the advantage of some and to the disadvantage of others, but do not, however, give rise to market failure and do not therefore warrant inclusion in the category under discussion.

Again, it is not unusual to find a group of non-economic factors attributable to education, which are assumed to have positive effects, included on the list of externalities. For example, it is often stated that education contributes to socially responsible behaviour, helps to foster lawfulness, political maturity, a sense of national pride and that it adds to the intellectual and cultural well-being of the community. Important though these may be, their non-economic nature should disqualify their being included.²⁾

- 1) Df. Blaug, M.: An Introduction to the Economics of Education, Middlesex, Penguin Books Ltd., 1970, p. 108.
- 2) Ibid. However, Friedman believes that the creation of a common set of values provides the prime justification for public support for education. Friedman, M.: 'The Role of Government in Education' in Solo, R.A. (Ed.): Economics and the Public Interest, New Brunswick N.J. Rutgers University Press, 1955. Compare also Bolton, R.E.: 'The Economics and Public Financing of Higher Education' in the Report of the Joint Economic Committee, Congress of the US: The Economics and Financing of Higher Education in the United States, Washington, DC, US Government Printing Office, 1969.

In conclusion it appears that the achievement of unanimity on what should be included under the externality heading, is unlikely. In addition, the unquantifiable nature of the problem remains, which explains why no research has yet been able to assess categorically what the relative magnitudes of private to social benefits are. In the case of higher education at university level, the uncertainties are partially alleviated and the scales tipped in favour of social benefits by the undeniable importance of research, which for analytical purposes may be regarded as a joint product of teaching. The results of research are generally truly public in that their use by one academic does not inhibit their simultaneous use by any other person.

Despite these difficulties, the public good properties of education, broadly defined to include externalities, are often used as justification for state involvement in the provision of education. And because the exclusion principle is not applicable, it has been argued that education falls into a group of 'merit' goods;¹⁾ which is to say that because their consumption is deemed beneficial to society and because the individual consumer is unlikely to perceive the total social value thereof, he should be persuaded (by the state) to consume more than he perhaps otherwise would have done. It does not follow, however, that state involvement requires state provision, as educational requirements may be provided by private schools with minimum standards enforced via the legislature.²⁾ Where full financial provision is made by the state, its justification must usually be sought in other quarters: equal opportunities irrespective of social class and equitable income distribution, for example, are two that come to mind. A related problem that justifies state intervention may be market failure in the financing of investment in education, because of the risk element involved. For

-
- 1) Musgrave, R.: The Theory of Public Finance, New York, McGraw-Hill, 1959, pp. 13-14.
 - 2) Friedman, M.: Op. Cit. advocates this procedure.

example, a gifted child from a poor home may experience difficulty in borrowing funds to enable him to pursue his education. This is analysed below in Section 4.1.

2.3 Education as Consumption and Investment

Up to this point education has been referred to as 'consumption' although no justification has been advanced for doing so. This practice corresponds with the conventional national accounts definitions of consumption and investment, whereby purchases by households (with the exception of housing) are classified as the former. Because education is generally acquired by persons in their private capacities, it is justifiably defined as consumption in terms of these definitions.

Nevertheless, consideration of the true nature of education reveals a second attribute of equal or possibly greater economic importance than the first. The educational process undeniably adds the vital element of knowledge to society's stockpile of productive assets that generate consumable goods in the future, whether those assets be material as say, a machine, or immaterial, as for example a technique. The process of addition to the sum of these assets may be defined as investment, in which case education is clearly classifiable as such. In addition, educational 'capital', or 'human capital' as it has come to be called, is subject to similar forces of obsolescence and attrition as are other capital goods.

The capital nature of investment in education is well demonstrated by an analysis of the age-earnings profiles of educated persons. These show that the average earnings of a cohort of persons, with a specified level of education, quickly rise with the passage of time above those of contemporary

cohorts having less education. Present consumption is forgone (and costs incurred) so that the level of future consumption may be higher. And these higher levels may best, although inaccurately, be indicated by the higher incomes generated. Undoubtedly education is not the only contributor to higher earnings, as indeed a host of factors such as intelligence, home circumstances, parental attitudes, educational attainments, social class, the possession of scarce talents, market imperfections and discrimination, all play a role. Some have gone as far as to assert that, because of the preponderance of these 'non-economic' factors, the educational structure is nothing more than an elaborate screening device that selects the naturally able, whilst eliminating the less competent.¹⁾ Nevertheless, despite the weight of these arguments, the available evidence confirms that, whatever the relative merits of other factors, formal education remains on average the key to unlocking them in the generation of earnings.²⁾

2.4 The Rate of Return on Education

If education is viewed as an investment in a non-tangible

- 1) For a formal statement, see: Arrow, K.J.: 'Higher Education as a Filter', in Lumsden, K.G., (Ed.), Efficiency in Universities, (The La Paz Papers, Amsterdam, Elsevier Scientific Publishing Co., 1974. Also: Layard, R.R.G. and Psacharopoulos, G.: 'The Screening Hypothesis and the Returns to Education', in Journal of Political Economy, Vol.82, Oct., 1974, p.985. These authors show that three basic predictions in the spirit of the hypothesis are not in fact borne out. An empirical test by Taubman, P.J. and Wales, T.J. lends some support to the hypothesis, on the other hand; 'Higher Education, Mental Ability and Screening', Journal of Political Economy, Vol. 81, Jan-Feb. 1975. Also Taubman, P. and Wales, T.: Higher Education and Earnings. College as an Investment and Screening Device, New, York, McGraw-Hill Book Co., 1974.
- 2) Cf. Becker, G.S.: Human Capital. A Theoretical and Empirical Analysis, With Special Reference to Education, New York, Columbia University Press, 1964, p. 83 and Blaug, M.: Op. Cit., p. 39; also Sadie, J.L.: Labour Demand and Supply, Stellenbosch, Kosmos Publishers, 1980, Chapter 9.

capital good, the question of a return on that investment arises. The calculation of costs is, therefore, required.

The costs of education are customarily divided into direct and indirect components. The former includes the out-of-pocket expenses which the student incurs by paying primarily for his books and tuition, the latter results from the income forgone by the student by his not working in the time used for his education. The social costs of education - those to society as a whole - may be analysed along similar lines. In addition to the costs incurred by the student, society must bear the costs of facilities provided by the state, which in many instances is the major portion of all direct costs. The indirect costs to society, that is, that portion by which the national product is less than it would otherwise have been, will normally correspond to the total of incomes forgone by students.¹⁾

The principle for the inclusion of indirect costs is that in any situation the choice between alternatives should be made on the basis of opportunity costs, i.e. the forfeited benefits of the next best possibility. At the initial stages of the debate, however, arguments were advanced for the exclusion of indirect costs on the grounds that young people are often barred from the labour market by legislation, that off-setting benefits are also present, and that in the event of all students entering the labour market, many would not find employment.²⁾ It is submitted (and now generally agreed

- 1) Committee on Higher Education : Report, (The Robbins Report), London, H.M. Stationery Office, Vol. 4, Cmd. 2154, 1963, concluded that in Britain forgone incomes equalled about 42% of the total costs of higher education and, because of grants, almost the total of private costs.
- 2) Vaizey J.: The Economics of Education, London, Faber & Faber, 1962, p. 42-43. Vide O'Donoghue, M.: Economic Dimensions in Education, Dublin, Gill & MacMillan Ltd., 1971 for a lucid discussion. Also Bowman, M.J.: 'The Costing of Human Resource Development', in Robinson, E.A.G. and Vaizey, J.E. (Ed.) : Economics of Education, London, MacMillan, 1964.

upon), that arguments for inclusion or exclusion apply with equal force to direct and indirect costs as well as to their accompanying benefits; that legal constraints upon the individual are variables for society and that education must therefore always entail social opportunity costs; that student time, although generally unpriced, is a costly input in the educational system; that the only proxy available as a measure is the earnings of peers who have renounced further education; and that what is to be measured is the costs of using resources, not of letting them lie idle through unemployment.

Once the difficulties of deciding upon which costs are to be included have been overcome, they must be compared to the stream of increased earnings attributable to that education. The technical process of discounting future earnings so that they become comparable with present costs is conceptually simple. In general, if the sum of the discounted stream minus costs is set equal to zero, the resulting equation reveals the rate of return on the investment in education. This calculated rate is then compared to the return on other forms of investment to determine the relative profitability of education.¹⁾ Alternatively, a rate of interest that is considered to reflect correctly the 'social time preference rate' of the community, may be employed to discount the income stream, and the amount by which this sum exceeds costs is called the net return on the investment. If the operation is performed upon marginal units and the net marginal return is positive, an expansion of the project will prove profitable (but not necessarily the most

-
- 1) A comprehensive study has been done by Psacharopoulos, G.: Returns to Education, An International Comparison, Amsterdam, Elsevier Scientific Publishing Co., 1973. A study based on South African data has been done by Joubert, R.J.O.: Enkele Ekonomiese Aspekte van Suid-Afrikaanse Onderwys-investering: 'n Verdienstefunksiebenadering, RAU Unpublished Thesis, 1976; also his 'Verdienstefunksies in die Onderwys', South African Journal of Economics, Dec. 1978, p. 371.

profitable). Also, when the net present value of the marginal unit is zero, the allocation of resources to that project is 'optimal', as is demonstrated below in the Appendix, i.e. unless additional constraints (such as insufficient resources to cover all projects) are present.

The possibility exists that these two procedures may not sanction the same projects. For example, the choice of an interest rate is critical to the results of the second technique, as the present value varies inversely with the interest rate chosen. Also, if the undiscounted net returns at any point of the age earnings profile become less than zero at more than one point, the first method may become indeterminate.¹⁾ Fortunately, the likelihood of this happening in education is very remote, at least in the kind of aggregated analysis usually employed. A whole cohort would have to return for additional schooling simultaneously for the undiscounted net returns to become negative for a second time.

2.5 The Demand for Education

Education is demanded by private persons because it has 'utility' both as a consumer good and as a capital good. The rate of return indicates the utility of the latter and is obviously influenced by the price payable for the education. Other important factors, upon which the amount of education demanded depends, are the income of the person and his tastes for education relative to other goods.

Economic theory has come to refer to a demand schedule as the normally negative relationship that exists between prices and quantities under the condition of all other factors being held constant. When these concepts are applied to education, however, one is confronted with the difficulty of not having

1) Mishan, E.J.: Cost-Benefit Analysis, London, George, Allen & Unwin Ltd., 1971, p. 231.

unambiguous definitions. Educational output is currently not directly measurable. It is not clear how outputs are related to inputs or even how outputs are to be quantified.¹⁾ If for example the number of graduates is taken as indication, should differentiations be made between subjects or institutions? And if a student fails to take his degree after spending time at a university, is he to be regarded as part of the output of that university? The current practice²⁾ of measuring the production of education by the sum of money spent on it, is at best a poor approximation that makes statistical analysis extremely hazardous. This procedure amounts to measuring the output in terms of inputs without reference to the production function, efficiency, or scale economies. It also has the result that an increase in lecturers' salaries automatically increases the amount of education being produced, in value terms, despite the fact that the same number of students may be in attendance. And if prices are related to costs, this increased value of output could result in prices being raised, which seemingly would give an 'abnormal' demand curve for education. For example, if a rise in lecturers' salaries is passed on to students in the form of higher fees, the price of education rises. However, in terms of the output measure just discussed, increasing costs are seen as higher output; and the combination of a higher price and a 'greater quantity' of education used may appear as an abnormal demand curve.

Nevertheless, by postponing these considerations and by momentarily allowing the amount of education demanded simply

-
- 1) A discussion of the production function is to be found in Chapter 3. Numerous proxies for output have been proposed e.g. the total number of students, the number of school days per year, total costs, number of student-hours taught. Cf. Machlup, F.: Education and Economic Growth, Lincoln, USA University of Nebraska Press, 1970, p. 64, et. seq.
 - 2) i.e. in the national accounts. Cf. Sheenan, J.: The Economics of Education, London, George, Allen & Unwin, (no date), p. 12.

to be indicated by the number of student places required, some elements of a normal demand curve may be discerned. (Of course, students and their time are yet another input rather than an output.) A priori reasoning suggests the postulate that, other things being equal, a fall in tuition fees is likely to be followed by an increase in the number of applications for the available places, simply because the private returns to education are increased thereby. The exact nature of the relationship could be described by the price elasticity of the demand for education. This elasticity would in turn be influenced by, amongst others, the absolute and relative prices before and after the change, the family circumstances of the students, their income and the availability of credit facilities and the measure in which education is viewed as a necessity or luxury.

The second major determinant of the demand for education is income. If prices are held constant and incomes allowed to increase it is postulated that the demand for education will increase. Whether that increase will be more or less than proportional to the change in income is indicated by the income elasticity of the demand for education.

Estimates of both price and income elasticities are subject to practical complications unless several simplifying assumptions are included. Cross-sectional analyses must assume that the students being researched are equal in all respects save the one under review, whereas time series methods assume that the tastes for education of the persons being studied remain constant over the period. Both procedures assume that the quality of the educational service is constant either as between institutions or over time. Despite these difficulties estimates of the magnitudes involved have been attempted. One such study, undertaken under the auspices of the OECD, attempted the calculation of income elasticities from cross-sectional data from more than one hundred

countries.¹⁾ The results indicate that the income elasticity is greater than one, implying that as persons become richer, a greater than proportional increase in the education demanded may be expected.

Thirdly, tastes, i.e. how education enters the utility functions of persons, play an important role in determining demand. Although many variables, which may all to some extent be interrelated, may be involved, research by, amongst others, the Robbins Committee in Britain has emphasized the strong correlation between the educational attainments of parents and those of their offspring.²⁾

Parents having less education tend to be of the lower classes and to avoid a perpetuation of this status it is often strongly argued that education in these cases warrants treatment as a merit good. On the other hand children born of wealthy middle class parentage tend to place undue emphasis on education as a consumer good, especially in those countries where (higher) education is supplied at relatively low costs to the user and student admissions are not restricted.

2.6 Economic Growth and the Optimal Amount of Education

2.6.1 Economic Growth

Economic growth is measured by changes in the national income, which in itself is the sum of individual earnings. Therefore, the fact that education helps to raise individual earnings implies that it fosters economic growth; that is, if the higher earnings of the educated are not simply the result of a redistribution of income from the uneducated to the

1) Blot, D. and Debeauvais, M.: 'Educational Expenditure in Developing Areas', in Financing Education for Economic Growth, Paris, OECD, 1966. Vide Section 4.3.2 with respect to universities.

2) The Robbins Report: Op.Cit., paragraphs 137-143.

educated or of an inflationary spiral caused by higher incomes unmatched by an ability to produce more in real terms.¹⁾

Various attempts have been made to quantify the contribution of education to growth, of which the most notable are those by Denison.²⁾ Denison's technique entails the implicit estimation of an aggregate production function of the Cobb-Douglas type for the whole economy i.e. $Q = AL^a K^b$, where Q = physical quantity produced, L = labour, K = capital and A , a and b are parameters. Denison's estimates in his first study showed that a considerable percentage of economic growth in the USA over the years 1925 to 1957 was attributable to investment in education. In his later work, however, his results were less conclusive in explaining differences in growth rates between countries.

Interesting though these studies are, their results cannot be evaluated without scrutiny of the assumptions upon which they are based. And the latter are of such a nature as to have evoked more than scepticism in some commentators. Therefore, although the results may well indicate the magnitudes involved, they must be handled with caution. The simple elegance of the Cobb-Douglas function has had much appeal for economists, despite the improbability of one equation being able to summarize in a meaningful way the productive activities of a whole economy. The function is linearly

-
- 1) Blaug, M.: Op.Cit., p. 61.
 - 2) Denison, E.F.: The Sources of Economic Growth in the United States and the Alternatives before Us, New York, Committee for Economic Development, 1962; Why Growth Rates Differ, Postwar Experience in Nine Western Countries, Washington, DC, The Brookings Institution, 1967. There is an in depth discussion of Denison's approach in the OECD publication: The Residual Factor and Economic Growth, Paris, OECD, 1965, to which many authoritative authors contributed. Surveys are to be found in Blaug, M.: Op. Cit., pp. 89-100, and O'Donoghue, M.: Op. Cit., pp. 108-117.

homogeneous of the first degree, which ensures the constant returns to scale necessary for neo-classical distribution theory, and in the absence of which the sum of marginal productivity payments do not exhaust the national income. However, the marginal productivity theory itself cannot go unquestioned, nor can its assumptions of a perfectly competitive economy, factor substitution, the absence of market failure and profit maximization. Casual empiricism is enough to refute many of these and, consequently, Denison's results have been strongly challenged.¹⁾ The conclusion must therefore be that economics is not as yet capable of calculating exactly what the contribution of education to growth has been, although general agreement exists that it has been significant. Not unsurprisingly, it has also not been able to determine what the optimal investment in education for the nation should be.

A closely related question is that of the correlation between the educational effort of a particular country and that country's level of economic development. Numerous studies have attempted to establish this relationship, using as variables the Gross National Product, per capita calorie consumption per day and the total per capita consumption of energy, amongst others.²⁾ Significant correlations were found in most cases to indicate that education is an important element of development. One study in particular found that technically orientated education was the predominant catalyst in the initial stages of development, whereas

-
- 1) OECD : The Residual Factor and Economic Growth: Op.Cit., passim.
 - 2) For example, Bennett, W.S.: 'Educational Change and Economic Development' in Eckstein, M.A. and Noah, H.J.: Scientific Investigations in Comparative Education, London, MacMillan, 1969, p. 168, et seq. Harbison, F. and Myers, C.A.: 'Quantitative Indicators of Human Resource Development', in Gezi, K.I.: Education in Comparative and International Perspectives, New York, Holt, Rinehart and Winston, 1971.

academically inclined curricula are more germane to the advanced countries.¹⁾ The existence of correlation does not, however, establish causation. It may be that, rather than education causing development, developed and therefore richer nations can afford more education. In addition causal sequences are likely to differ from country to country.²⁾

2.6.2 The Manpower Approach

Educational planners are most interested in being able to estimate the optimal amount of education and, consequently, means have been devised to approximate it. The first of these is the manpower approach, the basis of which is an estimate of the labour needs of society at some future date.³⁾ The present manpower structure is extrapolated using the desired rate of growth of the national product to arrive at an estimate of numbers that will be required in the various job categories in the future. Then by inspecting these categories the required educational attainments are specified for the satisfactory fulfilment of that type of work. Finally, the educational requirements are translated into a demand for education and educational facilities. The demand for education is seen, therefore, as a derived demand which depends upon the manpower needs of society.

Attractive though this scheme may be, it does rest upon

-
- 1) Bennett, W.S.: Op.Cit.
 - 2) Cf. Garms, W.T.: 'The Correlates of Educational Effort' in Eckstein, M.A. and Noah, H.J.: Op.Cit., pp. 410-428; also International Association for the Evaluation of Educational Achievement (IEA): The National Case Study: An Empirical Comparative Study of Twenty-One Educational Systems, New York John Wiley and Sons, 1976, passim.
 - 3) Cf. Bartholomew, D.J.: Manpower Planning, Middlesex, Penguin Books, 1976; also Parnes, H.S.: Forecasting Educational Needs for Economic and Social Development, OECD 1962, of which pp. 7-22 are reprinted in Baxter C., O'Leary, P.J. and Westoby, A.: Economics and Education Policy: A Reader, London, Longman in Association with the Open University Press, 1977, pp. 114-117.

certain significant assumptions. Firstly, the extrapolation requires one to assume that the present use of manpower is in some sense optimal, for if not, its projection into the future would only perpetuate errors. This assumption covers both the current provision of manpower and the efficiency of its utilization. The second assumption is that the costs of providing the trained personnel are less than the benefits that will flow from it. In this way the absence of any form of pricing is overcome. The assumption is not, however, strong enough to ensure that the educational projects, actually undertaken on the basis of the forecasts, are more profitable than other investment projects would have been. Thirdly, it must be presumed that job classifications can be made accurately. Fourthly, manpower models generally assume that the economy's input-output relationships are subject to 'fixed technical coefficients' in the use of manpower. That is, that no or at least minimal substitution can occur between the various job categories. Someone trained as an engineer is thereby assumed not to be available as a manager, for example, or for that matter for any other job other than that of an engineer. If this last assumption is made, then it is one that is often likely to be violated in practice. Therefore, attempts have been made to design manpower models that make provision for the substitution of workers trained in one field for those in some other field by calculating rates of exit from and entry to the various categories for specific cohorts of workers. These are then generalized in the total calculations to arrive at the final estimates. However, when the assumption of no substitutability is made, as often is the case, it contradicts a primary premise of most neoclassical economic models, that rely upon a high measure of factor substitutability, and could rather be said to have a greater affinity to the Loentief type of input-output theory. It is true that this issue has given rise to considerable debate in which eminent

economists have sided against the neoclassical orthodoxy.¹⁾ However, the substitutability of education is clearly on a different, albeit related terrain. Psacharopoulos has estimated the elasticities of substitution for different kinds of educated labour between pairs of labour groups.²⁾ His results indicate that there are substantial possibilities for substitution, as evidenced by an elasticity of substitution equal to 2,2 between the higher and secondary educational categories, an elasticity equal to 4,8 between the secondary and primary categories and equal to 50 between the primary and 'no education' categories.

An alternative, not unrelated approach, which estimates the demand for university places by students, was used by the Robbins Committee in Britain.³⁾ Firstly the sizes of the relevant age cohorts were calculated as also the proportion of each that was likely to reach levels sufficient for entry to universities. Thereafter an estimate was made of the proportion of those likely to be eligible, that would apply for admission to universities. Finally a decision was taken as to the number of places to provide and the appropriate length of study. When seen in conjunction with the grant system in the UK, this procedure amounted to giving particular emphasis to demand forces, whilst establishing an elastic supply schedule at a low price level.

Although the manpower way of calculating future educational requirements generates a specific figure, there is, of course, no guarantee of its accuracy. And indeed as has been said, suboptimal or inefficient situations may be projected forward.

-
- 1) Vide: Harcourt, G.C.: Some Cambridge Controversies in the Theory of Capital, London, Cambridge University Press, 1972.
 - 2) Psacharopoulos, G.: Op. Cit., p. 15 and Chapter 9.
 - 3) The Robbins Report: Op. Cit., also quoted in Baxter, C., O'Leary, P.J. and Westoby, A.: Op. Cit., pp. 2-19, especially p.9.

2.6.3 The Rate of Return Approach¹⁾

An alternative way of approximating the optimal amount of education required in an economy is presented by the rate of return calculations that were discussed in Section 2.3. Rates of return may be calculated and then, if education of a specific type has a marginal rate of return that is higher than that of other forms of investment, the need for expansion in that field is called for. On the other hand, if the marginal rate of return is lower than that generally pertaining in the economy, a contraction is needed. In a market orientated economy the underlying mechanism is such that rates of return on different types of investment tend towards equality. If investment in a particular field shows a relatively high return, resources will be attracted to that area, the supply will increase and therefore, unless the demand increases proportionally, the returns will be less. Similarly if low returns are being earned, resources will be diverted from that category of investment so that the supply decreases and the relative scarcity results in an increase in the rate of return. In a dynamic setting equality will never be attained, however, despite the presence of equalizing forces. It is argued that if rates of return on different categories of education are calculated, educational planners simply need to simulate the market and to expand those categories of which the returns are high and contract the areas showing low returns.²⁾

-
- 1) Cf. Layard, R.: 'Economic Theories of Educational Planning', in Peston, M. and Corry, B.: Essays in Honour of Lord Robbins, London, Weidenfeld and Nicholson, 1972, pp. 118-149; and Blaug, M.: Op. Cit., Chapter 6.
 - 2) It is important to remember that this rule applies to marginal rates. Empirical studies based on the assumption that marginal and average rates are equal should, therefore, be used with caution for policy purposes. 'Marginal' is usually taken as referring to one year of schooling. Cf. Hu, T.W., Kaufman, J.J., Lee, M.L. and Stromsdorfer, E.W.: 'Theory of Public Expenditures for Education', in Wykstra, R.A.: Education and the Economics of Human Capital, London, Collier-MacMillan, 1971, pp. 89-104.

The rate of return analysis clearly does not specify an optimum; it merely indicates in which direction the optimum is to be sought. The great advantage of this approach is, however, that the planner is not asked to make projections of supply and demand. That is in effect left to the inherent workings of the economic system. Nevertheless, serious difficulties are not to be avoided.

Firstly, there are the few conceptual difficulties with the idea of a rate of return that have been discussed above in Section 2.4. However, of greater importance in practice is the assumption of perfect markets, which allows one to deduce that the calculated rate of return accurately shows what is beneficial for society. In reality many instances of market failure exist that cause social benefits and costs to deviate from their private counterparts.¹⁾ The question of externalities and public goods has been analyzed above in Section 2.1, but in addition, any personal taxation and transfer payments by the government will result in differences between the private and social rates of return. Again, any restrictions placed upon the labour market, be it in the form of direct discrimination in employment and wages or impediments to mobility, will usually cause wages to diverge from marginal products. Those suppliers of labour who have monopolistic powers may be earning economic rents on their scarce talents, which will add to the distortion. And discrimination in schooling and in the access to funds to finance schooling will complete the disarray. Of course, educational planners are required to make their decisions on the grounds of the social rate of return, but on account of the complications that have just been outlined, it could prove extraordinarily difficult to make all the necessary adjustments, despite the possibility of calculating a shadow wage in principle.

1) Pigou, A.C.: The Economics of Welfare, London, MacMillan, 1978 (4th Edition), Part 11, Chapter IX, offers an extensive analysis of these problems.

2.6.4 Marginal Cost Pricing

As is demonstrated in the appendix below, welfare economic theory can be used to show that, if the prices of all goods are set equal to the marginal costs of their production and consumers and producers are thereafter required to choose the combinations they prefer, the welfare of the community is maximized. The logic of this 'rule' is that, if the price of a good exceeds the cost of producing the last article consumed, society benefits from its production, because the price indicates what a consumer is prepared to pay for that article and therefore indicates his evaluation of the benefit received. Conversely, if marginal cost exceeds marginal benefit, the last article should not have been produced because the consumer's benefit is less than the costs of the resources that society was required to forfeit in its production. It follows that optimal production is reached when price is equated to marginal cost; that is, unless 'distortions' are introduced into the system.

These theoretical results can be turned to a practical end in the following way. If one assumes a reasonably well functioning market mechanism and sets the price of education equal to its marginal costs, the market will see to its efficient distribution.¹⁾ What is therefore required of the planner is that he should determine what the marginal costs of the various educational 'packages' are and thereafter ensure that a sufficient supply of education is produced to satisfy the demand at that price. If demand exceeds the supply, additional facilities are called for and an excess of supply over demand indicates that too many resources are being deployed in education.

Unfortunately, of course, reality is not as simple as this

1) Danière, A.: Higher Education in the American Economy, New York, Random House, 1964, argues forcefully in support of this thesis.

model would suggest. Most of the difficulties discussed above, that complicate the other planning techniques, are equally relevant to marginal cost pricing.¹⁾ Public good qualities, research and market failure are of particular importance. It is argued above in Section 2.1 that the presence of externalities would result in less education being used than optimal for society, if decisions were left entirely in the hands of private consumers. In the case of marginal cost pricing the solution is to 'correct' the price by subsidizing education to the extent that these externalities exist. However, the problem of calculating the size of the subsidy is not easily overcome because the extent of the externalities concerned is open to dispute. Nevertheless, it may be argued that if the error occurs on the side of overproduction or underpricing of education, the 'harm' done is likely to be condoned by society.

The second peculiar difficulty of applying marginal cost pricing to education concerns the role of research. In the case of universities, where research entails considerable expense, the price of the teaching output must clearly equal the adjusted marginal cost of a university department minus the equivalent costs attributable to research. The price charged to students should not cover the costs of research, the benefits of which accrue to society as a whole. But Chapter 3 explains that, in fact, it is far from easy to apportion costs in this way.

A third impediment requiring attention is that of the market failure, which results from impoverished students being unable to raise loans for extended periods of study and the accompanying inequity caused thereby. These are important, but, it is suggested, can conceivably be overcome with a system of scholarships and loans as is discussed in Chapter 4.

1) See in particular Graaff, J. de V.: Theoretical Welfare Economics, Cambridge, University Press, 1957, Chapter X.

A fourth problem, of great importance in South Africa, is that labour market restrictions influence the prices of different categories of labour, which means that students' choices of occupation are biased. Although this bias could theoretically be neutralized by 'corrective' pricing, the size of the necessary corrections is virtually impossible to quantify.

In conclusion, it is evident that marginal cost pricing as a solution to educational planning is beset by as many problems as are the other available methods. This was to be expected, for, as demonstrated in the appendix, the rate of return or cost-benefit approach to educational planning is founded upon exactly the same theoretical basis as is marginal cost pricing. Indeed, there is no easy solution to the questions raised in the introduction to this dissertation. However, marginal cost pricing holds several advantages for the South African university dilemma that, on balance, it is submitted, tip the scales in its favour at this juncture. Firstly and most importantly, the universities are traditionally autonomous from state control and justly resent direct interference in their internal affairs. Their autonomy includes the right to admit as many students and to whichever courses they see fit, although this right is currently qualified by restrictions based upon racial distinctions. Both the manpower approach and the rate of return approach could imply infringements upon this right depending upon the methods of implementation used. State action through the provision of subsidies has, however, always been acceptable to the universities. Planning of a discrete nature via the provision of subsidies is, therefore, likely to be accepted. And there is no reason why the calculation of subsidies could not be made with reference to marginal costs.

In addition, radical breaks with tradition are best avoided when unnecessary. The current subsidy formula is based

upon the implied costs of universities, although the theoretical underpinnings do not appear to have been considered in the formula's construction.¹⁾ However, there is no reason why this could not be done. And if done, the formula would be based upon as sound a theoretical footing as empirically possible without disrupting the procedure that has grown pragmatically over approximately half a century.²⁾ The procedure of basing the price of education upon its marginal cost has deficiencies, but no more so than the other possible procedures. If these are not forgotten and adjustments are made as far as possible to accommodate them, it is submitted that the additional advantages gained justify the use of marginal cost pricing as an important point of departure for revision of the financing formula. If further adjustments are made for the sake of equity, income distributions or whatever, their explicit incorporation is to be advocated.

-
- 1) Main Report of the Commission of Enquiry into Universities, (The van Wyk de Vries Report), Pretoria, Government Printer RP25/1974, Chapter IX, makes no reference to this point.
 - 2) Cf. Louw, J.B.Z.: Owerheidsbeleid en -Administrasie van Universiteite in Suid-Afrika, D.Phil. thesis, University of Pretoria, 1978.

2.7 Appendix : Principles of Resource Allocation¹⁾

A simplified economic model could be based on the following assumptions. Assume a world consisting of two consumers, each with ordinal preference functions, who consume two products that are in turn produced by two factors of production. Both factors and products are homogeneous and perfectly divisible; both preference and production functions are of smooth curvature and display what have, in economic theory, come to be regarded as 'normal' properties. 'Diminishing returns' prevail but there are constant returns to scale. In the maximization process the Pareto criterion is employed to determine optimum positions: a position is considered to be optimal if a participant can only be advantaged via the redistribution of either products or factors to the detriment of one of the other parties.

If the production functions of the model are illustrated with isoproduct curves and a fixed quantity of factor inputs is assumed, Pareto optimal positions are reached when the isoproduct curves of the two producers are tangent to one another. This result follows because at such points it is no longer possible to reallocate resources to raise one producer to a higher isoproduct curve without simultaneously having to move the other producer to one of his lower curves. Tangency implies equality of the marginal rates of technical substitution in the two producing firms and may be regarded as the first 'rule' in the optimization process.

Similarly, it can be demonstrated that the Pareto optimal allocation of goods between the two consumers is characterized by tangency between the indifference curves of the two participants, implying thereby equality of their marginal

1) This subject is covered by a wealth of material. See for example: Graaff, J de V.: Op. Cit., and Little, I.M.D.: A Critique of Welfare Economics, Oxford University Press, 1957.

rates of subjective substitution. This gives a second 'rule' for the efficient allocation of resources, although efficiency is itself qualified by several important tacit assumptions. For example it is well known that the Pareto criterion is biased in favour of the current distribution of wealth in society, a factor that may be of considerable importance. But possibly of greater significance is the unstated assumption that the individual knows his own interest best, which, particularly in the case of education, may be questioned on the grounds of myopia.

Besides the two conditions outlined above, a third 'rule' is required for the necessary conditions for the 'correct' allocation of resources to be established. This additional rule states that equality must prevail between the equalized marginal rates of subjective substitution and the marginal rates of transformation in the economy. If this does not hold, some factors of production may be reallocated to the production of that product that is valued relatively more highly, thereby making it possible to increase one of the consumers' welfare without that increase being at the expense of any other person.

In summary then, overall Pareto-type efficiency is achieved if equality exists between the marginal rates of substitution in consumption, the marginal rates of technical substitution in production and between the marginal rates of substitution and transformation. These conditions hold in general as between outputs, inputs, and outputs and inputs together. There is, however, nothing unique about the efficient solution thus achieved, for each initial distribution of wealth between the various participants will result in different, although equally Pareto efficient, configurations. The choice of a 'unique best' solution rests with some omniscient being capable of discerning and applying a social welfare function.

An interesting corollary of the Pareto conditions is that, if consumers are free to maximize their own utilities and producers their profits and the prices prevalent in the economy hold for all without exception, the Pareto conditions are automatically fulfilled. This follows because individuals equate their marginal rates of substitution to the relevant ratio of prices under a freely and perfectly competitive system. Taking the logic one step further brings additional insights: it can be deduced that, if prices are set to equal marginal costs throughout the economy, the Pareto conditions will again be satisfied.

As proof consider the following example, in which P denotes price, G denotes the product and F the only factor used in its production. Delta, or a small difference in some magnitude, is written as d . Equality between the ratio of prices and the marginal rate of transformation appears then as $P_g/P_f = dF/dG$; which, as has been noted, is the condition for Pareto optimality in perfect markets. Consequently $P_g = P_f (dF/dG)$. That is to say, the price of the product equals its marginal cost in terms of the factor of production.¹⁾

Further manipulation leads easily to another standard result. Allow for a temporal dimension in the example above, where the subscripts 1 and 2 denote consecutive years. Investment in the production factor in year 1 generates product G in year 2. Now the marginal cost rule requires that

$P_g = P_f (dF/dG)$, but P_g and P_f occur in different years and are therefore not comparable. Because of the accrual of interest, (r) over time

$P_{g1} = P_{g2} / 1 + r$. Accordingly the rule states that

$P_{g2}/1+r = P_{f1} (dF/dG)$ and further manipulation gives

$\frac{P_{g2} \cdot dG}{1+r} - P_{f1} \cdot dF = 0$. The latter expression says that the

1) Cf. Millward, R.: Public Expenditure Economics, London, McGraw-Hill, 1971, p.38, et seq.

present value of additional goods, produced in the future by a project, minus the present value of the additional costs incurred thereby, that is, the marginal net discounted present value, should be zero. Because of the assumption of decreasing returns (and therefore increasing costs), it implies that if the value of the left hand side is positive, the project should be expanded by increasing investment. The intuitive explanation is that the benefits of the project must exceed costs.

CHAPTER 3

THE UNIVERSITY AS A PRODUCING UNIT3.1 Introduction

For some purposes universities, and for that matter any educational institution, may be regarded as producing units.¹⁾ Inputs are used - lecturers' salaries, students' time, buildings, etc. - and (after a period of time) output is produced in the form of 'educated' youths. Degrees certify that the final products are of a minimum standard.

The purpose of this chapter is to describe the relationships that exist between inputs and outputs in universities. Such a relationship is referred to as a production function, and may be presented as a curve or as an equation that describes the maximum output technically obtainable from the given inputs. Despite the physical nature of the relationship described in this way, prices are required to aggregate both factors of production and final products.²⁾ Prices are also required to equate what is technically feasible with what is economically desirable.

Production functions may in principle be specified for individual producing units, for industries and for the economy as a whole.³⁾ Knowledge of these relationships is of prime

-
- 1) That is not to deny the other issues involved. S.E.Harris once remarked: "From the beginning it seemed best not to have too many economists in this seminar,.... It is helpful to have non-economists around in meetings of this kind to restrain the economists who might forget that though the limitations of resources is very important, educational values are the major issues." 'Notes', Review of Economics and Statistics (Supplement), XLII, August, 1960, p. 3.
 - 2) Melck, A.P.: "A Note on the Use of 'Productivity' in Economics", Studies in Economics and Econometrics, June 1979.
 - 3) Cf. the Cobb-Douglas production function discussed above in Section 2.6.1.

importance to the planner, who with their aid will be able to determine the relationship of costs to outputs, the efficiency of input use, returns to scale, productivity and other equally important properties of the process. The difficulty lies, of course, in the specification of the functions, which in the case of education is compounded by science's inability to measure satisfactorily either the inputs used or the outputs generated.¹⁾

3.2 Measuring Inputs

In education, as in other service industries, it is often not possible to measure either inputs or outputs in physical units as is required by the production function concept and, therefore, the use of various proxy measures becomes obligatory. In addition these proxies must be aggregated, unless the specification of a very simple production function relating only one of the inputs to outputs, the others being held constant, is attempted. Accordingly, whatever measures are used should also be capable of expressing inputs in value terms.

The first of ~~the inputs in the university process~~ is that provided by academic staff - physical labour, as indicated by the hours worked, and combined knowledge and experience. The latter is, in contrast to the labour component, in the form of human capital.²⁾ Various suggestions have been made as to how staff inputs can best be measured. One of these is that the time spent on each activity is a suitable proxy, but this unfortunately allows the deduction that he who, for example, prepares a lecture in two hours has con-

-
- 1) For an example of the use of econometrics in the specification of educational production functions, see: Verry, D. & Davies, B., University Costs and Outputs, Amsterdam, Elsevier, 1976; also Garvin, D.A.: The Economics of University Behaviour, New York, Academic Press, 1980.
 - 2) Because of the institution of tenure the costs of academic staff may be regarded as quasi fixed costs.

tributed more inputs to the process than he who has spent only one hour. This may clearly be an absurd conclusion, implying that, besides the truly physical element of labour present in hours worked, measurement of inputs by means of the time spent on different activities is possible because all staff members have equal intellectual capabilities - an assumption that is avoided by the use of the total academic staff wage bill in calculating an aggregate input. Nevertheless, it is often resorted to once attempts are made to apportion inputs and costs to particular categories of outputs.

The second procedure is that of using wages. The assumption upon which it rests is that variations in salaries accurately reflect the marginal social opportunity costs and the value of marginal production for each category of academic labour. If a freely competitive market for academics exists, the assumption will in all likelihood prove to be a reasonable one. But under conditions where across-the-board institutional setting of wages or where wage collusion amongst universities creates 'monopolistic' forces, it will not be reasonable to presume that wages measure anything except 'what is politically expedient at that moment to pay'.¹⁾ It may be argued in addition that even in the case of competitive markets, academic wages probably reflect past accom-

-
- 1) Archibald, G.C.: 'On the Measurement of Inputs and Outputs in Higher Education' in Lumsden, K.G.: Efficiency in Universities, Amsterdam, Elsevier, 1974, p. 124. Competitive wage formation will, of course, result in wage differentiation. As Blaug points out, though, in capitalist systems wage differentials primarily reflect relative scarcities and not the inherent worth of different academic disciplines. Blaug, M.: An Introduction to the Economics of Education, Middlesex, Penguin, 1970, p. 274. Archibald argues that the market plays an important role in determining the hourly wage rate, even when wages are set institutionally. If the price for commissioned research, consulting or other extra-mural work is high, relatively less time will be spent on university work and consequently the wage calculated per hour worked will rise. Op. Cit., p. 125.

plishments more truly than present inputs. Despite these shortcomings, no superior proposal has as yet been advocated and therefore the measure is often used. But to be of use in research and planning, the measure must generate an estimate of the value of academic time. This is made by dividing the appropriate salary by the total number of hours. However, for this to be interpreted as an hourly shadow wage rate for a particular category, the strong assumption that the marginal and average values are equal, is required. Practical difficulty may also be experienced in deciding whether summer vacation hours and extra incomes earned from commissioned research should be included in the calculations. Bear¹⁾ argues that summer hours, but not extra salaries, should be included on the assumption that most faculty members would have engaged in research over this period, whether or not they had received extra remuneration.

The second major input is that of student time, which because of its being unpriced, is all too easily overlooked. In Section 2.4 mention has been made of the important opportunity costs involved because of forgone incomes. Measurement of student time as an input should ideally distinguish between various uses of that time, for example, as between lectures, tutorials and independent study. Again, however, the difficulties encountered with aggregation enforce the use of income, that is income forgone, as a substitute for physical measures. For a university student the relevant magnitude will be indicated by the income earnable on the completion of secondary schooling. Similar assumptions apply to the use of income in this case as applied to its use in approximating staff inputs.

As has been pointed out with respect to inputs by lecturers, students entering universities bring with them a certain quantity of human capital which forms an intermediate input

1) Bear, D.V.T.: 'The University as a Multi-Product Firm', in Lumsden, K.G., Op. Cit., p. 99.

and which must be distinguished from their physical labour inputs. It therefore becomes necessary to distinguish between a human capital input and a human capital output and the difference between the two - the value added by the university - is what is of importance for the calculation of output and productivity.

Conceptually the stock of human capital embodied in a student can be measured by capitalizing the future stream of earnings arising from that capital. Unfortunately, however, no better way of achieving that than by using average wage rates exists and, as has been discussed in Section 2.6.3, market imperfections and aggregation make this a very blunt instrument. Accordingly, various attempts have been made to measure this form of input more directly.¹⁾ For example, measurement of school academic achievements in an 'objective' way has been attempted by devising suitable tests to supplement and check school leaving examinations. The complexities of educational production are, however, so vast that even intricate output measures including "... standardized test scores, juvenile delinquency rates, post-school income streams, occupational choice and the level of education completed..."²⁾ have not been able to capture the entire output. In one paper³⁾ it was concluded that: "There is a considerable part of teaching that cannot be explained by a set of fairly standard variables measuring teachers and classrooms." In addition, the more generalized any such scheme of appraisal becomes, the closer it will approximate

-
- 1) Vide for example: Attiyeh, R. and Lumsden, K.G.: 'University Students' Initial Understanding of Economics: The Contribution of the A level Economics Course and of other Factors'. Economica, XXXVIII, February 1971, pp. 81-97; Hanushek, E., 'Teacher Characteristics and Gains in Student Achievement: Estimation using Micro Data', American Economic Review, LXI, 2, May 1971, pp. 280 - 288; and Schultz, T.: 'Resources for Higher Education: An Economist's View', Journal of Political Economy, May/June 1968, pp. 327-347.
 - 2) Hanushek, E.: Op. Cit., p. 280.
 - 3) Ibid.

the existing national schoolleaving examinations, which, although deficient in many respects, seem unlikely to be surpassed on a general scale in the near future. In as far as individual universities may be interested in tests of this nature for the purpose of setting entrance requirements, the more profitable avenue for exploration would appear to be the determination of correlation statistics between school examination results in particular subjects and university achievements.

Another labour input in universities is that provided by the ancillary staff, both in individual academic departments and by the central or faculty administration and library. As with the other labour inputs the feasible measures are time spent on wages. Severe difficulties are experienced when trying to apportion the costs arising from these sources to various activities, because of the jointness of these (and other) inputs, as will be analysed in greater detail in Section 3.4.3.

All universities, even those that use correspondence teaching, require considerable physical inputs. These range from the conceptionally trivial such as the provision of meals to others that are conceptually difficult to handle. The latter category includes a university's capital facilities. Obviously in this case, in contrast to some of the inputs already discussed, measurement in physical units is possible. Therefore, one may be tempted to imagine that specification of the way that physical plant enters the production function is easily achieved. Nevertheless, this is not so. Besides the difficulty of relating inputs to outputs, which is discussed in Section 3.4.3 below, the very diversity of capital facilities makes aggregation imperative and complicated. This is not to deny the possibility or the importance of specification in physical terms by, for instance, determining the square footage of space and the dimensions and quality of desks and seating required for an adequate performance of a university's diverse functions.

This has, indeed, been done effectively by the Department of National Education as will be shown in Section 5.3.1.9. What remains difficult is to conceive of a way of valuing these inputs so that cost functions describe the real or opportunity costs to society of the university's use of those resources. How are capital goods of different vintages, for example, to be compared and aggregated? Controversy has raged amongst economic theorists on this issue, although the niceties of the academic debate need not be discussed here. It is, however, clear that current accounting practices, those of depreciation or interest and redemption payments, need not reflect social opportunity costs.

In the case of capital assets owned by the university, a sum must be imputed for opportunity costs. The theoretically most satisfactory method is the calculation of an annual equivalent capital cost¹⁾ which is determined so that the sum of the present values of the annuity over the lifetime of the asset equals the replacement cost. The question is if, say, in practice interest and redemption charges can justifiably be used as the measure where capital has been loaned to finance construction. If it is assumed that university buildings can be converted so as to be usable for, say, office space, opportunity costs are involved. If the buildings are entirely unsuitable for other than university use, no opportunity costs are involved, even though accounting costs in the form of interest and redemption payments exist.²⁾ Because in general buildings and ground used by

-
- 1) Millward, R.: Public Expenditure Economics, London, McGraw-Hill, 1971, p. 214.
 - 2) This statement requires qualification, for within the university itself opportunity costs are almost invariably present. A laboratory used by one science department implies that a second similar science department cannot use the same laboratory. As superfluous facilities do not generally exist, opportunity costs do. Cf. Section 3.4.4 below.

universities can be converted without exorbitant expense, opportunity costs exist approximately equal to the rent payable if the building were let to other users. If the property market functions relatively freely, this rent will tend to equal the interest and redemption charges on building loans, because if rents are higher than interest and redemption charges, new buildings will be built with the result that rents will fall, and if interest and redemption payments are higher than rents, no new buildings will be built and rents will rise.

The 'problem' is that in many cases the asset has not reached the end of its life at the point when the loan has been fully redeemed and that the annuity has, by way of saying, been cramped into a shorter period than actually required. In which case the repayments will have been larger than the annual opportunity costs and after the loan has been repaid the use of the asset will erroneously appear to be free. Now will this, in fact, make an appreciable difference? With respect to the size of the redemption payments, the answer is that it will probably not do so, for if repayments are made over a relatively long period, it can be shown that the sum of interest and redemption tends to depend upon the magnitude of the interest component alone.¹⁾ But insofar as such a situation could tempt planners to regard the use of 'paid off' buildings as free, resources will be inefficiently used, to prevent which an imputed rent should be calculated. Nevertheless, in the South African context where the major university building programmes have been undertaken in the relatively recent past, the problem is unlikely to be excessive.

3.3 Measuring Outputs²⁾

Many of the problems encountered with the measurement of

1) Millward, R.: Op. Cit., p. 199.

2) Cf. Verry, D. and Davies, B.: Op. Cit., p. 9, et seq., also Wagner, L.: 'The Measurement of Output', in The Open University: The Internal Efficiency of Education Institutions, Milton Keynes, The Open University Press, 1977.

inputs apply mutatis mutandis to the measuring of outputs. Nevertheless there are important additional issues that require analysis.

University outputs may broadly be divided into the categories of instruction, research and community service, of which the first two are naturally of overriding importance. Although as will be analysed in detail below, the production of one of these outputs normally implies the automatic production of one of the others because of the characteristic of 'jointness' in the production function, it is convenient to begin by describing the nature of each output separately.

3.3.1 Instruction

The instructional or teaching output of a university may be seen for analytical purposes from various perspectives.¹⁾ For example a student may enrol for a particular course because he anticipates consumption benefits from that education to arise over a long future period of time, in which case the instructional output may be regarded as a consumer durable. Alternatively, the student in his capacity as consumer may regard his period of study as one providing current consumption benefits, in which case the teaching output would be classified accordingly. However, as is well known, education may be regarded as an investment, which makes the output a producer good. And in addition education is a source of externalities, which in a certain sense may be looked upon as biproducts in the production process.²⁾ Now, the exact mixture of these aspects of any one university course depends upon the subjects chosen. For example in a young country in which there is but a small

1) Cf.: Section 2.3 above.

2) Archibald, G.C.: Op. Cit., p. 115.

demand for the professional services of art historians, the study of the history of art is likely to be viewed more as a consumption activity than that of, say engineering. Because of these diversities lucid analyses demand the greatest possible disaggregation.

In opposition to the views just sketched, it has been argued that in many cases universities produce no final output as such, but that their function is either to screen applicants for competitive jobs or to produce an intermediate product in the form of 'trainability' which in turn becomes an input in on the job training.¹⁾ However, these dissident views have not succeeded in ousting the established orthodoxy, despite the fact that no clarity exists as to how outputs are to be measured and, where there is joint production, what system of weights should be used in aggregation.²⁾

In principle output should be calculated as a net amount, that is, the value added must be determined. As the analysis of Section 3.2 has shown, no operational method of achieving that has as yet been proposed, other than either that of calculating the human capital before and after university training by capitalizing earnable incomes, or by administering tests before and after the process.³⁾ The difficul-

- 1) Vide Section 2.3 and also Archibald, G.C.: Op.Cit., p.117.
- 2) Berls, R.H. in a survey of productivity studies in education concludes pessimistically that "... the experience of college does not exert a profound influence on most students." (p.229). He notes that research suggests that variation in final year student achievements, i.e. university output, is dependent more upon the characteristics of students that they had before entering the university, than upon those of the university itself. Berls, R.H.: 'An Exploration of the Determinants of Effectiveness in Higher Education', in : Joint Economic Committee, Congress of the United States : The Economics and Financing of Higher Education in the United States, Washington, D C , U S Government Printing Office, 1969.
- 3) Vide Attiyek, R.E., Bach, G.L. and Lumsden, K.G.: 'The Efficiency of Programmed Learning in Teaching Economics : The Results of a Nationwide Experiment', American Economic Review, LIX, 2, May 1969, pp. 217-223, as also note 1) on page 47.

ties encountered through market imperfections have been described. What remains to be pointed out is that, although the application of tests at school level is feasible, at levels of higher education the setting of objective standards across universities is unlikely to be so. Besides the diversity of university degree curricula, the variation in subject matter encountered in courses having the same titles does not allow the development of such tests without serious infringement upon university academic autonomy.

One may well inquire whether the way out of the dilemma is not the use of a university's internal examination system to judge output by using the marks achieved in subjects or the class of degree awarded as measure. However, the differences in standards set by departments within one university, let alone between universities, complicate the use of such a measure, even for the internal allocations of funds. Consider for instance the case where departments are granted teaching staff on the grounds of output measured in this way. The temptation to lower standards could arise on the short term at least, even if the 'cheapening' of degrees leads to a fall in demand on the long term. A partial solution is offered by the careful use of external examiners, who although unable to achieve uniform standards, can prevent their deterioration. The system can though, if used without care, be deceptive, as when examinations are set by those teaching the particular course, the external examiner merely checking the answers, and students are coached to answer only these seemingly difficult questions. Nevertheless, an output measure based upon pass rates that are carefully monitored by external examiners is, despite imperfections, likely to remain the best approximation available. Although the outputs measured in this way would be gross outputs and not net outputs, it could justifiably be argued to be an improvement upon the oft used technique of using inputs as proxies for outputs.

A debatable suggestion to help solve the impasse is that the determination of value added is essentially unimportant and that what is required is the monitoring of output. It is argued that the latter is what is of economic importance and that, therefore, a university that can train the most successful candidates for, say, the chartered accountant examinations, should be allocated the greater share of resources. The fact that the university may have had the best students to begin with should be counted in its favour because of its ability to attract the better material; so the argument runs. If value added is used as basis for resource allocation, this aspect is ignored. Now, however attractive these thoughts may be, they do ignore some important issues. Firstly the idea is based upon the assumption that elitism in education is a good thing, whereas many would argue that the provision of universal education is the most satisfactory method of achieving egalitarianism. Secondly, it is a non sequitur to argue that because an institution has attracted the best students, it should be allocated proportionately more funds. If one of its inputs is better than average, efficiency would suggest that less of the other inputs is required. Good students require less tuition and therefore, although of course a greater number requires a larger total subsidy, the average sum required per student could well be less.¹⁾

The difficulties encountered when attempting to measure value added has led to the use of student numbers as a measure of university output. For example, the number of students in attendance annually is often used as basis for state funding, on the grounds that a university requires resources in relation to its 'output' of students.²⁾ As has already been

-
- 1) This applies to teaching. It may well be, however, that the more gifted students require better research equipment than the less gifted do.
 - 2) This is the rationale of the van Wyk de Vries subsidy formula, for example.

stressed, students' time (their annual attendance) is one of the major inputs and not an output of the system. This practice therefore reduces to measuring outputs by inputs and can consequently be deceptive. Normally, in other activities, the allocation of inputs is based upon the outputs generated in such a way that he, who uses the least resources to produce a given output, is entrusted with the greater use of those resources. However, in this case the university making the most liberal or extravagant use of a particular resource (students' time) is granted the greater share in the other inputs as well. The fact that, notwithstanding these reservations, the measure is widely used, emphasizes the extremely complicated nature of educational output and its measurement.

Variations on the use of student numbers have been advocated, of which the most widely used are the full-time equivalent (FTE) student measure and the student-credit hour measure. Both are rationalizations of the diversity in teaching methods and teaching time found in different university faculties. Halstead defines a 'full-time equivalent student' as "... a uniform unit of measurement that represents the normal academic load (work schedule) carried by one full-time student ... during a normal academic year."¹⁾ A student-credit hour he defines as "... one student receiving instruction for a period of time for which one hour of credit is granted. The total student-credit hours for a course is determined by multiplying the credit-hour value of the course by the number of students registered in that course."²⁾ As such the student-credit hour measure is a useful indication of the volume of teaching being undertaken in particular subjects.

1) Halstead, J.K.: Statewide Planning in Higher Education; Washington DC, US Government Printing Office, 1974, p. 669.

2) Ibid.

Besides the conceptual error of using an input as proxy for an output, an additional difficulty is encountered when student numbers form the basis for subsidies payable to universities. A distortion of incentives occurs in the sense that a greater total subsidy is procured by the university's expanding the intake of students, and whether the latter is desirable will depend upon the circumstances. It may be desirable if appreciable economies of scale exist, but it may equally lead to competition among universities for students and lowered entrance requirements. A comprehensive analysis of these issues is to be found in Chapter 5.

An issue related to the measurement of instructional output is the determination of the quality of the output, because if increases in quality are not accounted for, estimates of the quantity produced must be downwardly biased. This is because increased product quality will normally imply greater use of resources, which could have been used to produce more of the older, inferior output. This aspect is usually incorporated into economic analysis by inspection of the price differential existing between the original and the improved products, and by attributing the higher price of the latter to better quality. In the case of education, however, even this undoubtedly crude procedure is likely to falter for the want of suitable prices. None exists with which to differentiate between subjects, universities, year levels or postgraduate and undergraduate teaching. The procedure usually adopted is to devise a system of weights that will take quality into consideration, albeit defectively. But the choice of weights must usually be based upon cost data on the assumption that costs and quality are reasonably correlated. Because this procedure does not include both supply and demand factors as in the more normal case of using prices, some accuracy may be forfeited. Nevertheless, the measure sometimes adopted, of considering a postgraduate student as being equal to two or three FTE undergraduate students, presents a practical solution for an otherwise

insoluble problem.¹⁾

3.3.2 Research

The second major output of a university is research, which may be defined as the addition to the stock of human knowledge. It is generally conceded that, in fact, the feature which distinguishes a university from any other educational institution is the research output of its faculty members, without which teachers cannot lay claim to being in constant touch with the frontiers of their subject. Indeed, the teaching of postgraduate students of necessity entails supervised research in some or other form. It is, therefore, apparent that any measure of a university's output must include this essential element, as before and if possible in both physical and value terms.

Now unfortunately, this is far from easily accomplished. The very nature of research suggests that this should be the case, for knowledge is a public good par excellence. The use of knowledge cannot normally be regulated by the exclusion principle (except where patent rights have been awarded) and the marginal cost of an additional user is zero, for his use of the knowledge does not deprive anyone else of doing likewise.²⁾ Also, in only limited cases does a market exist for university generated research in the sense that knowledge is bought and sold. Although commissioned research could conceivably play a more significant role than it does at present (in which case the commissioning body could decide whether or not to publish), most university research is printed in scientific journals and consequently

1) For example O'Neill, J.: Resource Use in Higher Education. Trends in Output and Inputs, 1930 to 1967, New York, Carnegie Commission on Higher Education, 1971. This procedure has also been adopted by the van Wyk de Vries formula which normally regards honours students as two and Masters and Doctoral students as three FTE students.

2) Cf. Section 2.2 above.

immediately becomes 'public'.

The essentially unquantifiable nature of research derives from the public properties just noted. Despite this, one must, as with the other inputs and outputs already described, attempt to develop a suitable proxy so that an indication of the magnitudes involved, however rough these may be, may be had. The first of these proxies is the use of inputs, which when transposed into value terms, implies that the sum of costs spent upon a particular research project are taken to approximate reasonably accurately the value of the research. As research is an output, such a methodology assumes that on average benefits equal costs in research; that is, if it may safely be assumed that the results of all research, including say, that on atomic weapons, are beneficial. A simple procedure based upon these assumptions, has been suggested for the analysis of university inputs and outputs. As by definition or assumption benefits equal costs in research, research output may safely be accounted for by ignoring the benefits whilst subtracting the costs from total inputs and concentrating further upon the other outputs alone. Indeed, this procedure has been followed in several authoritative studies.¹⁾ Now, besides the fact that analysis, that is based upon these arguments, precludes the use of any form of cost effectiveness technique and therefore pari passu loses much of its value, if the arguments are accepted in the case of research, they cannot logically be excluded with respect to the other educational outputs.

-
- 1) For example: Woodhall, M. and Blaug, M.: 'Productivity Trends in British University Education, 1938-1962'; in Minerva, II, 4, Summer pp. 483-498; and O'Neill, J.: Resource Use in Higher Education - Trends in Outputs and Inputs, 1930-1967, New York, Carnegie Commission on Higher Education Report, 1971. Both these publications are cited in Very, D. and Davies, B.: Op. Cit., p. 18.

The logic applies a fortiori to teaching, for which, as we have seen, the specification of an output measure is equally arduous. But of course this cannot be done. Therefore nothing but a spurious solution has been offered, for the exclusion of both teaching and research on these grounds leaves the analyst with next to nothing to analyse. It must, consequently, be deduced that the argument is flawed. Alternatively it must be concluded that the powerful assumption by which the problematique has been reduced, when taken through to its logical conclusion, has hacked its way so successfully through the Gordian knot that what remains has become trivial. The assumption that benefits equal costs in research is, therefore, not merely simplifying but restrictive and must be discarded as inadequate.

A related facet, that cannot be overlooked, is that even if inadequate data necessitates the use of costs as an output measure, the problem remains of deciding how costs should be divided between the various outputs, or in fact, whether any satisfactory division can be made at all if the production function displays joint production properties. However, this problem is analysed in Section 3.4.3 below.

The major alternative to using cost data is to quantify the physical output of research, the most tangible form of which is the number of words, pages, articles and books published. Despite shortcomings this method has been successfully used in a number of studies.¹⁾ The shortcomings include the omission of research that is not published, as

1) Vide: Arrow, K.J.: 'Classificatory Notes on the Production and Transmission of Technical Knowledge', *American Economic Review*, LIX, 2, May 1969, pp. 29-35; Hansen, W.L., and Weisbrod, B., 'Toward a General Theory of Awards, or Do Economists Need a Hall of Fame?', *Journal of Political Economy*, 80, 2, March/April 1972, pp. 422-431; and Lovell, M.C.: 'The Production of Economic Literature: An Interpretation', *Journal of Economic Literature*, XI, 1, March 1973, pp.27-55.

may occur with some kinds of commissioned research but also with papers delivered at conferences and seminars and research which goes towards higher degrees, and the inclusion of some material which is not true research. The latter category includes text books and reviews. There may also be a measure of duplication in so far as the results of research may be published simultaneously in both a journal and a book. Nevertheless this method does generate an indication of the volume of research being undertaken, although as already implied the emphasis falls very heavily upon work that is published, in the belief that to be truly of use, knowledge must be disseminated.

Page counting cannot, however, produce any indication of the quality of the research being undertaken. Efforts to incorporate a measure of this aspect have centred upon an adaptation of the former method, namely that the footnotes and bibliographies of published works are scrutinized to ascertain who, in the opinions of authors in general, are considered to be producing the most valuable contributions to any particular science. It is assumed that in so doing the combined opinion of the scholars in a particular field can be aggregated by assessing the frequencies with which they quote or refer to the publications of their colleagues. Although, inevitably by no means a perfect measure, the citations approach may justifiably lay claim to being the most successful available, as has been demonstrated in a number of studies.¹⁾

The imperfections of the method include those arising from

-
- 1) In addition to those mentioned in the previous foot-note, see: Cole, S. and Cole, J.R.: 'Scientific Output and Recognition: A study in the Operation of the Reward System in Science', American Sociological Review, June 1967, 32(3), pp. 377-390; MacRae, D.J.: 'Growth and Decay Curves in Scientific Citation', American Sociological Review, October 1969, 34(5), pp. 631-635.

biased citations, for example when an author wishes to win the favour of a colleague, air his own achievements through self citations, destroy the arguments of an academic adversary and so forth. It also appears that citations tend to favour work published in the same journal and that authors tend to favour the journals attached to the institutions from which they graduated.¹⁾ Of greater significance may be the fact that an author (or university department) may accumulate many citations by publishing a great number of relatively trivial articles, each of which is cited, say, only once, whereas another may publish less, but because of the fundamental nature of each contribution is cited many times over. In such a case a citation index could well rank the two authors equally, despite the appreciable and intrinsic disparity involved. A related bias inherent to the method derives from the extreme contemporaneity of most sciences. Citations in the natural sciences in particular tend to be to very recent publications²⁾ with even seminal articles not cited or at best mentioned in the text without references. Accordingly, the use of the citations method for assessing the output of an academic department over a number of years may introduce a pronounced bias against, say, physics in favour of history, to take two departments at random.

The practical task of enumerating citations has been alleviated in most disciplines by the development of citations indices.³⁾ These, however good they may be, almost invariably still contain certain built-in limitations. Except where a field is small and narrowly confined so that all publications of merit may be sought in a relatively small number of journals, some selection of journals to be included

1) Lovell, M.C.: Op. Cit., p. 44.

2) Vide MacRae, D.J.: passim.

3) The most comprehensive are the citation indices compiled by the Institute for Scientific Information (I S I) in Philadelphia, Pennsylvania.

in the index must be made. Again, within any particular index itself, journals of differing academic standing are included and it, therefore, becomes necessary to devise some measure for differentiating between the more and the less prestigious publications. The use of weights according to journal presents a practical solution.

One suggestion is that an 'impact factor' should be calculated for each relevant journal. This impact factor would be based upon the number of citations made to articles in a specific journal within a certain period of time as indication of the research community's evaluation of the work published in that journal. To account for the different numbers of articles published annually by different journals, the impact factor would have to be an average citation rate per article. Accordingly, the impact factor could be defined as "... the number of times articles published (by a specific journal) during the preceding two years were cited during the current year, divided by the total number of articles published (by the same journal) during the preceding two years."¹⁾ Research output would, accordingly, be measured by determining the number of articles published by the staff of a particular institution and weighting each article by the impact factors of the journal in which it had been published. Although the impact factor concept holds much promise, its evaluation of the most prestigious journals having long waiting lists of would-be contributors could be biased, because the suggested two year period could be too short to account for the publication delay, plus allowing time for response in the form of citations.²⁾

As was the case with the other university outputs, a physical specification of the quantity and quality of research rarely

-
- 1) Reynhardt, E.C.: Citation Analysis as a Tool of Research Evaluation, Pretoria, Department of National Education, 1982, p. 6.
 - 2) This insight is attributable to Prof. H.A. Steyn.

suffices: a procedure for valuing the output economically is desirable. Several possibilities may be considered, none of which however presents both a theoretically satisfactory and practicable solution. Because of the public good qualities of research, one is faced with the traditional problem of establishing a price under conditions where consumers are not prepared to reveal their preferences for that good, as they cannot be excluded from its consumption even when they do not. As was demonstrated in Section 2.2 above, the theoretical solution in determining how the public good should be supplied, is to inspect the sum of the benefits conferred by that good upon all its separate consumers. As this is, however, not practically possible and cannot, therefore, generate usable prices, other suggestions have been made for the calculation of shadow prices, that is, constructed prices which approximate or equal the ideal prices that would have been 'ground out' by a perfectly functioning market. For example, the salaries of the researchers divided by the number of pages produced annually, or the total of subscriptions to a journal divided by its number of pages, or the sum of the research grant divided by the number of pages have been suggested.¹⁾ Intuitively, however, one feels that a price that comes into existence ex post, almost by chance, as it were, cannot be satisfactory and indeed none of these procedures can be justified by the theoretical principles outlined above.

An idea has been submitted by Archibald as "... a crude method of estimating what universities are presently paying for research",²⁾ although the author readily concedes that there is no way of valuing the stock of knowledge effectively. He suggests that use be made of the hierarchial structure of academic institutions that can be found in most

-
- 1) Very, D. and Davies, B.: Op. Cit., p. 20 and Bear, D.V.T., Op. Cit., p. 96.
 - 2) Archibald, G.C.: Op. Cit., p. 120.

societies. At the bottom of the ladder of tertiary educational institutions are the colleges whose sole function is that of teaching and in which no research is undertaken. At the top are the prestigious universities where great emphasis is placed upon research. Archibald's method is to assume that the salary paid to the average faculty member in the teaching orientated institution is intended entirely for his teaching services and may, therefore, be used to estimate what fraction of other academic salaries is implicitly being paid for research. Because in the research orientated university faculty members have lighter teaching loads, the 'full teaching salary' (the equivalent of that paid in the colleges) is diminished to the relevant degree. For example, if the teaching load is half as heavy per faculty member, half the 'full teaching salary' is attributed to that faculty member and the difference between this calculated amount and his actual salary is imputed to research as the implied costs of the research undertaken. A variation upon this suggestion is sometimes put to practical use. University staff members could be requested to estimate the percentage of their time they devote to their respective activities and total costs divided in accordance with those estimates. The implications of this procedure for the 'joint production' phenomenon are discussed below in Section 3.4.3.

3.3.3 Other Outputs

Teaching and research are the major outputs of universities. As was, however, apparent from the analysis of Sections 2.2 and 2.3, other important factors are also involved. In particular, education generates externalities, although their exact scope and magnitude are subject to debate. In addition the consumption or entertainment benefits derived

from education may be important.¹⁾

These two categories often defy quantification either as such or with the aid of proxies and, therefore, any calculations made of the outputs of a university must be deficient in this respect. Figures derived by the variety of means suggested in the previous sections consequently need careful interpretation. Judgement is necessary to make the adjustments required by the explicit exclusion of these factors from the arithmetic.

As was described above in Section 2.5, the convention of indicating the total amount of education 'produced' in a country by the sum of expenditures on education in the national accounts is well established. On the basis of such figures, international comparisons between the 'educational efforts' of various countries are often made, usually by presenting total expenditure on education as a percentage of national income or gross national product. In the light of the analysis of Section 3.3 it becomes unnecessary to comment on the inadequacy of this procedure. In addition, it is as well to remember that such comparisons can never indicate whether a particular country is producing its optimal amount of education. The fact that some other country may be spending a greater proportion of its national income on education can only show that a similar effort is possible; it can never, however, demonstrate that it is desirable. The procedures for and difficulties with the determination of the optimal amount have been analysed above in Section 2.6.

-
- 1) Practical analysis may, of course, require greater differentiation than made here. Compare, for example, South African Post-Secondary Education (SAPSE): Programme Classification Structure Manual, Pretoria, Report SAPSE-002, Department of National Education, First Edition, 1982. Kershaw, J.A. and Mood, A.M. believe that six outputs should be distinguished, namely, the classification of youths, occupational training, research, organization of knowledge, general education and services. 'Resource Allocation in Higher Education', American Economic Review, May 1970, 60, pp. 341-346.

3.4 The Educational Production Function

3.4.1 Estimating the Production Function

In Section 3.1 above the significance of the educational production function was outlined. It was pointed out that the essence of a production function is that it relates inputs to outputs in such a way as to describe the efficient possibilities of combining the former to give the latter. To that end the preceding two sections were devoted to exploring just what is implied by inputs and outputs in the higher education field. It is the task of this section to formalize the ways in which these two may be related.

An educational production function may be written as follows:¹⁾

$$A = f (X_1 \dots\dots, X_n)$$

where A measures the educational output, (assumed to have been suitably aggregated) and $X_1 \dots, X_n$ represent the different inputs in the educational process.

As written above, the production function merely states that the output depends upon certain inputs. It does not as yet explicitly state what the nature of the functional relationship is. The difficulty of explicitly including the functional form in the equation stems from an ignorance of the learning process. Because no adequate theory of the latter has as yet been developed, at least not to explain how inputs are transformed into outputs in economic terms, an a priori explicit specification of the form of the production function can not be made. In its stead use must be made of what is referred to as the 'experimental approach'

1) Bowles, S.: 'Towards an Educational Production Function', in Hansen, W.L.: Education, Income and Human Capital, New York, Columbia University Press for the National Bureau of Economic Research, 1970. pp. 11-70.

to econometric analysis¹⁾ which incorporates a posteriori considerations of which functional form most adequately describes the observed empirical patterns. The method implies the testing of various functional forms to determine which is statistically the most relevant under the circumstances. In the absence of well defined theory the subtleties remain enshrouded, as it were, and the functional form of the equation above must be assumed to be that which generates the most satisfactory results.

The procedures generally used for acquiring empirical results in such cases, are known as regression techniques. For the purposes of this dissertation it is important to determine whether the functions estimated in this way can confidently be assigned the properties of an economic production function. In the first instance, for this to be possible, the economist must satisfy himself that no econometric bias has been introduced into the estimates. One of the requirements for the absence of bias, is that the independent variables, that is the inputs in this case, be exogenously determined. Now, when an error term is included in the specification of the production function to allow for the fact that the equation is unlikely to describe the data exactly, the condition just stated implies foremostly that the input variables must not be correlated with that error term. Usually the error term, which in the case of universities may represent the economic inefficiencies of specific departments, is considered to be both randomly and normally distributed around a zero mean. If this assumption is extended to include the case under consideration, the first possible source of bias is presumed to be avoided. Nevertheless a second related one remains, namely that known as simultaneous equation bias. It may happen that the input variables are not exogenous for other reasons, as for instance when inputs and outputs are simultaneously determined.

1) Koutsoyiannis, A.: Theory of Econometrics, London, Mac-Millan, Second Edition 1977, p. 22 considers this a valid method.

Verry and Davies¹⁾ illustrate this possibility with respect to cost functions. They demonstrate that if output is being related to total costs, with the use of cross sectional data, marginal costs may be underestimated. This occurs if the more efficient firms or units are also the larger ones, implying that, in comparison to the average unit, the total costs of the larger units are lower than those of the average unit would have been, if it had been producing an equally large output. The fact that entrepreneurial or managerial talent is related to the use of the other inputs, introduces the bias. If a production function, as opposed to a cost function, were to be estimated under similar conditions, this source of bias would result in an overestimate of the elasticity of output with respect to the inputs.

The existence and seriousness of the bias will depend upon the factual position within universities, which may, however, itself not be unambiguous. Bowles²⁾ suggests that university administrators do not optimize in a well defined way because of political and legal constraints on the one hand and ignorance of interdepartmental efficiencies on the other. One may therefore, he submits, assume that the input variables are exogenous. Attiyeh and Lumsden assume that the objective of a university department is the maximization of social profit, which they define as being equal to the value of students' knowledge at the end of the year, less the value of their knowledge at the beginning of the year less the cost of university and student inputs.³⁾ This need not however, imply that university administrators are conscious of departmental objectives and efficiencies. Others believe that universities maximize their status by having as

1) Verry, D. and Davies, B.: Op. Cit., pp. 49-50.

2) Bowles, S.: Op. Cit., p. 16.

3) Attiyeh, R. and Lumsden, K.G.: 'Educational Production and Human Capital Formation', in Lumsden, K.G. (Ed.): Op. Cit., p. 133.

many instructional and research programmes as possible in a display of 'conspicuous production'.¹⁾ Verry and Davies,²⁾ argue that in fact university authorities may well be aware of which departments are relatively more efficient and allocate resources accordingly, in which case the bias will be introduced after all. In their own work, in an effort to avoid the problem, they do nevertheless resort to assuming that not to be the case. One of the negative results of this assumption, that is of assuming that optimization in universities is ill-defined, is that the 'production function' finally estimated can no longer be regarded as necessarily describing the maximum output obtainable from the various input combinations. Instead, it becomes an illustration of the average production possibilities of all the universities, which may or may not correspond with the maximum positions.³⁾ Furthermore, it has been asked if the attitudes of students to academic achievement as compared with the other benefits to be derived from university attendance should conceptually not also be incorporated as one of the variables in the production function. But these attitudes, it is submitted, will not be independent of the other inputs, for the magnitude and composition of the latter will undoubtedly influence students' conceptions of the purpose of university education. Attitudes will consequently be correlated with the error terms. The incorporation of attitudes therefore reintroduces the simultaneity problem, which it has been important to avoid. Bowles suggests that it is best overcome by assuming that the results of student attitudes are already embodied in the other input variables, upon which the attitude variable may

-
- 1) Lee, M.L., Stevens, D.W. and Wallace, R.L.: 'A Conspicuous Production Theory of Resource Allocation in Higher Education', Higher Education, Vol. 4, no. 1, Feb. 1975, pp. 77-86.
 - 2) Verry, D. and Davies, B.: Op. Cit., p. 51.
 - 3) Cf. Section 3.4.4 below in which the possibility of inefficiencies within universities is discussed.

safely be left out.¹⁾

A related issue of relevance to the foregoing is what has come to be called the identification problem,²⁾ which is also concerned with the circumstances under which the estimated function truly represents the production function.

It has already been mentioned that if universities do not optimize well defined objectives, the production function may describe no more than the average production possibilities. It may in addition be that different universities' relative valuations of the various components of output are not the same, in which case the relationship of inputs to outputs will depend upon how the composite output is aggregated.

The identification problem may become pertinent if university funds are 'tied' to any significant extent, that is, if funds are made available on the condition that they only be used for specific purposes. If that were to be the case, estimates of the production function would reveal no more than the constraints of the funding party and the 'real' production function would not be 'identified', as it were. In South Africa the greater part of university funding has in the recent past been generated by the van Wyk de Vries formula,³⁾ the components of which specify subsidy amounts for specific university activities. However, the universities are not required to adhere to the divisions implied by the formula for their own internal allocation of resources. Consequently, the formula can be regarded as a computational aid for the Department of National Education with which to

-
- 1) Bowles, S.: Op. Cit., p. 19.
 - 2) Verry, D. and Davies, B.: Op. Cit., pp. 41-47, upon which much of the next few pages depends.
 - 3) Cf. Main Report of the Commission of Enquiry into Universities, (Van Wyk de Vries Report), Government Printer, RP 25/1974, Pretoria, p. 581, et seq.

apportion the total sum expropriated by the Treasury. It can, therefore, be argued on a priori grounds that if universities were simply to adhere to the confines of the formula, they would not be acting rationally, especially if, as was regarded to be possible above, the objectives and the relative weights attached to different programmes differ from institution to institution. One would at least expect cost-minimizing within departments, even if the central administrators do not maximize well defined objective functions. But this statement partially conflicts with the assumption made earlier to overcome the simultaneous equation problem. Therefore, in as far as these two assumptions are incompatible, the interpretation of the exact nature of the estimated function or the measure of bias included in the estimate must remain ambiguous to a certain extent.

A second point of importance to the identification problem is whether sufficient variation in the level of educational 'production' exists between departments at different universities along the same production function for the function to be identifiable. It goes without saying that if all departments are equal in every respect, only one point and not the function itself can be identified. Equally, if each university has a different production function, cross sectional analysis will lead to the construction of an erroneous estimate. Again, if input prices or input availability vary from university to university, the optimal combinations of these factors cannot remain unchanged and, therefore, the functions will become impossibly difficult to estimate correctly. Fortunately, these difficulties appear to be largely spurious in the South African context, where on the one hand, with the notable exception of the University of South Africa, which uses correspondence teaching, instructional technology does not differ significantly between the universities. It can be assumed thereby that all have the same production functions. On the other hand

salary scales are centrally administered via the Civil Service and apply without differentiation to all. However, as has been pointed out,¹⁾ there may nevertheless be de facto variation in salaries if the possibilities for doing consultations or commissioned research are better in some quarters than in others.²⁾ Real salaries may also differ if the costs of living and housing vary geographically. But these factors may to some extent be complementary and thus offsetting, so that for example universities located where commissions may readily be sought also have to contend with high costs of living. It is, therefore, not unreasonable to expect that inaccuracies in the estimated function will not be excessive on this score.

With regard to the necessity of there being sufficient variation in the volume of output to enable regression techniques to establish the nature of the function, the diversity of the South African university sector, despite its being restricted in numbers, is likely to ensure the required conditions. The absolute sizes of the residential universities under the jurisdiction of the Department of National Education vary considerably from just over 2 000 students to over 17 000. It is assumed that the variation in the faculties and departments within these universities is correspondingly sufficient to allow the use of regression

1) In Section 3.2

2) Bowen, W.G. investigated the position in British universities and found significant differences in remuneration between members of different faculties because of differences in age-grade ratios, lifetime salaries and outside earnings. He concluded that ... "the appearance of complete interfaculty equality conveyed by the uniform salary scales has been an appearance only - in practice, systematic differentials in average grade and salary have been the rule." (p.356) 'British University Salaries : Subject Differentials', in Economica, Vol. 30, Nov. 1963, pp. 341-359. However, Metcalf, D. and Bibby, J. found the influence of the subject taught surprisingly low on the salaries of academic recruits. 'Salaries of Recruits to University Teaching in Britain', Higher Education, Vol. 1, no. 3, Aug. 1972, pp. 287-298.

techniques.

This assumption is, of course, not applicable to the University of South Africa (Unisa), which by nature is sui generis. The uniqueness of this university renders the use of cross-sectional analysis impossible and necessitates the use of time series techniques.¹⁾ The latter method, however, introduces the problem of inflation and the data consequently can only be meaningfully interpreted once the trends in real expenditure have been calculated, if necessary with the aid of a specially constructed index of educational costs.²⁾ The uniqueness of Unisa could possibly imply a lack of competition from other universities and may once again raise the spectre of insufficient optimization to allow the deduction of a 'true' production function. Within the university itself, however, there is no reason to suspect that faculties of departments are less concerned with cost minimization than in other universities.

In the case of the residential universities, the relatively small number of universities in South Africa could, however, have adverse consequences for the use of cross-sectional data in regression analyses for estimating the production functions of universities. Although random variation, as reflected in the error term of the estimated equation, is to be expected in an empirical investigation, the limited number of universities, and thus statistical observations, could prove insufficient in relation to the variation found in the

- 1) Time series analysis may, of course, also be used for residential universities. See da Silva Freire, M.E. and Fraústo da Silva, J.J.R.: 'The Application of Production Functions to the Higher Education System - some Examples from Portuguese Universities', Higher Education, Vol.4, no.4, Nov.1975, pp. 447-460, in which the numbers of professors and their assistants are regressed upon student numbers with the use of a Cobb-Douglas function.
- 2) Halstead, D.K.: Statewide Planning in Higher Education, Washington DC, US Government Printing Office, 1974, Appendix B., discusses the computation of such an index. Cf. Navia, L. and Magura, M.: 'A Price Index for University Budgetary Decisions', Journal of Higher Education, Vol. XLVIII, no.2, March/April 1977, p. 216.

data for the results to be interpreted with confidence.

If production functions are to be estimated for the undergraduate and post-graduate divisions of academic departments separately, one is likely to encounter what is referred to in the literature as the 'regression fallacy'. This occurs because there may be considerable variation in student numbers from year to year, especially amongst post-graduates. The staff required to teach these students varies much less dramatically, partially because of the institution of tenure, with the result that these quasi 'fixed' staff input costs may be spread over more or less students without the academic programme being affected. But when cross-sectional studies are made, situations such as these will be registered as falling average costs or, what is merely the other side of the same coin, as rapidly increasing productivity. However, the true picture as revealed by the long-term data is that the situation just described will give rise to average costs that are relatively static.¹⁾

One may enquire whether this phenomenon is likely to be significant in South African universities. Now, if the position with regard to the acceptance of post-graduates by departments were similar to that in the more select universities abroad, where a specific 'capacity' for taking students exists and demand invariably exceeds supply, the answer would be that it is not. In South Africa, unfortunately, this is seldom the case, with supply often greater than the demand for post-graduate places, at least by students of the calibre eligible for admission. The situation is aggravated by the dearth of skilled labour in the South African economy, which means that potential post-graduate students are quickly siphoned off by employers, especially so during upward phases

-
- 1) Tierney, M.L. suggests that a longitudinal component must be added to the regression to eliminate the 'regression fallacy' which may otherwise occur. 'An Estimate of Departmental Cost Functions', Higher Education, Vol. 9, no.4, July 1980, pp. 453-468.

of the business cycle. A department's post-graduate capacity is seldom fully used, for even a one hundred per cent increase in student numbers in a class of four or five is unlikely to necessitate additional staff inputs. It may even be that the demand for post-graduate places in a department displays anticyclical tendencies because of the forces just described, with the result that, if one were to determine secular productivity changes within these departments and to compare the results with productivity changes in the economy as a whole, the two would seemingly vary inversely.¹⁾

The problems raised by this inherent instability could be overcome if post and undergraduate student numbers were to be grouped together so that the greater scale and stability of the latter could compensate for the deficiencies of the former. Such a procedure would, however, not be advantageous because the van Wyk de Vries financing formula distinguishes between post- and undergraduates by assigning weights of 2 to Honours students and 3 to Master's and doctoral students. The prima facie evidence suggests that a greater degree of disaggregation is required in the composition of the formula, which would, of course, not be possible if the estimated production functions did not distinguish between these two basic categories at least. A solution is offered by the possibility of making the estimates for groups of subject departments or for faculties, but with the maintenance of the post/undergraduate distinction, in which case the extreme fluctuations will in all probability be erased. And as cross-sectional rather than time series analyses are to be employed, the judicious selection of the years to be tested will diminish the remaining bias to within tolerable limits.

-
- 1) Handa, M.L. and Skolnik, M.L. found that the effect of unemployment upon the demand for university places was weak but that expected earnings upon completion of a degree had a strong positive impact upon enrolment. 'Unemployment, Expected Returns, and the Demand for University Education in Ontario: Some Empirical Results', Higher Education, Vol. 4, no.1, Feb.1975, pp. 27-43.

3.4.2 Economies of Scale

The preceding analysis of the econometric problem of regression fallacy must be carefully distinguished from what in economics has come to be called economies of or returns to scale.¹⁾ The former is concerned with one of the difficulties of estimating the production function correctly, whereas the latter describes one of the properties of the production function itself. Normally three cases are distinguished: constant returns to scale, diminishing and increasing returns. A production function is said to display constant returns to scale, if when all the inputs are, say, doubled, the outputs also increase twofold. If the outputs increase proportionately more than inputs do, increasing returns have been observed, and conversely if outputs increase less than proportionately to inputs, decreasing returns are said to be present. Although the convenient mathematical properties of production functions displaying constant returns to scale have made this category popular for theoretical analysis, there are several reasons why in practice increasing returns may be found. The first is caused by the existence of indivisibilities in the production process, by which is implied that the nature of certain inputs is such that they cannot be split into small sections. This may in particular be the case with some physical inputs used by universities. Advanced research often requires the availability of sophisticated computational machines which generally have sufficient capacity to accommodate numerous users. Therefore, once the machine has been purchased, the number of researchers may for a period be increased without additional capital outlay on similar facilities. Another pertinent example is that of the university

1) Analyses of this phenomenon are to be found in most micro-economic textbooks. See for example, Baumol, W.J.: Economic Theory and Operations Analysis, London, Prentice Hall, 1972, Third Edition, pp. 279-282; also Koutsoyiannis, A.: Modern Microeconomics, Second Edition, London, MacMillan, 1979, pp. 76-82.

library, in which case the indivisibility is less of a physical than of a functional nature. It is well-known that to be efficacious for research purposes a library requires a large, and simultaneously specialized and varied collection. Once such a collection has been amassed, however, it can be used with advantage by a large number of readers. Consequently economies of scale may be exhibited, for as the university grows, its library facilities may proportionately be put to better use.

It can be argued that indivisibilities are conceptually not the exact equivalent of scale economies, although the problems caused are similar. The difference occurs because, in the case of indivisibilities, when the scale of the operation is increased all the inputs are not, in fact, increased proportionately as is required by the definition of scale economies. Practical examples that comply more closely to the formal definition may, however, be produced with relative ease. For example the geometry of buildings is such that their volume increases more than proportionately to the wall space required, and that therefore, ceteris paribus, economies of scale exist in building larger lecture halls, larger laboratories, etc.. On a different terrain it may be that larger departments are able to deploy specialized staff to the betterment of teaching or that the cross-fertilization of ideas in larger departments leads to better research, in which case scale economies would once again be present.¹⁾

If scale economies are to be measured empirically by using cross-sectional data, one must assume that the educational technologies used in the different universities are essentially similar. This has, of course, been implied throughout the foregoing analysis, for if this assumption were to

1) There is some evidence to suggest that large departments actually do less research than small ones. Verry, D.W.: 'Economics of Scale', Higher Education, Vol. 2, no. 2, May 1973, pp. 214-217 on p. 216.

be violated, the basis for estimating the production function itself would be destroyed. Halstead,¹⁾ however, points out that there may be sufficient variation in technology to cast some doubt on this procedure. The primary variation occurs in the student-faculty ratios that exist in small and large institutions. And because of the labour intensive character of university technology, variations in this ratio have significant effects. He cites evidence to the effect that within some groups of institutions class size, which is the most important factor governing the student-faculty ratio, is positively related to enrolment.²⁾ This implies that costs per student, at least for instruction, will be lower in the larger universities, suggesting the presence of scale economies. Nevertheless, he argues that one must take care to ascribe the accompanying cost reduction to the difference in pedagogical technology used, rather than erroneously to economies of scale, unless, of course, class size is the direct result of scale, as may be the case with small universities that are forced to have classes smaller than they would otherwise have chosen. With this exception, variations in technology imply that one has in effect moved analytically from one production function to a second, albeit related one, along which production may be undertaken more cheaply than along the first.

Despite the apparently tight logic of this thesis, counter-arguments may be raised simply by questioning the initial, tacit assumption upon which it depends. The assumption is that the student-faculty ratio is an appropriate measure of the relevant technology. In fact, there is no a priori

-
- 1) Halstead, D.K.: Op. Cit., p. 271-278..
 - 2) Blakesby, J.F., et al.: Indiana Facilities Utilization Survey for Colleges and Universities, Fall 1967, Indiana Advisory Commission on Academic Facilities, Bloomington, 1968, pp. 141-142, quoted in Halstead, D.K.: Op. Cit., p. 273.

reason why some other measure should not be used. Consider, for example, that of the number of contact hours between staff and students during which actual tuition occurs, be it in the form of lectures, tutorials or practicals. If the number of these hours is maintained, one could justifiably argue that technology is unchanged, even though the student-faculty ratio may have altered, provided that no active participation by students is required during such teaching sessions. It is well documented, that if this proviso holds, the quality of the tuition remains unimpaired.¹⁾

Now, the use of the contact hour measure in conjunction with a maximum number of students that can attend a lecture before it becomes necessary to repeat it, implies that the student/faculty ratio deteriorates as a department grows. If, for instance, the maximum class size of 60 students and a student-faculty ratio of 10:1 exists in a particular department, and if a particular class begins with only 30 students, the addition of 30 more will not affect the contact hours of the person teaching the course. This 'filling up' process was considered to be an important aspect of scale economies in a study of the University of Bradford. In particular it was found that, as enrolments increased, a less than proportional increase in teaching meetings was required to maintain the course structure unaltered. Consequently, a constant teaching load per faculty member implied that staff numbers increased less than proportionately to student numbers and that the student-faculty ratio declined. In addition, it declined at a decreasing rate, so that the economies to be gained from successive increases in student

-
- 1) Harris, S.E. (Ed.): 'Higher Education in the United States: The Economic Problems', Review of Economics and Statistics, Supplement, August 1960, p. 131. Harris reviewed the research to date on the effects of class size on the effectiveness of teaching in his book: Higher Education: Resources and Finance, Maidenhead, 1962, a summary of which appears in O'Donoghue, M.: Economic Dimensions in Education, Dublin, Gill and MacMillan Ltd., 1971, pp. 165-168.

numbers diminished. Finally, the fall was punctuated by sharp rises, indicating the points at which it became necessary to repeat the lecture meetings.¹⁾ The results of this analysis, which were corroborated by the statistical findings in Bradford University, imply a reduction of teaching cost per student as course size increases and, therefore, a more economical utilization of academic staff resources.²⁾

In empirical studies it is far from easy to identify and separate scale economies from these other complimentary forces,³⁾ the more so where the number of institutions from which data may be selected is small, as is the case in South Africa, thus making stratification of the data impossible. It is as well, therefore, to bear in mind that the estimated economies of scale may be exaggerated by other factors. On the other hand there are forces that may offset these tendencies and which are also generated by technological differences. For example, the larger universities tend to be prolific in the smaller departments as well as the expensive faculties. Examples of the former are to be found amongst some of the foreign and classical languages, whereas those of the latter include engineering and medicine. The solution may, as before, be to estimate functions by faculty if not by department, but unfortunately this procedure has the effect of eliminating many of the principal sources of scale economies from the analysis. These are general administration, library, student services and maintenance. None of these can logically be apportioned so as to be included partially in an analysis by faculty or by department, but can only be incorporated in total. Consequently many empirical

-
- 1) Bottomley, J.A., et al.: Costs and Potential Economies, Paris, O E C D Centre for Educational Research and Innovation, 1972, p. 87.
 - 2) Ibid., p. 369.
 - 3) Cf. Ball, R.: 'Allocation of Academic Staff in Universities', Higher Education, Vol. 9, no. 4, July 1980, pp. 419-428, in which student-staff ratios are analysed.

studies have concentrated upon the scale economies inherent in the institution in its entirety.

Authoritative work on the existence of economies of scale in American institutions for higher education has been undertaken by the Carnegie Commission.¹⁾ Because of the diversity of the higher education institutions in the U S A , the Commission distinguished between five main groups, namely doctoral-granting institutions, comprehensive colleges, liberal arts colleges, two-year institutions, and specialized institutions. In each category a further distinction was made between public and private institutions. Despite this stratification some considerable diversity remained. For example, amongst the doctoral-granting institutions, which correspond most closely to the South African norm, none of the 101 public universities had less than 3 000 full-time equivalent (FTE) students in 1970. However the median was approximately 15 000 FTE students with about 23 per cent of the universities with over 20 000 FTE students. In contrast only about 10 per cent of the equivalent private institutions had 15 000 or more FTE students and the corresponding median was about 7 000 in 1970.²⁾ Although these differences gave rise to variation between the public and private university sectors, as also, naturally, between the institutional categories themselves, the Commission concluded in their later report that important generalizations could be discerned that were applicable to all groups.

Firstly, they found that the grouping of educational and general expenditures per FTE student portrayed economies of scale most effectively, because of the inclusion thereby of expenditures for administration, student services, plant

-
- 1) The Carnegie Commission on Higher Education: New Students and New Places (Policies for the Future Growth and Development of American Higher Education), New York, McGraw-Hill, 1971; and The More Effective Use of Resources (An Imperative for Higher Education), New York, McGraw-Hill, 1972.
 - 2) The Carnegie Commission: New Students ..., Op. Cit., p. 65.

maintenance and operation and libraries.¹⁾ Expenditures for departmental but not for organized research (i.e. sponsored and other separately budgeted research) were included. Post-graduate student enrolment was given a weight of three.

Secondly, it appeared that exceptionally small institutions tended to have relatively high costs.²⁾ The costs per F T E student initially fell sharply as enrolments increased, but less dramatically once the institutions had reached a moderate size, indicating a curved relationship between F T E enrolment and costs per FTE student. Scale economies, therefore, primarily benefited the smaller institutions, whereas the growth of the larger ones brought relatively few economic advantages from this source.

Thirdly, it was found that the variation between institutions, spoken of above, resulted in the fitted regression lines having low correlation coefficients and high standard deviations. Multivariate analysis, that made provision for the inclusion of the variable 'number of fields', tended to improve the statistical results by catering for the cost raising diversity commonly found in the larger universities.

The Commission's analysis of the data pertaining to universities alone was restricted by a lack of financial information, especially regarding the public research orientated universities, with the result that emphasis was placed in the analysis upon private universities. Nevertheless, the available data (1967-1968) showed that for all universities combined educational expenditures per FTE student (i.e. excluding general expenditures) declined quite sharply until FTE enrolment reached about 5 000 and then more gradually to an enrolment in the vicinity of 15 000 FTE students.³⁾ Some

-
- 1) The Carnegie Commission: The More Effective ..., Op. Cit., p. 163. For the use of costs instead of inputs compare Section 3.5 below.
 - 2) Ibid., p. 164.
 - 3) Ibid., pp. 165-167.

evidence was produced to suggest that after a certain point, which for private universities was considerably lower than for the public ones - 10 000 as against 20 000 FTE students - costs could rise again. The analysis of expenditures for the other categories distinguished for the private universities, namely instructional and departmental research, general administrative and institutional functions (including student services), physical plant maintenance and operation, and library services, disclosed patterns of variation that conformed closely to those already discussed.¹⁾ The only exception was that expenditures upon administration and student services per weighted FTE student for the private universities displayed a more consistent decline than those for the other components.

In their analysis of English university data for 1969-1970, Verry and Davies concluded that economies of scale in that country are primarily due to the size and the indivisibility of the fixed or set-up costs of a university.²⁾ What causes recurrent average costs to decline is the 'spreading' of the fixed cost component as departmental outputs increase. These results are derived from their having concentrated upon simple linear cost functions, after having examined and rejected several alternatives. One of the implications of this procedure is that marginal costs, that is, the costs of each additional student, are assumed constant, implying that average costs should fall and tend to equal marginal costs as enrolments increase. Growth must, therefore, continue to be beneficial in these terms for extended periods, although gargantuan campuses could generate other 'diseconomies' in the sense of failing to provide their students with intellectually and socially suitable environments.

The Verry and Davies results conform with those of the Carnegie Commission in as far as they, too, found that economies

1) Ibid., p. 167.

2) Verry, D. and Davies, B.: Op. Cit., pp. 233-234.

of scale were important and significant for universities. The major difference lies therein that the Carnegie Commission hypothesized a curved relationship between total costs and enrolment whereas Verry and Davies suggest a linear relationship. In neither case was there sufficient evidence to reject their respective hypotheses. Indeed, it may be that differences in median university size on either side of the Atlantic could have contributed to the observed variance.¹⁾

The foregoing has focused upon recurrent or operational costs. Economies of scale may also, of course, exist for capital costs, as was noted in the introductory remarks to this section. In this respect Halstead quotes sources to demonstrate that the required physical space per FTE student for classrooms, teaching laboratories, library and other general facilities varies inversely to enrolment.²⁾ In contrast, in the Indiana institutions scrutinized office space and that for medical care tended to vary relatively little for institutions of different sizes, whereas the space allocated per student for laboratories tended to increase with the size of the university. In summary, it was found that non-residential space in 1967 varied between 173,6 square feet per FTE student, if total enrolment was less than 500, to 124 square feet, if enrolment exceeded 5 000.³⁾

Another study emphasizes the impact of the initial 'one-time' expenditures such as land acquisition, site development and the provision of basic utilities on the relation of

-
- 1) The data provided in the two sources are not sufficiently comparable to allow more than speculation on this point.
 - 2) Blakesbey, J.F., et al.: Op. Cit., p. 57, as quoted in Halstead, D.K.: Op. Cit., pp. 275-276.
 - 3) Ibid.

average costs to enrolment.¹⁾ It was estimated that in California in 1977 it was almost three times as expensive to construct facilities for each additional FTE student at a small campus, say of 2 000 students, than at campuses where enrolment was in the vicinity of 12 000.²⁾

A final point to be noted with respect to economies of scale is that the size of an institution could conceivably play a greater role in determining the quality of its output than its quantity. One may, for instance, surmise that in larger departments the possibility of greater specialization would enhance the quality of the teaching. On the other hand it could be that greater departmental size leads to a lack of cohesion and unity within the department. Whatever the effects may be, they at present undoubtedly elude measurement and may accordingly distort any estimates of the economies of scale that are made.

3.4.3 Joint Production

In the earlier sections of this chapter reference was made to the phenomenon of joint production and the complications caused by its presence for the apportionment of inputs to specific outputs. Various definitions may be given of what constitutes joint production, of which possibly the most helpful is, that when two or more activities are to be performed, the provision of one of these results in the others becoming available at zero extra (marginal) cost. In essence this simply implies that the production of both products together can be undertaken more cheaply than the production

-
- 1) With the exception of land, these facilities do, however, require renewal after a certain period of time. Cf. Model E in Chapter 8.
 - 2) California Co-ordinating Council for Higher Education: Meeting the Enrolment Demand for Public Higher Education in California Through 1977 - The Need for Additional Colleges and University Campuses, CCHÉ, Sacramento, Appendix D, as quoted in Halstead, D.K.: Op. Cit., p. 276.

of each of them separately.¹⁾

In universities the problem of jointness is usually raised with respect to the provision of undergraduate teaching, postgraduate teaching and research at departmental level, although conceptually further distinctions could be made between the various products of each of these categories. It is argued, often on a priori grounds, that time spent, say, on post-graduate teaching benefits the instructor's ability to teach undergraduates and that therefore, if two persons were to be employed to teach the respective categories, the sum of their inputs would exceed the total inputs of the single instructor engaged in both. Similarly, the argument is that by engaging in research, faculty members are kept abreast of the latest developments in their fields, without which far greater effort would be required for adequate teaching.

Jointness is often presumed to be a typical characteristic of educational production. It may also, though, be important from the user side, as was described above in Section 2.2, where it was demonstrated that education could be viewed simultaneously as consumption and investment. This characteristic may cause difficulties for the determination of the optimum amount of education if rates of return are not calculated so as to incorporate both aspects. It is, however, with the production problems caused by jointness with which the analysis must now grapple.

In the literature the major difficulty arising from joint production has been illustrated by using a 'mutton-wool' analogy, which states that it is impossible to say which proportion of a sheep's feed goes towards the production of

1) Millward, R.: Op. Cit.: p. 252, and Verry, D. and Davies, B.: Op. Cit.: pp. 52-59.

mutton and which proportion towards the production of wool.¹⁾ Likewise, in universities it is often not possible to state which inputs have been used for which outputs. A book read for the purpose of research may stimulate better teaching, for example, and so the argument runs, there is no logical way of apportioning the time spent in reading to the one or the other output. If this really is the case and holds generally for many university activities, any allocation of time and costs spent upon specific outputs will be incorrect. This makes the accurate monitoring of inputs impossible and applies equally to those outputs which must be measured by input proxies. Therefore, if jointness does exist to this extent, the measurement of the research inputs made by a university by the method of asking staff members to state how much time they devote to that activity must at best be an inaccurate procedure. Also, the fact that no time may be allocated to the 'indeterminate' category of the questionnaire, does not necessarily imply the absence of joint production. As was discussed more fully in Section 3.2, it could however, prove to be the best possible method under the circumstances.

Joint production has much in common with the indivisibilities, analysed above in the context of economies of scale, because many functions that were classified under the heading, including library, administrative and other ancillary services, do not generally lend themselves to ready compartmentalization.

Nevertheless, one should beware of concluding from the foregoing that all university production is invariably subject to jointness. It may be that many aspects are separable, as often is the case with marginal costs in particular. It may even be the case that outputs compete for the available

1) Carter, C.F.: 'The Economics of Higher Education', The Manchester School of Economics and Social Studies, XXXIII, Jan. 1965, pp. 1-16 on p. 2.

inputs, in the sense, for example, that undergraduate teaching could become a positive hindrance to research activities. Verry and Davies found that their cost analyses produced no statistically significant evidence of joint supply between undergraduate teaching, post-graduate teaching and research, although their production function results indicated that jointness probably exists between post-graduate teaching and research at least.¹⁾ If jointness affects quality more than quantity, its effects become even more difficult to assess.

3.4.4 Productivity and Efficiency²⁾

Productivity refers to output per unit of input and is therefore clearly related to the production function concept. In fact, the production function defines the locus of optimally productive points obtainable with the available technology that is traced when output is increased. In addition, if this maximum feasible productivity is attained, production is said to be efficient. If not, it is technically possible to move away from points of inefficiency to the boundary that defines the efficient possibilities as described by the production function.

Economists are interested in average productivity but also, in particular, in marginal productivity. This is because one of the corollaries of welfare economic theory is that under certain conditions an optimal configuration is characterized by the deployment of resources such that the ratio

1) Verry, D. and Davies, B.: Op. Cit., p. 235. However, McKenzie, R.B. argues with the aid of elementary indifference curve analysis that an increase in teaching load could possibly affect an increase in the time spent on research and vice versa. 'The Economics of Reducing Faculty Teaching Loads', Journal of Political Economy, Vol. 80, no. 3, part 1, May/June 1972, p. 617-619.

2) Cf. Verry, D.: 'Cost Studies and Efficiency', in The Open University: Op. Cit.

of the marginal products of any two factors equals the ratio of their prices.¹⁾ Therefore, the combined knowledge of both marginal products and prices could be of great use to planners, who could confidently advise the increased use of those factors of which marginal product exceeded price and the decreased use of those of which price exceeded marginal product. Fortunately, estimates of the marginal products of the various factors are given by the structural parameters of an econometrically estimated linear production function.²⁾

An increase in productivity can be caused in two ways, either by a move from a suboptimal to an optimal point on the production function, in which case the earlier production was inefficient, or by a shift of the optimal frontier itself, possibly by the introduction of new technology. In the second case one has clearly moved to a new, although related production function. The question that arises is this: if measured productivity in education were to increase, would one wish to attribute the change to the first or the second of these possibilities? The answer, of course, depends upon whether universities may reasonably be assumed to maximize their objectives, an assumption that was scrutinized in Section 3.4.1 above. It was decided at that point that, although broader university objectives were not well defined in a quantifiable way, it was reasonable to assume that individual departments within the university attempt to minimize costs. Even so it was concluded that estimated production functions were best given on 'average' interpretation in the sense that there were likely to be aberrations from the achievable maximum.

Because productivity relates physical inputs to physical outputs, one is faced with all the problems of measurement

1) Cf. the Appendix to Chapter 2.

2) Bowles, S.: Op. Cit., p. 26.

discussed in Sections 3.2 and 3.3. Nevertheless, attempts have been made to quantify productivity trends in higher education, two of which - those by O'Neill, and by Woodhall and Blaug - will be discussed briefly.

O'Neill attempted to analyse the use of resources in higher education in the U S A over the period 1930-1967.³⁾ Credit hours were used as the basic component with which to measure productivity, research being omitted by subtracting research expenditure from total costs. Several largely unavoidable sources of bias were introduced by this procedure and acknowledged by the author. Firstly, the possibly positive effects of joint production were not incorporated due to the exclusion of research. Secondly, quality changes, which in economics are generally accounted for by observing variations in price, could not be adequately included due to the lack of suitable educational prices. Thirdly, the measurement of the credit hours themselves as well as of many of the other variables was considered to be less than perfect. Nevertheless, the results of the research are interesting.

It was found that over the period 1930-1967 the average annual increase in costs per credit hour was approximately 3.4 per cent, which may be broken down into two components, namely, changes in input prices per unit of input and changes in the amounts of inputs used to produce a unit of output. Clearly it is the latter which is of importance for the measurement of productivity. It was found that the inflation of input prices had occurred at a rate of 3 per cent per year, so that once adjustment had been made for the possible effects of quality changes, it could be concluded that the real resources used per credit hour had not changed

1) O'Neill, J.: Resource Use in Higher Education - Trends in Outputs and Inputs, 1930-1967, New York, Carnegie Commission on Higher Education Report, 1971. Vide Section 3.3.2.

over the period.¹⁾ The evidence therefore suggested that productivity in higher education had remained static.

Woodhall and Blaug attempted to measure trends in the productivity of British university education over the period 1938-1962.²⁾ They did so by constructing indices of educational input and output over the period. The unit for the index of output was taken as a student completing a course, which, although leaving the problem of 'wastage' unsolved, readily provided totals for the years analysed. Three different sets of weights were used to aggregate these totals, giving indices with respectively an educational, a cultural, and an economic slant. However, it appeared that the choice of weights did not affect the results appreciably, because the strongly rising trend in the number of students overshadowed the effects of different trends in the various faculties.³⁾

The index of inputs included estimates of the opportunity costs of student time, the number of teaching staff weighted by their salaries, the real expenditure on books and administrative services, and capital. Provision was made for research by estimating the percentage of resources absorbed by it, and subtracting that from the total.⁴⁾

On comparing the two indices of inputs and outputs it was found that the increase in inputs had been greater than the increase in outputs, and that moreover, there had been a steady decline in productivity over the period under review. Even if provision had been made for quality changes, it is

1) Ibid., pp. 37-38.

2) Woodhall, M. and Blaug, M.: 'Productivity Trends in British University Education', Minerva, II, 4, Summer, 1965, pp. 483-498.

3) Ibid., pp. 489-490.

4) Cf. Section 3.3.2.

unlikely that the conclusion would have been altered.¹⁾ The implications of this conclusion are that university education continually absorbed more of the country's resources, the more so because the prices of the factors used in educational production, as also, therefore, the opportunity costs of each factor, were influenced by the average productivity of the economy as a whole, which had been rising over the period.

The results of this research by Woodhall and Blaug illustrate one of higher education's most pressing problems, namely the lack of technological change in an environment characterized by rapid innovation. The absence of increased productivity coupled with a labour intensive production process has resulted in the real costs of education rising more than proportionately. In order to attract staff, universities must compete with industry and the other sectors of the economy, which have been able to pay higher wages out of increased production. Consequently universities have become more expensive, relatively speaking, in an era in which great expansion in university education has occurred. Sheenan, for example, quotes evidence to show that in West Germany between 1950 and 1962 the cost-of-living index increased by 27,9 per cent, the implicit GNP price index by 49,1 per cent and the educational input price index by 126,9 per cent.²⁾ Even if provision is made for inaccuracies in measurement, the trend is clearly discernible.

Some authors have questioned the need for static university technology by pointing to the possibilities offered by teaching aids such as closed circuit television and video-

1) Ibid., pp. 495-496.

2) Edding, F. and Berstecher, D.: International Developments in Expenditure, 1950-1965, Paris, UNESCO, 1967, Table 17, quoted in Sheenan, J.: The Economics of Education, London, George Allen and Unwin, no date, p. 16.

tape and suggested that many of the more standard courses could be produced effectively by these means.¹⁾ Their use would result in greatly improved labour productivity within the university. Undoubtedly, this approach to teaching is less appropriate in those fields which depend heavily upon the interpretation of a teacher or on class debate. However, even in these fields it has been demonstrated that effective, alternative and often less costly means of teaching do exist, as for example have been developed by the correspondence universities, such as Unisa in South Africa.

In a study of the Open University in Britain, which uses correspondence teaching, Wagner found that its costs were significantly different from those of the conventional universities. Many conceptual and statistical problems arise in making such comparisons, but the results are of such a nature that they cannot be ignored. It was estimated that the average recurrent cost per equivalent undergraduate at the Open University was little more than quarter of that of conventional universities; that the capital cost per student place was about six per cent of the conventional figure; that the average recurrent cost per graduate would have been equalized to the conventional equivalent, if the Open University had had a drop-out rate of eighty-five per cent; and that the resource cost per equivalent undergraduate was about a sixth of that of conventional universities.²⁾ In the interpretation of these results, it should, however, be borne in mind that these statistics refer only to the teaching of particular courses. It could be argued that students are educated by the general influence of a university, an influence that is largely denied to those students

-
- 1) Reder, M.W.: 'A Suggestion for Increasing the Efficiency of Universities', in Lumsden, K.G. (Ed.): Op. Cit., pp.207-216.
 - 2) Wagner, L.: 'The Economics of the Open University', Higher Education, Vol. 1, no.2, May 1972, pp. 159-183.

who are unable to attend conventional residential universities. The importance of this aspect is mirrored in the statutory residence periods required by most universities of their students.¹⁾

It has also been suggested that the economic organization of modern universities perpetuates inefficiencies and the use of obsolescent technology.²⁾ The 'non-profit' nature of the education industry, the absence of a group with the rights and interests that accompany ownership, and the difficulty of monitoring the outputs of university staff, all contribute to this argument. Because of the lack of both profits and owners, the pressures normally brought to bear upon firms to achieve efficiency do not exist. The control that would otherwise have been exercised through these channels is diverted to the faculties, giving rise to the anomaly, where those with vested interests in minimal control are in fact called upon to monitor outputs. When viewed in conjunction with the current incentive system with its heavy bias towards publications and consultative work, the lack of consumer sovereignty and the control of admissions, the system is seen to be inherently static and prone to technical inefficiencies.

Of course, these arguments have profound implications for the normal interpretation of production functions. Accordingly, it was emphasized above in Section 3.4.1 that empirically estimated production functions should be interpreted as portraying the 'average' production possibilities of universities rather than the set of best possibilities

-
- 1) Cf. Carter, C.F.: 'The Economics of the Open University: A Comment', Higher Education, Vol. 2, no. 1, Feb. 1973, pp. 69-70. Also, Mace, J.: 'Methodology in the Making: is the Open University Really Cost-Effective', Higher Education, Vol. 7, no. 3, Aug. 1978, pp. 295-310.
 - 2) Cootner, P.H.: 'Economic Organization and Inefficiency in the Modern University', in Lumsden, K.G. (Ed.): Op. Cit., pp. 217-240.

available.

Efficiency pertains not only to teaching and research but also concerns the use of capital assets. In this respect many have observed that the use of university buildings is, in particular, often subject to inefficiencies. It is cogently argued that, for example, the traditional scheduling of lectures on weekday mornings and laboratory practical classes for the afternoons implies that both lecture halls and laboratories are under-utilized. It is clearly also possible to use these facilities on Saturdays and in the evenings.¹⁾

The cause of inefficiencies of this nature is partly to be found in the absence of rental charges for the use of equipment, office space, lecture rooms and the like in most universities' internal accounting systems. Economic logic confirms that, if resources are scarce, they are best rationed by charging user prices equivalent to the marginal opportunity costs entailed.²⁾ If this is not done, those departments that have either fortuitously or by means of rhetoric within university committees acquired possession of various assets, are deprived of incentives to use them

- 1) Williams, B.R. warns against hasty conclusions in this regard by reminding his readers that it is easy to over-estimate low capacity utilization. There may be constraints in other, complementary sectors that make the overall improved use of facilities difficult, he argues. 'Capacity and Output of Universities', The Manchester School of Economic and Social Studies, Vol. XXXI, no. 2, May, 1963, pp. 185-202. The existence of such a situation suggests unbalanced planning, however. Dunworth, J. and Bottomley, A. found that in the University of Bradford, laboratories were used for 40 per cent of a 32-hour working week, the lecture theatres and classrooms for 51 per cent, when they were on average 47 per cent full. 'Potential Economies of Scale at the University of Bradford', Higher Education, Vol. 2, May 1973, pp. 225-228, on p. 227. Cf. also Eurich, A.C.: 'Increasing Productivity in Higher Education', The Review of Economics and Statistics, Supplement, August 1960, pp. S185-188.
- 2) Cf. Section 2.7, the Appendix to Chapter 2, in which the logic of this 'rule' is explained.

efficiently. Under conditions of fixed supply, as is the case in the short run with university assets and physical space, the relevant opportunity costs are not equal to either the average or marginal costs of providing the facilities, but are equal to the values placed on small additions of the particular assets by the users just excluded. In effect, therefore, the department that bids highest for the use of, say, a particular room should be allocated the use thereof and charged the price tendered. But this practice is, of course, rarely adhered to (an exception being charges made for computer time), with the result that inefficiencies are unavoidable.¹⁾

Suggestions for the overall improved use of university buildings include the adoption of a three term calendar or other variations of year-round operation.²⁾ The current semester system, it is submitted, leaves the university's physical assets idle for a substantial fraction of the year. If, therefore, universities were to operate all the year round, they would be able either to function with fewer facilities or admit more students in relation to the existing facilities. In the case where facilities already exist, one is clearly faced with the second of the alternatives.

-
- 1) A scheme to enhance incentives for efficiency is to be found in Dunworth, J. and Cook, R.: 'Budgetary Devolution as an Aid to University Efficiency', Higher Education, Vol. 5, no. 2, May 1976, pp. 153-168. In some universities internal pricing in the form of formula weights are used. Minahan, J.P.: 'Administrative Cost Accounting : Whose Cost and Whose Accounting', Journal of Higher Education, Vol. XLV, no. 1, January 1974, pp. 38-47.
 - 2) Cf. Halstead, D.K.: Op. Cit., pp. 634-635; Carnegie Commission on Higher Education: The More Effective Use of Resources, Op. Cit., pp. 122-125; and de Villiers, J.W.R.: Die Drietermynstelsel aan 'n Universiteit, Unpublished Essay, University of Stellenbosch, 1980.

A three term calender would not necessarily require that students remain at university during any one year any longer than they do under the semester system. They would, of course, be permitted to do so, if they wished to complete their studies more quickly than previously possible. The system does, however, depend upon at least two intakes of students during the year, so that the facilities are used during each of the three available terms. Students wishing to make use of only two of the terms could use the third for on-the-job training, military service or the earning of their keep. The implications for faculty staff are similar to those for students: they would not be required to teach for more than two of the three terms, and would have the remaining time available for research, reading, preparation of lectures, etc.

Needless to say, the last point implies that more staff members will be required in total than before, but, given time, the increase should be offset against the increased intake of students. The difficult period is that of transition, during which productivity may be forced down by the additional teachers required to operate the extended system, unless it is introduced piecemeal, as and when departments become large enough to warrant two streams of students. In addition, long term problems may be experienced by those departments that have insufficient students to warrant their division by two intakes, unless they operate during two of the terms only. Careful analysis of the empirical situation is required to ascertain whether these and other possibly increased costs do not outweigh the capital savings hoped for from the more efficient use of facilities. The many variations possible on year-round operation make a priori speculation on costs and benefits difficult. Each scheme requires individual investigation before being either rejected or accepted for use in a particular university. On the national front the labour force implications of the possibly speedier delivery of cohorts

of graduates also require consideration. Williams adds that the system will be difficult to introduce into existing universities. It would also make the university's timetable inflexible because the number of sessions required would only just fit into the calendar year.¹⁾

Carter has warned that although many of the benefits of such a reorganization are measurable, the disadvantages often defy quantification, being of an intangible nature. He does believe, however, that the judicious application of operations analysis to the use of university facilities, and technical, ancillary and administrative staff can be beneficial.²⁾

In some quarters the use of planning-programming-budgeting-systems (PPBS) has been advocated for universities desirous of improving their efficiency. PPBS is designed for the organization and presentation of information, particularly on costs and benefits, as an aid for rational decision making. Its principal features are the organization of activities into structured programmes, that relate to specific objectives, and the identification of the costs and benefits, associated with each programme, so as to enable sound financial and academic planning.³⁾ Weathersby and Balderston, the authors of an extensive study on PPBS in

-
- 1) Williams, B.R.: Op. Cit., pp. 201-202.
 - 2) Carter, C.F.: 'The Efficiency of Universities', Higher Education, Vol. 1, no. 1, Feb. 1972, pp. 77-89. See also: Weathersby, G.B. and Balderston, F.E.: 'PPBS in Higher Education Planning and Management: Part III, Perspectives and Applications of Policy Analysis', Higher Education, Vol. 2, no. 1, Feb. 1973, pp. 33-68, in which pp. 47-68 offer a case study of year-round operation at the University of California.
 - 3) Weathersby, G.B. and Balderston, F.E.: 'PPBS in Higher Education Planning and Management: Part I, an Overview', Higher Education, Vol. 1, no. 2, May 1972, pp. 191-206; also their '... Part II, The University of California', Higher Education, Vol. 1, no. 3, Aug. 1972, pp. 299-320; and '... Part III, Perspectives and Applications of Policy Analysis', Higher Education, Vol. 2, no. 2., Feb. 1973, pp. 33-68.

universities, warn against the simplistic use of PPBS in academic institutions, but do nevertheless recommend decision-focused analysis as essential for improving efficiency.¹⁾

3.5 From Production Functions to Cost Functions.²⁾

Cost functions relate costs, either total, average or marginal, to output and are conceptually not far removed from production functions, although logically the latter must precede the former. Most of what has been said in Section 3.4 applies mutatis mutandis to cost functions, so much so that, in the analysis of production above, costs were at times substituted for inputs. This was permitted not only because of the similarities between the two concepts, but because educational inputs are often notoriously difficult to quantify in other than cost terms. Nevertheless, at this juncture a distinction must be made between these two concepts.

Cost functions can be derived from production functions by the simple means of multiplying the physical inputs by the respective input prices. If input prices are constant, irrespective of the volume of production, and linear production functions are assumed, the move from a production to a cost function is an easy operation that leaves the shape of the function unaltered, but changes the scale of and intercept on the vertical axis. However, if input prices vary

1) Ibid., Part III.

2) Cf. Layard, P.R.G. and Verry, D.W.: 'Cost Functions of University Teaching and Research', Economic Journal, Vol. 85, March 1975, pp. 55-74, as also Verry, D.W. and Davies, B.: Op. Cit., passim. The policy variables that affect costs are: the faculty budget per staff member, the proportion of funds used for teaching, the yearly hours of instruction per student, the total staff-contact hours per staff member and the average section size of the class. CUA/LOU Joint Subcommittee on Finance/Operating Grants: Financing University Programs in Education, Report on the Special Study of Requirements for the Formula Funding of Education Programs in Ontario Universities, Ontario, 1971, pp. 32-33.

with the volume of production, the transition from a production to a cost function will entail altering the functional equation, which now may or may not retain its linear properties. Clearly, cost functions and production functions are only 'interchangeable' for practical purposes in the first case described above.

The first case corresponds to what is known in the literature as that of 'perfect factor markets', the second to that of 'imperfect factor markets'. In perfect markets individual firms, (in the case under consideration, individual universities), are unable to influence the prices of their inputs by manipulating the quantity demanded thereof, whereas in imperfect markets, this does not apply. It is therefore necessary to examine the position of the South African universities in this respect to determine the nature of their factor markets.

It is submitted that the major university factor markets, namely those for academic and other staff and for capital, may for all practical purposes be considered to approximate 'perfect' markets sufficiently to be treated as such analytically. This submission can be defended upon the following grounds. Individual universities are 'price takers' with respect to the salaries they pay to faculty members, because salaries are determined by the Department of National Education in conjunction with the Civil Service after consideration of the demand for and supply of academic skills in the academic, public and private sectors. Individual universities are not normally able to influence this process in any way. To acquire administrative and clerical staff, universities have to compete in the open market for such skills. And with respect to capital requirements, the current procedure is similar. Although the Government guarantees and subsidizes the interest and redemption payments on loans made by the universities within pre-stated limits, the universities themselves must compete on the open capital markets for the money needed.

Under these circumstances it is not unreasonable to assume that cost functions are derived from the production functions by multiplication with a constant price, in which case the functional form remains essentially unaltered. Once provision has been made for this difference, the analysis above applies to the cost functions under review, as well as to the production functions and need not be repeated. In fact, even if this had not been the case, most of the conceptual problems would have been the same. Therefore, although some differences in functional form could occur, the analysis above retains its relevance.

CHAPTER 4

PUBLIC OR PRIVATE PROVISION OF HIGHER EDUCATION4.1 Introduction

In the preceding pages an analysis of the production of higher education was advanced. However, nothing was said of how financial provision was to be made for that production, except that in Chapter 1 two polar cases were briefly identified, namely, provision by the state and provision by the private sector. It is the aim of this chapter to return to and to amplify that topic by discussing firstly the case for the provision of higher education by the government and secondly that of private provision.

The arguments for and against both of these two possibilities have a long history and in many respects the debate remains unresolved.¹⁾ Often, too, an argument for one of the methods implies an argument against the other. The stating of the pros and cons of each independently would, therefore, entail tedious repetitions, to avoid which use has been made in the exposition below of the obvious overlaps that exist. Sections 4.2 and 4.3 should consequently be read together. Section 4.4 is devoted to examining the possibilities of combining private and governmental efforts into a mixed system for financing university education by using the positive elements of each.

4.2 The Provision of Higher Education by the Government4.2.1 Market Failure as Justification for the Public Provision of Education

It has come to be universally accepted that the government has an important role to play in the provision of higher education. Nevertheless, a distinction must be made between governmental

1) West, E.G.: 'Private versus Public Education : A Classical Economic Dispute', Journal of Political Economy, October 1964, pp. 465-76.

financial aid to education and the actual physical provision of educational services by the government. The former does not necessarily require the latter and, in fact, as will be demonstrated below, financial assistance by the government to privately owned and operated institutions has come to be of utmost importance.

The governmental provision of higher education is generally thought of as being the 'free' supply of education by the state to selected students. This definition requires qualifications in respect of the term 'free'. What is usually meant thereby in this context is that the costs of teaching are waived, but of course, teaching costs are only a part of a student's costs, which in addition to fees include board and lodging and forgone income. Because costs for board and lodging are incurred by students and non-students alike, they do not comprise opportunity costs. On the other hand, income forgone by students clearly must fall in the latter category. Consequently, to be truly free education would have to be provided not only without charge but with a grant to cover the student's full opportunity costs. Because in practice this rarely occurs, education usually commands a price, even when no user charges are made, although the fact that the price is concealed results in its usually being overlooked.

The provision of (higher) education at a near zero user charge to the student is considered by some to be desirable for several reasons. Of these some have already been dealt with in general terms in Section 2.2. For instance, the primary economic justification for public support for higher education is to be found in its public good properties. Because education gives rise to externalities, 'insufficient' education would be used, if the decisions concerning its consumption were to be left entirely to private persons. Because of these 'neighbourhood effects', as they have also been called,¹⁾ education can be considered a 'merit'

-
- 1) Friedman, M.: 'The Role of Government in Education', in Solo, R.A. (Ed.): Economics and the Public Interest, New Brunswick, N.J.: Rutgers University Press, 1955; also Becker, G.S.: Human Capital. A Theoretical and Empirical Analysis with Special Reference to Education, NBER, New York, 1964, pp. 117-121.

good, in which case interference in private decision making is justified.

The extent to which public benefits are generated by education will, in accordance with this argument, determine the extent to which the public purse can be held liable for the costs of education. In this respect, it is possible that the returns to education for society at large will vary in accordance with the type of education and its level. Undoubtedly, the strongest argument for 'total' subsidization is in respect of the first number of school years during which the basic computational skills and literacy are taught. It goes without saying that the community benefits of having one's neighbours possess these initial scholastic attributes, are considerable. They are, indeed, essential for exercising the basic rights and duties of citizenship in a democratic state. As the student progresses up the educational ladder there is arguably, however, a decline in the additional community benefits generated by a particular student's greater learning¹⁾ and thus, pari passu, reason for a less than one hundred per cent subsidy by the state. Although undoubtedly benefits for the community at large are generated by higher education, governmental intervention in the form of subsidies is only required in as far as those benefits are not adequately reflected in market prices (and wages) and thus give rise to market failure.

In a similar vein some are wont to argue, that with respect to those categories of education that provide specifically vocational or professional training, the private returns to the student outweigh those to society and that, accordingly, public financial support to those groups should be correspondingly lower.²⁾ It could however, be that the distinction is spurious, for a general higher education in, say the humanities, could open occupational possibilities no less than would a specific education in, say,

1) Friedman, M.: Op. Cit., p. 88.

2) Ibid. ; also Wiseman, J.: 'The Economics of Education', Scottish Journal of Political Economy, February 1959, p. 52.

the applied sciences or law, albeit possibilities of a more general nature. The call for differentiated subsidies in favour of the non-professional forms of higher education cannot, therefore, be supported on these grounds.¹⁾

A related, although non-economic reason for state support, is the creation of a relatively uniform set of national values that would generate social cohesion and national pride by means of a standardized education. But this is an argument that would be of less significance to higher education than to schools, besides being one that would not necessarily be endorsed by all.

Further justification for state support is that the educational effort of a country and its economic growth have been shown to be closely correlated and that, consequently, the government should encourage investment in human capital by shouldering a major portion of its costs. The difficulties encountered in trying to establish the nature of this correlation were discussed in greater detail in Section 2.5 above.²⁾

It is often argued that further justification for public support for education is to be found in the market failure associated with the financing of investments in human capital, because of the problems raised by uncertainty, risk and insufficient liquidity.³⁾ Young persons are generally uncertain of their abilities to benefit from higher education and may originate from homes that are sadly lacking in parental guidance in this respect. Furthermore, uncertainty of future events, including life-span, morbidity and academic prowess may influence a prospective student's vision of the rate of return upon his investment and may

-
- 1) Horobin, G.W. and Smyth, R.L.: 'The Economics of Education : A Comment', Scottish Journal of Political Economy, February 1960, pp. 67-74 on page 73.
 - 2) Cf. also Bowman, M.J.: 'Schultz, Denison, and the Contribution of "Eds" to National Income Growth', Journal of Political Economy, Vol. 72, October 1964, pp. 450-464.
 - 3) Becker, G.S.: Op. Cit., pp. 55-58.

result in a socially incorrect 'market' solution. A complicating factor in the case of investment in education is its highly illiquid nature, which implies that, once the investment has been made, only one way of acquiring a return exists. The asset cannot be transformed into any other or generate a dividend by any other means. Therefore, an incorrect investment remains so for ever, which discourages those of meagre means from entering the field at all.

Then again, imperfections on the supply side of capital markets could produce a similarly sub-optimal solution that could require state intervention in the form of the 'free' provision of higher education. Human capital cannot generally be offered as collateral for the purpose of raising loans to finance (higher) education, with the result that poor students may experience difficulties with procuring funds and possibly be deprived of making what could have been profitable investments. Although similar arguments are applicable to other forms of investment by young persons, the effects in the case of education may be expected to be more severe, because of the relatively long-term nature of the investment and the difficulties encountered with its postponement. Because of the reluctance on the part of outsiders to invest their money in students' education, self-financing must often be resorted to by students, especially by those envisaging a general as opposed to a technical education and consequently unable to solicit some measure of support from private firms. And undoubtedly, self-financing by the family favours those of wealthy parentage.

Market failure of a different kind occurs when economic forces exist that give rise to monopolies, as may happen if significant economies of scale are present. As has been pointed out in Section 3.4.2 above, there are reasons to believe that in the case of education, higher education in particular, such scale economies, albeit loosely defined to accommodate indivisibilities, are to be expected. The implications of such a situation are that, because growth of a particular institution results in lower average costs, small competing units are inclined to merge to reap the advantages of size. The outcome is a monopoly with

its attendant disadvantages of being able to raise prices, reduce quantities and eliminate a good deal of consumer sovereignty.

Although these disadvantages are in general serious, it is not self-evident what they in fact mean when applied to education. In as far as universities are maximizers it is unlikely that income will be maximized. If prestige is maximized, it seems possible that an increase in, rather than a diminution of quantity, i.e. students, could be implied. And considerable doubt exists whether consumer sovereignty is a meaningful concept in institutions that pride themselves on faculty autonomy. Therefore, although local monopolies may be inclined to develop in the education market, their significance seems ambiguous. Their effect, especially in the field of higher education, will in all probability also have been reduced by the speed and convenience of modern transportation.

4.2.2 Equity as Justification for the Public Provision of Education

The advocates of state provision of higher education point to the inequities that would result from educational market failures, as well as to the benefits that would arise from 'free' governmental provision of higher education.¹⁾ They argue that their case is strengthened by the apparent correlation that is believed to exist between the education received and social strata attained by parents and those of their off-springs.²⁾ On these grounds they argue that the removal of at least one of the obstacles to higher education in the way of the poor and socially disadvantaged, although by no means capable of offering a panacea for inequalities, could contribute to the removal of inequities.

- 1) Cf. Wattenbarger, J.L.: 'Student fees and Public Responsibility', in Orwig, M.D. (Ed.) : Financing Higher Education : Alternatives for the Federal Government, Iowa City, Monograph 5, The American College Testing Program, 1971.
- 2) Unfortunately the interrelatedness of numerous social and physiological factors makes the identification of such relationships extremely difficult. Jencks, C.: 'Social Stratification and Higher Education', in Orwig, M.D. (Ed.) : Op. Cit., and Blaug, M.: An Introduction to the Economics of Education, Middlesex, Penguin Books, 1970, pp. 32 - 46.

Unfortunately, it is not certain that this will necessarily follow. Firstly, if the relationship noted in the previous paragraph does generally hold, it would appear to suggest that 'free' governmental provision would be an ineffective instrument for achieving the stated goal. Secondly, although financial matters are no doubt of importance, one study, at least, found that parental income had relatively little influence upon university admissions.¹⁾ It is also possible that some enrolled students receive no parental support, but fend for themselves on the earnings of their holiday work. In fact, it has been alleged that the greater financial source of inequality of opportunities is the absence of support in the final school years for impoverished students who have passed the legal school-leaving age. School holidays and requirements are less convenient for part-time work than are the university equivalents. The pressure upon poor students to leave school and find full-time employment is consequently greater. But the successful completion of school is a prerequisite for university admission.²⁾

From the point of view of equity, some have asked if it is not inequitable to confine subsidies to those who are able and eligible to go to universities, rather than to provide subsidies for all of university-going age.³⁾ As Johnson has phrased it: "Superior intelligence or skill is undoubtedly more economically useful than the absence of it, but discriminating in favour of it by fiscal subsidization will not necessarily produce a more democratic and poverty-free or egalitarian society."⁴⁾ It would

-
- 1) Jencks, C.: Op. Cit., pp. 88-97; also Correa, H.: The Economics of Human Resources, Amsterdam, North-Holland Publishing Co., 1963, Chapter VII. Cf. Section 4.4.3 below.
 - 2) Cf. Blaug, M.: Op. Cit., p. 306; also Pechman, J.A.: 'Note on the Intergenerational Transfer of Public Higher-Education Benefits', Journal of Political Economy, Vol. 80, no. 3, Part II, May/June 1972, pp. S 256-259. See also Froomkin, J.: Trends in the Sources of Student Support for Postsecondary Education, Iowa, American College Testing Program, Special Report 16, 1975, p. 23, where the importance of student earnings in financing higher education is emphasized.
 - 3) Ibid.
 - 4) Johnson, H.G.: 'The Alternatives before Us', Journal of Political Economy, Vol. 80, no. 3, Part II, May/June 1972, pp. S280 - S289 on p. 289.

be possible to investigate the relationships between university fees, per capita national income and student enrolments. However, considered opinion has it that what could be of greater importance than financial ability is the attitude adopted both by the potential student and his parents towards university attendance. Perception of the need for and the will to achieve a higher education can be of overriding importance for a student's success at university.¹⁾

Equity should, of course, be viewed against the broader backdrop of society as a whole. Public or state provision of higher education, which requires taxation of the community for the provision of funds, cannot therefore be judged in isolation. In an important sense, what occurs if this method of financing is resorted to, is a redistribution of income and wealth from one section of the community, the taxpayers, to another, the students. Now, the correlation between higher education and future earnings has been well established, even though doubt exists as to the causality involved: although a degree does not of itself generate higher earnings, it has certainly become the most convenient key to the portals of future financial success.²⁾ The question to be asked is, accordingly, if it is equitable to tax the community at large, including its poorer members, to subsidize a group that will undoubtedly become its more affluent portion in the future.

-
- 1) Jencks, C.: Op. Cit., pp. 88-97; Bowles, S.: 'Schooling and Inequality from Generation to Generation', Journal of Political Economy, Vol. 80, no. 3, Part II, May/June 1972, pp. S219-S251, comes to the conclusion that, despite some evidence to the contrary, '... a surprisingly strong relationship (exists) between socio-economic background on the one hand, and educational attainments and income on the other' (p. S239). Psacharopoulos, G. and Soumelis, C. found in a study of Greek schoolleavers that school grade dominated in affecting plans for further study. And parents' education was the dominant variable in determining school grade. 'A Quantitative Analysis of the Demand for Higher Education', Higher Education, Vol. 8, no. 2, 1979, pp. 159-177.
 - 2) Cf. Section 2.2 above.

The financing of 'free' higher education in this way could have regressive effects, as has been demonstrated in one study of the system of public colleges and universities in California. It was estimated that the families of the upper income students paid approximately one-third of the overall state and local taxes which support the state's higher educational system, whereas they enjoyed about seventy-five per cent of the advantages of the 'free' higher education provided.¹⁾ The regressive nature of the current system of higher education charges could be emphasized by regarding tuition and other fees as user taxes, which form a greater percentage of the incomes of poor families than those of the rich.²⁾

The counter-argument to that raised in the preceding paragraph is that it is not useful to consider only one public service in isolation, for in total there are likely to be others that more than compensate for this effect of the current methods of financing higher education. In addition, the initial argument overlooks the important market failures inherent in the provision of education, particularly that caused by the externalities arising from education's public good properties.³⁾ Clearly, public benefits arise from the education of both the rich and the poor. And when it is remembered that forgone earnings usually constitute a major portion of total costs and are borne by students alone, state subsidies often cease to look exorbitantly high.

It can be demonstrated that a related effect of the present method of subsidizing higher education, but, however, one that operates effectively through the market mechanism, indirectly benefits those who do not go on to receive university training.

-
- 1) Hinson, J.P.: 'Higher Education - How to Pay', New England Economic Review, March/April 1971, pp. 3-22 on p. 5.
 - 2) Johnson, J.L.: 'Setting Tuition Levels at Public Institutions: The Case of the University of Washington', Journal of Higher Education, Vol. XLVII, no. 2, March/April 1976, pp. 125-139.
 - 3) Bowen, H.R.: 'Finance and the Aims of American Higher Education' in Orwig, M.D. (Ed.): Op. Cit., p. 160.

It could be termed the 'relative wages effect' of the subsidy, because over time it raises the wages of those occupational groups which do not require university training relatively to those groups which do. This occurs because, if higher education is subsidized, the private costs of the student are reduced. More students are consequently attracted to the universities and eventually find themselves in white collar occupations. The effect thereof on the blue collar job market is that the supply of aspirant workers is reduced, which will, if other things remain equal, induce a wage rise. On the other hand, the increased supply of white collar workers reduces the wage in that market. Respectively, therefore, the university subsidy could alter the levels of wages to the benefit of the unsubsidized group.¹⁾

4.3 The Provision of Higher Education by the Private Sector

4.3.1 Decentralization as Opposed to Centralization

The provision of higher education by the government, as described in the previous Section, contains many characteristics usually associated with centrally planned or socialist economies. The basic tenet of socialism is the centralization of economic activity as occurs, for example, when education is provided and administered by the state. In fact, socialism is usually defined in economics as a system in which control over production is "... vested with a central authority - or, ... in which, as a matter of principle, the economic affairs of society belong to the public and not to the private sphere."²⁾ Production is centrally controlled with the aid of detailed planning. But centralized decision making can only be undertaken if sufficient information on the relevant conditions is available to the planners, therefore communication channels must be in operation between all

-
- 1) Kottis, A.P. and Kottis, G.C.: 'Public Subsidies to Higher Education: A Mathematical Analysis of the Impact on the Supply and Salaries of College Graduates', Finanzarchiv, 32(2), 1974, pp. 305-12.
 - 2) Schumpeter, J.: Capitalism, Socialism and Democracy, London, Unwin University Books, Eleventh Impression 1966, p. 167.

the relevant spheres of the system. This is usually achieved with the aid of a pyramidal, administrative structure and a complicated bureaucratic system, in which decision making is the prerogative of the higher echelons and implementation the task of subordinates. This often leads to alienation from the planner's ideals as far as lower order managers are concerned and to confusion of means for ends by those who are unable to gain a comprehensive view.¹⁾ Plans are, in addition, sometimes intentionally misinterpreted to suit sectional interests; information sent to the planners on input needs and output possibilities is phrased to benefit the lower order manager, which leads to the wrong or inefficient allocation of resources.

On the other hand, the foundations of capitalism are individuality and the decentralization of economic activity applied to consumers and producers alike. Decentralization implies the existence of numerous decision units that are not administratively linked and which may, in fact, be economically in opposition to one another. Decisions are taken independently to further personal gain or corporate profit, which is the primary motivating force. Each unit acts in competition with other units on the economic information it has at its disposal, consisting of the market price, information on present market conditions and expectations for the future.

The co-ordinating mechanism of a decentralized economic system is the market, which solves the problem of pricing and which ordinarily requires decentralization for its efficient functioning. Pricing implies, firstly, the automatic inflow of information on production possibilities, consumer preferences, conditions in the markets of other goods, income, time preferences,

-
- 1) Bergson, A.: 'Sources of Soviet Economic Inefficiency', in Feiwel, G.R.(Ed.): New Currents in Soviet-Type Economies, Pennsylvania, International Textbook Co., 1968. These and other problems encountered by centralized economic systems have been well documented. See for example: Wilczynski, J.: Socialist Economic Development and Reform, London, MacMillan Press Ltd., 1972; and by the same author: The Economics of Socialism, London, George Allen and Unwin Ltd., 2nd Edition, 1972.

speculation; and secondly the computation of an index of scarcity or opportunity costs. The application of these prices determines resource allocation and, through the pricing of original factors, also the distribution of income. The whole operation is performed automatically via the natural adaptive techniques of processing the vast amount of information, which flows into the market, and the instantaneous adaptability of the prices themselves.¹⁾

As is the case with centralized systems, decentralization is not devoid of problems, some of which have been alluded to above in Section 4.1 as market failures. Nevertheless, on the strength of several simplifying assumptions, it is possible to deduce that a freely functioning market model will produce an 'optimal' configuration of prices that will allocate resources 'efficiently'. The mechanics of such a model were outlined in Section 2.7 and the model itself called a 'perfect market model'. This is the model to which the protagonists of the private provision of education resort, when seeking support for the thesis that educational interests will be better served by the absence of state provision. As has been explained, this does not imply that there should be no state support for education, as indeed a system of governmental educational vouchers²⁾ is usually advocated to supplement the private provision of education. What is meant is that a 'free enterprise' system could help solve many of the difficulties encountered in a centralized system.³⁾

The arguments in support of such a scheme may be approached from the premise of individual freedom, which is assumed to be desirable, and the obverse of which is individual responsibility, including the responsibility for educating one's own children. This implies that parents should be held accountable for the

-
- 1) Lange, O.: 'The Computer and the Market', in Feinstein, C.H. (Ed.): Socialism, Capitalism and Economic Growth, Cambridge, Cambridge University Press, 1967.
 - 2) Vouchers are discussed in Section 5.2.3.
 - 3) Wiseman, J.: Op. Cit., and Friedman, M.: Op. Cit.

costs of their offspring's education, at least in as far as private gains are derived from their education. The exceptions allowed by the advocates of this approach are for the externalities, monopolies and other causes of market failure that have already received attention above. They argue that provision should be made for these shortcomings by offering governmental financial assistance in some form or other, for example by means of grants, loans and subsidies (possibly in the form of vouchers), but not by governmental administration of all educational institutions. And to ensure that the full social benefits are realized, legislation on minimum standards for and duration of formal education should be enacted and enforced by inspection.

4.3.2 The Potential Advantages of the Private Provision of Education

The advantages that are hoped for from such a system are said to be numerous. Firstly, it is believed that the administrative problems, associated with centralization and analysed above, can be avoided. Secondly, it is argued that the cumbersome procedure, whereby taxes are levied upon parents and channeled through the state coffers, only to be redirected to the institutions at which the parents themselves would have spent their educational budgets, would be replaced by a direct form of payment, in any case for the amount equal to the private benefit received by each user. If this were to be done, consumer choice, if not sovereignty, could be reintroduced into education. Parents or students would be able to choose educational institutions in accordance with the ratio of their perceived benefits from a particular institution on the one hand to, on the other, its costs (in excess of the standard subsidy advanced by the state to all institutions alike). Thereby students would be able to make rational choices with respect to their expected rates of return on their private investments, or with respect to their enjoyment received from the consumption of education.

It is believed that considerable educational diversification would become possible. Users of education would be able to choose institutions, established in response to their demand,

according to their emphasis, say, upon academic learning or athletics, music or metalwork, depending upon their particular tastes and aptitudes. In contrast, under a system of state provision, all are constrained to the average, with the exception of those who withdraw entirely from the system by choosing a private educational institution, if available. And the fact that some do, in fact, make such choices, despite their then having to pay for education twice, as it were, (once in taxation and once in school fees), emphasizes the desirability of the scheme. By the same token, it is argued that higher or additional costs would only be incurred by those whose gain in consumer welfare warranted better or more education, by which a more efficient allocation of resources could be ensured. Academically weak students would not be encouraged to prolong their studies unduly by having the costs of education concealed by the payment of governmental subsidies to all alike.

On the supply side, it is believed that efficiency, variety and flexibility could be enhanced by the competition that would ensue from educational freedom of choice. It is said that schools and universities would supply what was desired by parents and students for fear of forfeiting the income derived from fees, and what was desired would be what was considered relevant for the betterment of the particular student's future career prospects. Curriculum requirements would display a hitherto unknown alacrity of adaptation and be freed from the shackles of academic traditions and administrative bureaucracy. The proposed system could also be employed to make faculty and teaching staff salaries more susceptible to the forces of supply and demand, from which they are shielded if salary scales are administered by a nationalized education 'industry'. It is alleged that if that were to be done, the imbalances in the supply of the different categories of teacher, often experienced in centrally administered educational systems, could be

ameliorated.¹⁾

It has been suggested by some that the attributes of the market could be used beneficially within universities as well as between them.²⁾ In essence the logic is similar to that applicable to students' choices of institution: students should purchase their educational requirements from departments within the university so that the budget of each department would be determined by the sale of teaching to students and research to clients. If these were inferior or of a kind not generally wanted, the department would automatically be forced to update its curricula, improve its standards, research relevant topics or reduce its staff because of dwindling income. Provision would again be made for social benefits and fundamental but non-saleable research by means of subsidies. Auxiliary services within the university would be provided on a similar basis, with prices being charged for the use of administrative and library facilities by departments, as well as for the use of building space to ensure efficient use.

4.3.3 The Necessary Conditions for the Optimal Private Provision of Education

Now, it was stated above, that if certain assumptions were made, it could be demonstrated that the perfectly competitive market model would allocate resources efficiently, which is the result upon which much of the foregoing was based. This conclusion requires further analysis, because unfortunately it suffers from

-
- 1) On the other hand it has been argued that because of imperfect information flows, especially about future demands upon the educational system, planning by individual universities is complicated. Centralization could minimize the uncertainties and enhance efficiency. Archibald, G.C.: 'On the Measurement of Inputs and Outputs in Higher Education', in Lumsden, K.G.: Efficiency in Universities : The La Paz Papers, Amsterdam, Elsevier Scientific Publishing Co., 1974, p. 129. The effects upon academic freedom of exposing universities to the forces of supply and demand are also unlikely to be exclusively positive.
 - 2) Hoenack, S.A. & Norman, A.L.: 'Incentives and Resource Allocation in Universities; Journal of Higher Education, Vol. XLV, no. 1, January 1974, pp. 21-37.

several shortcomings stemming from the model's assumptions, if attempts are made to apply the model to what one may call 'reality'.

In Section 2.2 the relevance of the so-called 'theory of the second best' for the standard welfare results of optimality and efficiency were sketched in general terms. There it was pointed out that if the requirements of all the conditions for optimality were not met, one could not be certain that insistence upon satisfying the remaining conditions would not detract from, rather than add to welfare. The problem for the proposed market model for university finance is that it is almost certain that the assumptions necessary for the theoretical results will not hold in practice.¹⁾ And if they do not, there is in fact no theoretical justification for the use of the model at all.²⁾

Some of the more important assumptions required for a perfectly competitive market to exist are: that the product should be homogeneous that each economic agent should be so small, in relation to the total market, that it is unable to influence the market price by changes in its quantity demanded or produced; that there should be freedom of entry and exit to the particular industry; that there should be knowledge of the different products now and in the future; and that market failures, for example as caused by externalities, should not exist. Scrutiny of the higher education market place reveals that almost invariably none of these critical assumptions holds in reality.

In the preceding pages reference was made to a variety of market failures and ways of compensating for these were proposed. However, the other requirements of the theoretical construct are not as easily disposed of. Firstly, the homogeneity requirement

-
- 1) Leslie, L.L. and Johnson, G.P.: 'The Market Model and Higher Education', Journal of Higher Education, Vol. XLV, no. 1, January 1974, pp. 1-20.
 - 2) Cf. Graaff, J. de V. : Theoretical Welfare Economics, Cambridge, University Press, 1957, Chapter X.

is certain to be violated in an academic environment that cherishes autonomy. Courses bearing similar titles invariably differ markedly in content from one university to another, so that the resulting product differentiation could be said to resemble the imperfect rather than the perfect market model of economic theory. It is also to be doubted if, in a relatively small country like South Africa, a sufficiently large number of institutions exists to foster the price-taking required for perfect market conditions. As economic theory does not even provide a sufficient measure of the latter, the application of theory to practice raises severe methodological doubts. Furthermore, the requirement that students have sufficient knowledge of the various options at the different universities as well as of the advantages now and in the future of each of these options, as also the absence of (geographical) obstacles to the exercising of any option, is hardly likely to be fulfilled in practice.

One must conclude that the nature of the unmet assumptions are such that the advantages attributed to the practical implementation of a market mechanism remain enigmatic. This cannot be refuted by referring to the current global dominance of market economies, because of the absence of any objective measure with which the welfare of differing societies' achievements may be judged. Ultimately, preference for a particular system rests largely either upon belief or upon a political value judgement with respect to personal liberties and the role of the state.¹⁾

1) Cf. Leslie, L.L. and Johnson, G.P. : Op. Cit., p. 19. Although these theoretical conclusions are correct, some measure of pragmatism is necessary when seeking solutions to practical problems. If this were not acknowledged, cost benefit analysis, for example, which is based upon similar theoretical assumptions, would not be usable. The methodological inconsistency implied by such an approach was outlined briefly in Section 1.2.

4.4 Mixed Financing of Higher Education

4.4.1 General Considerations

The system in use in South Africa for financing universities relies both upon state support and student fees supplemented by donations. As such it may be considered to be a mixed system that aims to combine the best components of both the public and private methods outlined above. Considerable state support in the form of subsidies helps overcome the major deficiencies of a market mechanism for education on the one hand without on the other dispensing with its commendable attributes.

Decentralization via the market has the important advantage of easing the administrative and bureaucratic burdens associated with centralization. But a market mechanism relies upon prices to act as indicators of the relative scarcity of resources. In the education market, prices in the form of fees charged for tuition and other services are important, firstly, because they generate a not insubstantial portion of the universities' incomes and, secondly, because they form part of the basis upon which private decisions as to the desirability of pursuing a university education are made.

In this section the benefits and complications of a mixed system of financing universities are investigated. Attention is given to the importance of pricing educational services 'correctly', so as to solicit the best possible decisions by those who use educational resources. Ways of making provision for the effects of market failure upon those private decisions are suggested and the effects of pricing upon the flow of funds to the universities are considered. The importance of financial aid to students necessitates a separate chapter, despite its being a partial response to market failure and is, accordingly, dealt with in Chapter 5.

4.4.2 Pricing University Instruction¹⁾

The purpose of a price system is to allocate resources amongst competing ends in the sense that the resources are entrusted to those who are prepared to pay for them. It follows, therefore, that prices should be 'correct' so as to ensure that society's scarce resources are optimally used. In Section 2.6.4 and the accompanying Appendix it was explained that certain assumptions allowed one to deduce that optimal pricing is achieved if prices are set equal to marginal costs. This result was justified by the assumption that rational consumers will base their demands upon the benefits they receive and are good judges of the latter. Accordingly, if someone is prepared to pay the costs of producing a good, the benefits to him of the purchase are considered to exceed the costs and its production is judged to be a good thing. Alternatively, if the production of an additional unit of, say, education brings greater costs than benefits, it is considered best not to produce it. An optimum exists once production has been expanded to the point where marginal cost equals price as determined by demand. If pricing is done in this way, the private behaviour of individuals in the economy will result in a socially satisfactory allocation of resources.

As has been repeatedly stressed above, however, private and social benefits and costs may diverge, in which case privately rational decisions would lead to socially incorrect solutions. These and other forms of market failure prevalent in reality, it was decided, render the goal of efficiency, in a general equilibrium sense, unattainable. Nevertheless, much can still be said about efficiency in the Pigovian piecemeal tradition of comparing social and private costs and benefits; and marginal

-
- 1) Danière, A.: Higher Education in the American Economy, New York, Random House, 1964, suggests many of the ideas on educational pricing discussed in this section. See also Harris, S.E.: 'Higher Education in the United States : The Economic Problems'. Supplement to The Review of Economics and Statistics, Vol. XLII, August 1960, no. 3, part 2; and Tollison, R.D. and Willet, T.D.: 'A Proposal for Marginal Cost Financing of Higher Education', Public Finance, Vol. 27(3), 1972, pp. 375-380.

cost pricing may still be a convenient point of departure for pricing decisions in a decentralized economy.¹⁾

Because global efficiency is no more easily achieved in principle under centralization than under decentralization, the former does not present an easy alternative. In fact, decentralization via a market mechanism may be the best possible solution to the practical problems of administering a particular system. The allocation of resources is often more readily achieved with the aid of prices than by administrative edict.

Prices are, of course, in use in the South African higher educational system, which implies that their effective use is to be advocated. It therefore becomes necessary to analyse the effects of various pricing policies upon the supply of and demand for higher education. A number of issues assume importance in this respect.

4.4.2.1 The Elasticity of Demand for Education

If the demand curve for, say, university places by students has a normal, negative slope, lowering the tuition fee charged for admission must result in more students wishing to attend universities. The ultimate effect upon enrolments will depend upon the elasticity of demand for higher education. In this respect it is necessary to distinguish between the influence of price and those of social status and income upon the demand for higher education.

The Influence of Price : Unfortunately, virtually nothing is known of the empirical demand curve or its elasticity for South

1) Cf. Section 1.1 for a brief discussion of the methodological problems of interpreting the theoretical conclusions in a pragmatic fashion. Rusk, J.J. and Leslie, L.L. found that fees in U S A universities have largely been set on the basis of historical practices in an evolutionary rather than planned way. 'The Setting of Tuition in Public Higher Education', Journal of Higher Education, Vol. XLIX, no. 6, Nov./Dec. 1978, pp. 531-547.

African universities. However, empirical work has been done for foreign universities, mostly with the aid of econometric analysis, but also by simply asking students about their potential responses to changes in fees. Besides the limitations of the available data, many of the standard econometric problems are encountered in studies of this nature. Firstly, the demand function can only be estimated if sufficient variation in price occurs; secondly, provision must be made for the many other factors that can influence a student's decision whether or not to enrol. For example, student and parental income and social status, the courses offered by the universities, the ease of gaining admission, the availability of competing institutions of higher education and the student's location with respect to the university could all influence enrolments. Thirdly, the demand function must be econometrically 'identifiable'. Nevertheless, even if provision is made for all the potential discrepancies, the conclusion arrived at is that the price elasticity of demand for university places is low.¹⁾

Jackson and Weathersby, in a review of seven major demand studies, concluded that in all cases a statistically significant negative relationship existed between enrolment and the prices of university admission. However, the price effect was relatively small and decreased with increasing income, implying that the demand from richer families is relatively more inelastic than that from poor families.²⁾ Hoenack and Weiler estimated demand elasticities for the University of Minnesota and concluded that cost-related tuition policies would have overall beneficial financial results,

-
- 1) McPherson, M.: 'The Demand for Higher Education', in : Breneman, D.W. and Finn, C.E. (Eds.): Public Policy and Private Higher Education, Washington, Brookings Institution, 1978. Also, Campbell, R. and Siegel, B. : 'The Demand for Higher Education in the United States, 1919-1964', American Economic Review, 57, 1967, pp. 482-494.
 - 2) Jackson, G.A. & Weathersby, G.B.: 'Individual Demand for Higher Education - A Review and Analysis of Recent Empirical Studies', Journal of Higher Education, Vol. XLVI, no. 6, Nov./Dec. 1975, pp. 623-652.

implying therefore that the 'average' demand elasticity for the various subject groupings was small.¹⁾ Ghali et.al. found a price inelastic demand for enrolments at the University of Hawaii.²⁾

A low price elasticity means that a change in student fees would have a less than proportional effect upon enrolments. One of the explanations for this phenomenon, that could be advanced, is that, because the price of a university education in terms of student fees is but one part of the total costs, its influence upon enrolments is reduced. The magnitude of subsidies and forgone incomes largely account for this effect.

Hansen illustrates the point with the aid of an example in which a two year degree programme is assumed to have a private rate of return equal to 11.5 per cent when the student pays 30 per cent of total teaching costs. If tuition fees are abolished, the private rate of return rises to 12 per cent and with tuition fees set to cover full teaching costs, the private rate of return falls to 10.3 per cent.³⁾ Because forgone earnings play such a major role in determining total private costs, the effect of university fees is not large. A low price elasticity of demand may, therefore, be hypothesized.

It could be hypothesized that the price elasticity of demand could differ according to social group, in which case the equity arguments raised in Section 4.2.2 could acquire greater pertinence. It would, however, be difficult to stratify most available data

-
- 1) Hoenack, S.A. and Weiler, W.C.: 'Cost-Related Tuition Policies and University Enrollments', Journal of Human Resources, 10,(3), Summer 1973, pp. 332-60.
 - 2) Ghali, M., Miklius, W., and Wada, R.: 'The Demand for Higher Education Facing an Individual Institution', Higher Education, Vol. 6, no. 4, Nov. 1977, pp. 477-487.
 - 3) Hansen, W.L.: 'Equity and the Finance of Higher Education', Journal of Political Economy, Vol. 80, no. 3, part II, May/June 1972, pp. S.260-273 on p. S.267.

according to social class in order to investigate this problem empirically. Indeed, it seems that no attempts to achieve this have as yet been made. Nevertheless, if one were to distinguish between two broad groups, a low income group and a high income group, it would not be surprising to discover that the demand curves of both groups were price inelastic.

In the case of the poor, this could be justified a priori by noting the strong effect of rising incomes upon the demand for education¹⁾, which seems to indicate that the decisions of the poor to purchase education are influenced more strongly by their incomes than by the price of education. In addition, the opportunity costs of forgone income are often particularly high for this group.

In the case of the high income group, a low price elasticity is equally likely, because the decisions of the affluent to acquire university education are rarely affected by considerations of price, at least not when the level of fees is already low as a result of governmental subsidies. A second reason could be the high esteem granted to the graduate, which enhances the inherent desirability of a degree.

An exception to the general rule of a low price elasticity in respect of the demand for higher education could possibly be found, if a further distinction were made between those who had already gained admission to a university and new students. With respect to those who had already gained admission or who had already decided to do so, the hypothesis of a low price elasticity could prove inappropriate. The units of education demanded by this group, whether measured in years of university attendance or some other way, could indeed be sensitive to price changes, particularly in the sense that low prices could encourage students to stay at universities for lengthy periods. If this is correct, (and unfortunately little empirical evidence

1) Cf. the section on the effects of social class and income below.

exists)¹⁾ the group of students to whom this assumption applies may be considered to have developed preferences for university education as a consumption good.

The Influence of Social Class and Income : Although a low price elasticity of demand has been hypothesized for both the low and high income groups, the influence of social status and income upon the demand for higher education could be greater than proportional. The available evidence is particularly strong in the case of social class. Numerous studies have identified a strong positive relationship between status in society and the demand for (higher) education, indicating that relatively more interest is shown for university education by the higher echelons of a community than by the lower strata.²⁾

With respect to the influence of income upon the demand for education, the different authors offer partially conflicting research results. Jencks, for example, found that parental income had comparatively little influence upon the demand for university places.³⁾ However, Bolton came to the conclusion that purchases of higher education are highly correlated with family income.⁴⁾

Because it is conceivable that social class and income are themselves often highly correlated, one could conclude that the combined effects of these are, that as either increases, the demand for higher education can be expected to increase more than proportionally.

-
- 1) Cf. Section 4.4.2.2. below.
 - 2) Jencks, C.: Op. Cit., Blaug, M. : Op. Cit., pp. 32-46; Committee on Higher Education : Report (The Robbins Report), Vol. 4, London, H.M. Stationery Office, Cmd. 2154, 1963, par. 137-143; Bowles, S.: Op. Cit., p. S.239; and Psacharopoulos, G.: Op. Cit.
 - 3) Jencks, C.: Op. Cit.
 - 4) Bolton, R.E.: 'The Economics and Public Financing of Higher Education', in Joint Economic Committee, Congress of the United States: The Economics and Financing of Higher Education in the United States, Washington D C., U S Government Printing Office, 1969, p. 61.

4.4.2.2. The Consequences of Changes in Tuition Fees

The consequences of a low price elasticity of demand are important. In a sense they imply that pricing policy is a relatively blunt instrument for regulating the demand for university education, which conflicts to a certain extent with the ideas put forward in Section 2.6.3.¹⁾ There it was argued that if prices were set equal to marginal costs, a reasonably 'efficient' flow of resources to higher education could be expected. Although the rationale of this approach is not disproved by a low price elasticity, its efficacy is impaired. On the other hand, the notion of marginal cost pricing was advocated as a corollary of the cost-benefit technique or rate of return approach. And the evidence cited above does not conflict with the latter. On the contrary, Handa found that the effect of expected earnings upon completion of a degree had a strong influence upon enrolments.²⁾ This illustrates the importance of the rate of return approach when applied to total (expected) incomes and costs. As already noted, the problem with university pricing policy is that student fees account for a relatively small part of total costs only.

Although a low price elasticity would mean that pricing policy would not have as large an impact upon the total resources going to higher education as previously surmised, the setting of fees is nevertheless of great importance for the division of the financial burden of those resources between students and state. A low price elasticity means that students would on average be prepared to pay more for approximately the same amount of education,³⁾ that is, unless the demand curve for education is 'kinked' - a possibility that will be considered below. However, if it is assumed that that is not so, at least in respect of a

-
- 1) This insight is attributable to Dr. R.H. Venter.
 - 2) Handa, M.L. and Skolnik, M.L.: 'Unemployment, Expected Returns and the Demand for University Education in Ontario : Some Empirical Results'. Higher Education, Vol. 4, no. 1, February 1975, pp. 27-43.
 - 3) Hoenack, S.A. and Weiler, W.C.: Op. Cit.

majority of students, universities could well consider turning to fees to alleviate their financial plight.

As was noted in Section 4.2.2 the consequences of a low price elasticity for increasing enrolments from society's lower strata (via reduced fees) is that a less than proportional increase in enrolment will occur. Attempts at increasing these enrolments by decreasing fees will, therefore, be a very costly process, because the total loss in tuition fee income for the universities involved will be high in relation to the new enrolments generated.

In addition, if fees were lowered, increased enrolment from the higher social strata would be induced, unless discriminatory pricing were resorted to, as will be discussed more fully below. Accordingly, university income will be adversely affected from this side as well and the rich will receive a windfall gain that may conceivably be devoted to the trappings of their children's student existence - expensive motorcars, lavish living and the like have become a not unfamiliar campus phenomenon.¹⁾ In times of financial stringency as currently experienced by most universities, the possibility of such effects of lowering fees requires serious attention. Although fees generally provide only a fraction of a university's total income, they remain very important for the financial wellbeing of most institutions.²⁾

Because of a low price elasticity, lowering fees will only partially stimulate demand, whilst possibly decreasing the supply of (quality) education for lack of funds - an effect not associated with loan or scholarship programmes that are, however,³⁾ equally effective for overcoming most market deficiencies.

- 1) Cf. Hansen, W.L.: 'Income Distribution Effects of Higher Education', American Economic Review, Vol. 60(2), May 1970, pp. 335-340.
- 2) Harris, S.E.: Op. Cit., p. 12.
- 3) Eckstein, O.: 'The Problem of Higher College Tuition', The Review of Economics and Statistics, Vol. XLII, no. 3, part II, Supplement, August, 1960, pp. 61-72.

Lowering tuition fees will increase enrolments, even though the effect is likely to be less than proportional. This increased demand is a rational response when seen from the perspective of the individual student, who will naturally take only his private costs into consideration. The fact that the social costs of his education are almost invariably higher is usually concealed from the student by subsidies, either from the government or from accumulated university resources. Unless the external or neighbourhood effects of this expenditure upon education happen to equal the discrepancy between private and social costs, pricing below costs will result in too many resources being directed to education.¹⁾ The degree to which this occurs will depend on the price elasticity and the discrepancy between price and cost. If, as was submitted above, the price elasticity is low, a less than proportional effect will follow; and if the difference between private and social costs is great, the effect will be large. If, for example, a policy of 'free' university entrance (i.e. free of tuition fee charges) is followed, education will be used till the marginal benefit to the student has fallen to a correspondingly low level, i.e. considerably more than would otherwise have been used.²⁾

The effect of lowering tuition fees in respect of those students who had already gained (or decided to gain) admission to a university and who are likely to be sensitive to price changes, could be a greater than proportional increase in the duration of studies undertaken, as mentioned above. This has indeed been

-
- 1) Schultz, T.W.: 'Optimal Investment in College Instruction : Equity and Efficiency', Journal of Political Economy, Vol. 80, no. 3, Part II, May/June 1972, pp. S2 - S30. See also, Hansen, W.L. and Weisbrod, B.A.: 'A New approach to Higher Education Finance', in Orwig, M.D. (Ed.) : Op. Cit., pp. 117-142.
 - 2) Cf. Robinson, M.J.: 'Government Subsidy to Higher Education : Benefits, Costs and Non-Economic Value of the Policy' American Journal of Economics and Sociology, July 1971, 30(3), pp. 159-174.

evidenced in some quarters where admission charges have been reduced drastically.¹⁾ The monetary incentives to acquire a degree in the minimum period possible and to terminate study at a level realistic to the student's intellectual capability are removed. The result is over-investment in education and wasted resources.

One may inquire whether, in the light of tuition fees being no more than part of total costs, the effects just described are likely to be significant. When opportunity costs are totalled, fees are indeed a relatively small part, which would seem to suggest an insignificant effect, but forgone income may more readily be accounted for, simply by sacrificing the frills of affluence and living an ascetic life, than can direct expenditures. Therefore, if a student's taste for education is well developed, low fees could have a greater effect upon his demand than his opportunity costs would have the analyst suspect.²⁾

Despite these considerations the inverse of lowering fees, namely increasing student charges, has been sharply criticized for its possible effects upon the composition of the student body.³⁾

Although of course higher fees would be likely to influence potential enrolment from poor families negatively, it has been argued that the effect may be greater than proportional in percentage terms. Again, empirical evidence, in particular evidence of relevance to the South African situation, is sadly lacking. Nevertheless, even though this argument seems to be in prima facie contradiction of the low price elasticity suggested above,

-
- 1) For example in West Germany. Source: Prof. Dr. G. Turner, Präsident der Westdeutschen Rektorenkonferenz, Personal Interview, March 1981. See also: Hinson, J.P.: Op. Cit., p. 2.
 - 2) On the other hand, those who are really poor (and for whom the benefits of low fees are primarily intended), may find that the opportunity costs of forgone income are too great to warrant university attendance, even if tuition fees are zero. Cf. Hansen, W.L. and Weisbrod, B.A.: Op. Cit.
 - 3) Cf. Harris, S.E.: Op. Cit.

it need not necessarily be so. It is possible to envisage a situation in which a price fall would not increase enrolment significantly, but in which a price rise would have a significant but opposite effect. If that were to be so, the demand curve would be similar to the 'kinked' curve familiar to oligopoly theorists and the necessity of using policy measures other than fee adjustments to achieve the goal of increased enrolments from poor or other socially disadvantaged groups would be emphasized.¹⁾

One alternative policy measure is that of price discrimination, by which is meant that different groups are charged different fees. The necessary conditions for discriminatory pricing are: that the total market should be divisible; that each subsection should have different elasticities; and that it should not be possible to resell a commodity bought in a low-price market in a high-price market.²⁾ In education markets the last of these conditions is met and requires no comment; the second is not unlikely to be fulfilled either, even if the elasticities in both groups are less than one; and the first is possible in principle, even though practical implementation may not be easily accomplished.

The method most readily available for implementing discriminatory pricing is that of offering rebates on tuition and other fees in the form of bursaries or scholarships.³⁾ The effect is one of reducing fees for the selected group. The advantage

- 1) Cf. Jenny, H.H.: 'Pricing and Optimum Size in a Non-Profit Institution: The University', American Economic Review, Vol. LVIII, no. 2, May 1968, pp. 270-283 on p. 275.
- 2) Koutsoyiannis, A.: Modern Microeconomics, (Second Edition), London, MacMillan, 1979, p. 192. Also Kaysen, C.: 'Some General Observations on the Pricing of Higher Education', The Review of Economics and Statistics, Vol. XLII, no. 3, Part II, Supplement, August 1960, pp. 55-60.
- 3) Cf. Hoernack, S.A.: 'The Efficient Allocation of Subsidies to College Students', American Economic Review, Vol. 61, no. 3, June 1971, pp. 302-311.

of such a scheme is that candidates for financial aid present themselves of their own accord, which obviates the need to administer a universal needs test to gauge the financial plight of new entrants. The disadvantage is, however, that even the well publicized existence of a scholarship fund may be insufficient to overcome the initial scepticism raised by high nominal fees in the minds of potential students and may thus be a determining factor in the decisions of those with less than average tenacity. And with respect to university admissions, as was pointed out above, these may be those for whom the aid was intended.

4.4.2.3 The Desirability of Increased Enrolments

The questions to be answered next are, firstly, whether increased enrolment will enhance or detract from society's welfare, and secondly, whether the increased duration of a study period could be said to be detrimental if the student derives benefit therefrom and is acknowledged to be the best available judge of his own well-being. The answers are, needless to say, interlinked and related to the problems discussed in Section 2.6. In principle, if the social benefits that result from a higher enrolment exceed the social costs incurred, the effects will be positive and should be endorsed. However, if the opposite were to be true and the net social benefits were to be negative, the result would be a prodigal use of resources. That is, if low prices reflect low costs to society of making the necessary provision, all is well. The danger, however, lies in the provision of education below cost (even once all external effects have been accounted for) and allowing free access at that price, in which case welfare may be detrimentally affected.¹⁾

Clearly, if additional resources are to be deployed, welfare will be enhanced by their most effective use. But no a priori

1) See: Nerlove, M.: 'On Tuition and the Costs of Higher Education: Prolegomena to a Conceptual Framework', Journal of Political Economy, Vol. 80, No. 3, Part II, May/June 1972, pp. S.178-S.218.

reasons exist to suppose that educational expenditure should be more efficacious in increasing welfare than that on many other social services. In this regard some educationalists are wont to argue that an increase in the amount of education provided for and consumed by society is invariably a desirable thing, in which case increased enrolment would be lauded and the lowering of fees endorsed. The argument, however, overlooks the essential measuring rod of opportunity costs, implied in this case by increasing educational expenditure. Due to the scarcity of resources, other socially beneficial projects may have to be curtailed or postponed. And if the social returns on any of the latter exceed those derived from education, preference should be given to the former. For example, it is not to be argued that higher education should invariably take preference over the public provision of health services, law and order, housing or the like.

Indeed, difficult questions of interpersonal comparisons of utility are raised, for which no better measure than the (inadequate) one of money exists.¹⁾ Nevertheless, because it is not possible always to assume pre-eminence for education, social rates of return must be estimated for every possibility anew and will depend upon the circumstances.

Establishing what the social opportunity costs of increasing enrolments are, is thwart with the difficulties that have continually been encountered in the course of this dissertation. But that need not dull the principles involved. In fact, if all state subsidized ventures were to be ranked in order of priority so that the social opportunity costs of university finance could come to the fore clearly, it could conceivably be found that opportunity costs rise more quickly than possibly at first surmised. The reason would be that as more and more socially pressing projects were shelved to make room for university

1) It's use presupposes a reasonably equal income distribution, without which the measuring rod becomes distorted. For instance, a specified sum of money is unlikely to mean to a millionaire what it does to a pauper.

expansion the marginal social opportunity costs of higher education would rise, even if university accounts had not begun to show rising financial costs.

In conclusion of the above arguments, it seems that caution must be exercised on economic grounds when considering lowering university fees. The results could be wasteful whilst contributing little towards the social goal of increasing the proportional enrolment of working class students.¹⁾ On the other hand a caveat about lowering fees does not imply that fees should be raised. Obviously the arguments given above may be applied in reverse with equal force to fees that are 'too high'. Just as undercharging will lead to a profligate use of resources, so overcharging will result in an unwarranted parsimony in educational provision that will detract from welfare. Resources will once again be incorrectly allocated. And many would argue that if excesses are to occur, the benefit should be given to education. It could, in addition, be said by opponents of raised fees that opportunities will be removed from possibly deserving candidates. If, as was argued above, the demand curve of working class students is kinked, the effect could be severe. Means of providing student assistance to combat and even possibly reverse this effect are analysed below in Chapter 5.

Over time a counteracting force in the form of the positive income elasticity of demand identified above could prevail. A strong correlation exists between the growth of a nation's wealth and its demand for education.²⁾ However, this also implies that pressure upon the (higher) education system will increase as national income grows, an effect which is likely to be of particular relevance in South Africa, where a large section of the population has in the past neither enjoyed a high standard

1) Van Dijk, P.M.H.: Hoger-Onderwijsbeleid. Economische Toetsing aan Enkele Doelstellingen, Amsterdam, Ph.D. Thesis, University of Amsterdam, 1980, supports these general conclusions.

2) Cf. Section 2.5.1 above.

of living nor delivered significant numbers of students to the universities.

4.4.2.4 The Determination of Instructional Costs and Prices

The question remains of how tuition fees are to be set if marginal costs are used as a point of departure. Two points are relevant: firstly, the magnitude of the marginal costs, and secondly, the method for making provision for market failures.

The marginal costs of relevance for determining tuition fees are clearly those generated by teaching. However, as was pointed out in Section 3.4.3 above, teaching and research are usually jointly produced in universities and no watertight method of compartmentalizing costs exists, if production is truly joint. Nevertheless, to ignore the existence of jointness can hardly be considered a satisfactory solution. As was submitted in Section 3.4.3, a pragmatic apportionment of the costs of faculty inputs on the basis of, say, an estimate of time spent on teaching and research is at least a partial solution. Once this has been done, teaching costs can be estimated by subtracting the costs of research and the other ancillary services provided by the university from total costs. This procedure should ideally be followed for each different subject grouping and for different levels (e.g. undergraduate and post graduate). The possibility of having differences in fees as a result of differences in costs should also be acknowledged.¹⁾

Interest and redemption charges on loans for the buildings used for teaching should be included (once provision has been made for jointness with research). This is in conflict with the recommendation of the Van Wyk de Vries Report, which advocated the total provision of capital facilities by the state.²⁾ Basic economic

- 1) Carnegie Commission on Higher Education: Higher Education: Who Pays? Who Benefits? Who Should Pay? New York, McGraw-Hill, 1973, p. 109.
- 2) Main Report of the Commission of Enquiry into the Universities, (The Van Wyk de Vries Report), Pretoria, Government Printer, RP. 25/1974, paragraph 32.34.

principles, however, state that the relevant economic costs, which may differ from accounting costs, are opportunity costs. As was argued in Section 3.2, the majority of university buildings cause opportunity costs approximately equal to the relevant interest and redemption charges. These charges should, therefore, be included in total costs. ¹⁾

Once an estimate of teaching costs has been made and the marginal magnitude determined, provision must be made for the market failures that have been discussed at various points in this dissertation, for example, for those caused by the public benefits of education. However, it is not possible to state unequivocally how great the public benefits of education are. ²⁾ Undoubtedly, their magnitude will depend upon the peculiar circumstances of each society. In an economic system based upon socialist principles in which a great part of the economic returns (barring consumption benefits) are appropriated by the state, social benefits must dominate. On the other hand in a market system, the returns to education are to a large extent reflected in the remuneration paid to the educated and, therefore, accrue mainly to private persons with social benefits being correspondingly less. Nevertheless, the costs of the social benefits that are generated should be the responsibility of society at large. If no public provision were to be made, relatively too few resources would be directed towards education to the detriment of all. Many ways of subsidizing higher education have been devised for this purpose, some of which are analysed in the next chapter.

It may at times occur that shortages of skilled workers in the economy make it desirable for universities to train more students in various categories. In a market economy this result

-
- 1) Cf. Danière, A.: Op. Cit., p. 20, footnote 1, and Section 3.2 above.
 - 2) Cf. Section 2.2 above: also Schultz, T.W.: Op. Cit., on p.21 and Bowen, H.: Op. Cit., on pp. 168-170. The former states that the relevant externalities are few in number, whereas the latter argues to the contrary.

is achieved by the higher demand for those workers increasing wages in the particular skill categories which will raise the private returns on the educational costs, and therefore, encourage students to enrol for the required subjects. In principle it should not be necessary to reduce university fees by increasing subsidies to achieve the desired result.¹⁾ Marginal cost pricing ensures that participants in the economic system make socially correct decisions, which they cannot do if the true magnitude of costs is concealed. Nevertheless, it could be argued that an adequate supply of highly skilled labour (and entrepreneurs) is an essential ingredient for the creation of employment opportunities for unskilled workers. And because of the importance of employment to society in ensuring wealth and stability, universities should be encouraged to produce graduates by increased subsidization to higher education.

Although the creation of employment opportunities, especially in developing countries such as South Africa, undoubtedly adds an extra and important facet to the social benefits of education and does warrant public support, the uncritical subsidization of universities is unlikely to solve the basic problems generally inherent in economies of this type. Often, even in purportedly free market economies, structural reasons may be found for the inadequate flow of students to satisfy the demand for skills, for example in the form of inadequate primary and secondary schooling, insufficient financial support at those lower levels or social (and even legal) barriers in the way of access to institutions of higher learning or job opportunities. If the shortage is due to one or a combination of these factors, the indiscriminate subsidization of university students at a higher rate will have the effect of increasing the private returns of those for whom the obstacles do not exist, whilst having little effect upon enrolment. The benefits will go to those who are in likelihood already earning considerable rents upon their

1) As is pointed out in Section 8.2.3.2. , increasing wages could be detrimental for inflation; particularly if the pool of trainable persons in a country is small (in the short-run). See also the discussion in the next few paragraphs.

'artificially' scarce skills instead of to society as planned. This point is, of course, of relevance to the South African situation. It also emphasises a major problem area for effective educational planning. Because the supply of and demand for education are in many ways so intimately connected to labour market conditions, restrictions upon the horizontal and vertical mobility of labour, (as was formerly common in South Africa and of which the current generation still bears the legacy) make the straightforward application of market orientated planning techniques dubious. Unfortunately, both marginal cost pricing and rate of return analysis are equally tarnished in this respect.

Marginal cost pricing and discriminatory pricing between rich and poor students to influence the composition of the student body will also generally be incompatible seeing that the discriminatory pricing is based upon the use of monopolistic power. Little can be done about this, however, and the use of a particular pricing technique must depend upon the relative policy weights attached to the goals of 'efficiency' and 'equity'. Marginal cost pricing is, nevertheless, compatible with discrimination in a different sense, namely that different faculties could charge different fees depending upon their cost structures. But that is, of course, the essence of the method. If it is believed that enrolment in strategic subjects will be adversely affected thereby, corrections can be made by explicit differential subsidization in respect of the different community benefits involved. Such a procedure would not disguise the policy decisions or their costs. With respect to joint production, marginal cost pricing can also lead to different prices, depending upon the demand for the various joint products, without violating the principles involved. For example, if products A and B are produced in strict jointness, but the demand for A exceeds that for B, their prices will vary accordingly.¹⁾

Finally, although the principles enunciated above are clear, the inability to quantify the externalities arising from education

1) Kaysen, C.: Op. Cit., p. 57.

effectively in practice, renders it near to impossible to state categorically what percentage of costs should be the responsibility of the state and what percentage that of the private student.¹⁾ Resort must be had to the political process, whereby society can express itself on the issue of whether in its judgment (which, after all, must be the determining factor) more or less should be spent on education from the public coffers. In effect, unless extensive research is conducted on this question in the future, the economist can say little more than that some subsidization of higher education must occur and that in market type economies it should be less than in socialist systems.

The remaining principle source of market failure is the inability of capital markets to provide adequate funds for poor students, which results in relatively too few resources being used for education by this group. The problem is aggravated by the risks involved for the student in spending a large sum of money on his education before being certain of his being able to recoup his outlay.²⁾ The methods devised to overcome these difficulties are discussed below in Chapter 5.

4.4.3 Pricing Research

The principles for the pricing of teaching apply mutatis mutandis to the other university products, of which research is the major one. In effect this means that the recipients of the benefits should pay an amount equal to the marginal costs thereof and if the benefits of the last unit produced, as measured by the price offered for that unit, exceed its costs, output should be expanded.

- 1) Cf. Carnegie Commission on Higher Education: Op. Cit., Chapter 11.
- 2) Nerlove, M.: Op. Cit., pp. S185-S190. A possible solution would be to lower tuition fees in the first year of university study - perhaps to zero - so as to allow new students the opportunity of testing their academic capabilities. Thereafter it can be assumed that a decision to continue studying implies knowledge of the costs involved and a willingness to pay. A proposal to this effect was made by the Carnegie Council on Policy Studies in Higher Education: Low or No Tuition (The Feasibility of a National Policy for the First Two Years of College), San Francisco, Jossey-Bass Ltd., 1975.

If the benefits are shared between persons in their private capacities and society at large, then the costs should likewise be shared in the same ratio by means of state subsidies to universities.

With respect to research, one can conceive of two broad categories: firstly, research of a fundamental nature, the results of which add to knowledge and form the basis for applied studies in the future, but do not have immediate pecuniary spin-off effects for the researchers, and secondly, applied research to investigate specific problems in industry and usually undertaken on request of those who wish to make use of the results. The two categories are, needless to say, not clearly defined - some research projects will contain elements of both - but serve to illustrate the principles involved.

There are several reasons why research projects of the first kind should be subsidized by the state entirely. Firstly, the beneficiary from such research activities is society rather than the individual researcher. Secondly, the considerable element of risk involved in the breaking of new ground implies that the results need not invariably be positive and that therefore, individual researchers could be hesitant of undertaking projects of this nature. If, on the other hand, the risks were to be shared by society by means of subsidization, the burden for any single person would be negligible. Thirdly, the results of this kind of research are generally published in the particular disciplines' scientific journals and, consequently, immediately become public property. The withholding of this kind of knowledge from those unable to pay the price would be detrimental to the long run development of society. The public good quality of fundamental research should, therefore, preferably be emphasized by public funding.¹⁾

1) Cf. Magnussen, D.: 'The Cost and Financing of Post-Secondary Education', in O E C D. Report: Towards Mass Higher Education, Paris, O E C D , 1974, p. 200.

Research falling in the second category differs to a large extent from that in the first. Being largely commissioned for specific use in industry it does not have the public good properties just described. Neither is risk usually involved for the researchers, who are generally employed to investigate a problem area and to make recommendations. The fact that the latter may be either positive or negative from the viewpoint of industry is of little concern to the researchers. And most importantly, research of this nature commands a market price and generates income for the researchers directly. There is, therefore, no need for the state to interfere with the market mechanism by subsidization in this case. In fact, it would be preferable to classify work of this nature as part of the universities' public service programmes.¹⁾ A price equal to marginal costs, including the costs of university facilities used, should be charged.

The determination of the price of fundamental research is conceptually more difficult. Universities are generally involved with both categories of research simultaneously and, of course, much research is done that contains elements of each. Often in practice it will be difficult to distinguish between the two, which will complicate decisions on how the whole should be financed. Once again, a clear theoretical principle needs a pragmatic application. One possible solution would be to consider all research, of which the results are published in relevant journals, as falling in the first category, because publication turns research results into public goods. Not all research that is published in this way, will necessarily be of a fundamental nature, whereas some that is, is published in books and monographs that are not easily monitored. However, an indication of the magnitudes involved would be obtained by this method.²⁾

1) This is the case in the SAPSE system. Cf. Chapter 7.

2) Vide Section 3.3.2.

Because society is the beneficiary of fundamental research, it pays a price in the form of subsidization. Subsidization should be coupled (partially) to the output of the first category of research so as to ensure that incentives exist for researchers to use their time and other resources productively. The disadvantage is that inevitably incentives to publish will be generated that may lead to inferior work being produced, thereby placing heavy responsibilities upon journal editors. A solution to this problem would be to make use of the citation index system advocated in Section 3.3.2 above.

The total research subsidy cannot be based upon outputs alone, firstly because of the difficulties involved in measurement, but more importantly because of the 'riskiness' with respect to output mentioned above. Certain research consignments do not deliver results at regular intervals, but could nevertheless be most important, as the results eventually achieved, possibly after many failures, may constitute major scientific advances. Provision must be made for such cases by partially basing subsidization upon the time spent on research. Unfortunately, that implies basing subsidies upon inputs rather than outputs, which was considered undesirable in Chapter 3. It may also result in universities returning biased statistics on the division of faculty time and facilities between teaching and research respectively, seeing that fundamental research, but not teaching, should be subsidized in full.¹⁾ Undoubtedly inaccuracies will arise, the most serious being possible due to the inability of separating joint costs, but the proposal does go some way towards solving an otherwise insoluble problem.

It does not, however, solve the problem of determining how much money should be spent in total on basic research to arrive at a social optimum. Theoretically the subsidy should be such that the expected rate of return on the last research project undertaken with its aid equals the expected rate of return on the next

1) Vide Chapter 7.

best project that was forgone to make way for the research. But the empirical data for finding that point are unfortunately not available.¹⁾

In the case of commissioned research, the benefits of which accrue directly to the researchers, no subsidy should in principle be paid.²⁾ This may be difficult to achieve in practice, because some jointness with fundamental research can be expected, especially with regard to preliminary work, and some of the results are likely to find their way into the journal literature where they will be grouped in the first category. (This is not likely to happen until the commissioning institution has had the opportunity to monopolize and exploit the results to its satisfaction).

4.4.4 Pricing Ancillary Services

With respect to the other outputs of universities the same principle should be applied to determine whether subsidization is called for or not. Many of the ancillary programmes of a university do not qualify for subsidies on the grounds of public good properties. An example of these is the provision of board and lodging for students. The benefits of such facilities go directly to their users with negligible spin-off effects for other members of society. And prices can be charged for their use. Consequently there is no justification for their subsidization by the fiscus.

In the case of academic support programmes such as libraries, no theoretically satisfactory division can be made between the use of library facilities for teaching, research or other purposes, because of the jointness present in production. It is, for example, in many cases not possible to categorize a library

1) Nerlove, M.: Op. Cit., p. S.211.

2) This principle should be extended to all activities of the public service programme. Vide Chapter 7.

book as being for teaching or research. Nevertheless, some pragmatic indication may be had on the basis of an estimate. One could for instance argue that undergraduate teaching relies upon a relatively small collection of books; that post-graduate teaching and research are completely intertwined and rely upon a large library collection; and that commissioned research generally makes use of those facilities already created for fundamental research. Therefore, university libraries should be fully subsidized.

In the case of administrative services jointness could be more imagined than real, because within a central administration separate departments are usually employed for, say, academic student records, faculty staff matters, student residences etc. and, accordingly, costs can be apportioned and the basis for subsidization established.

4.5 The Implications for Non-University Post-Secondary Institutions

It was stated in Chapter 2 (and explained more fully in the accompanying appendix) that optimal resource allocation models indicate several 'rules' to be applied when seeking to maximize economic welfare. However, when the simplifying assumptions, upon which those models are built, are relaxed, these 'rules' lose much of their significance. Under such circumstances it is no longer possible to generalize in the way implied by the 'rules', because if the so-called 'first best' solution is not attainable, the nature of the 'second best' solution depends upon the form of the additional constraint placed upon the system by the relaxation of one of the initial assumptions.

Now, because the justification for marginal cost pricing is derived from the 'first best rules', it follows that the theory of the second best is relevant for the application of such pricing techniques. Of particular importance is one of the corollaries of the theory of the second best, which states that, if a piecemeal application of the first best rules is attempted, the result

could be a worsened rather than an improved allocation of resources. In the context of post-secondary education, this implies that the application of marginal cost pricing to the universities in isolation could be detrimental.

In practice this means that the same techniques should be applied to all post-secondary institutions at any one time. If, for instance, university fees were to be calculated on the basis of costs, but college fees not, with the result that a college education became relatively cheaper than a comparable university education, students would be unduly influenced to attend colleges. To avoid such possible distortions the whole post-secondary field should be regarded as a whole and the methods of subsidization and the setting of fees viewed comprehensively.

CHAPTER 5

FINANCIAL SUPPORT FOR STUDENTS AND UNIVERSITIES5.1 Introduction

University students are supported financially from a number of sources.¹⁾ To a very large extent the student himself bears the ^{Swear} onerous weight of the costs of a university education by forgoing the income he could have earned. Parents or families are also generally required to pay a portion of the direct costs of a student's education.²⁾ But, important though these contributions may be, it is not they that form the subject for discussion in this chapter, which is devoted primarily to the other sources of student and university income. As an initial generalization, these can be divided under two broad headings, namely, aid to students and their families, and aid to institutions.

The first category includes direct student grants, loans, education vouchers and tax concessions, whereas the second group consists of governmental subsidies to institutions and tax concessions that stimulate donations to institutions.

5.2 Financial Aid to Students5.2.1 Grants

Perhaps the most obvious way of assisting a student over his financial difficulties is to offer him a direct grant, which is a sum of money to be used for his education and to which no strings are attached other than that the money is to be devoted to education. Perhaps the best known form of grant is the scholarship which is awarded on the basis of scholastic merit

- 1) Cf. Woodhall, M.: Review of Student Support Schemes in Selected O E C D Countries, Paris, O E C D , 1978.
- 2) "One estimate for 1970 ... suggests that student aid amounts to 24 per cent of the earnings foregone (sic) of students in Britain, but only 5 per cent in France and 2 per cent in Japan. In the United States ... (it was estimated) that in 1970 student aid, including that devoted to fees, amounted to 13 per cent of earnings foregone (sic)." Woodhall, M.: Op. Cit., p. 16.

and which may be sufficient to cover either a portion of a student's direct costs or all his direct costs plus a fraction of his forgone income. Financial need rarely plays a prominent role in this kind of grant. Financial need could, however, be made the determining factor of eligibility for grants, in which case a means test would be needed to establish the financial position of the student or his family.¹⁾ The size of the grant could then be varied in inverse proportion to the ability of the family to afford the student's education.

Grants of this nature have the positive attribute of correcting to some degree the imbalances in financial power and, therefore, of the opportunities inherent in society, although, as was pointed out in Section 4.2, far more than financial means alone governs access to universities. In fact, as was stated at that juncture, 'free' education can have highly regressive effects because greater use of it is made by the rich. Nevertheless, grants are also beneficial in as far as they do not produce graduates who are burdened with debt, which could influence students' choices of careers.

Although the general provision of grants would be neutral in their effects on students' decisions, grants are often offered selectively to influence students to enrol, usually for particular courses. For example, when certain sectors of the economy require recruits with a particular training, it is common for both the private sector and the state to offer generous financial assistance to students who are prepared to enrol for the required disciplines, even though the efficacy of so doing has been questioned.²⁾ However, grants that are dependent upon financial need

-
- 1) Mushkin, S.J. (Ed.): Economics of Higher Education, Washington, D.C., United States Department of Health, Education and Welfare, 1962, Chapter 13 considers a means test acceptable in education, although it often fails elsewhere.
 - 2) Jackson, G.A.: 'Financial Aid and Student Enrolment', Journal of Higher Education, Vol. XLIX, no. 6, Nov/Dec. 1978, p. 548, points out that '... the power of financial aid to change prospective students' minds ... (is) modest ... (Most) aid intended to attract

alone may entail the disadvantage of affecting the incentives of students, not only with respect to subject choice, but also with respect to their will to complete their degrees in the shortest time possible. The detrimental consequences already noted of charging low tuition fees¹⁾ are, of course, applicable a fortiori to the case of grants. A partial solution would be to introduce a second proviso for eligibility, namely annual success in the university examinations.

In addition the provision of subsidies-in-kind, such as occurs with grants and below-cost tuition charges, can be shown to detract from a consumer's welfare, in the sense that, had the consumer been allowed to make his own choice amongst the available consumption goods at unsubsidized prices, he could have

(Footnote 2, p.146, continued) ... new students would go to students who would have enrolled without aid'. Peltzman, S. argues that subsidies-in-kind (e.g. government expenditures on higher education) merely substitute for private expenditures and do not increase enrolment appreciably. 'The Effect of Government Subsidies-in-Kind on Private Expenditure : The Case of Higher Education', Journal of Political Economy, Vol. 81, no. 1, Jan/Feb., 1973, pp. 1-27. On the other hand, Leslie, L.L. and Fife, J.D. found that when student aid is considered as money income it '... results in ... increased consumption of higher education...'. 'The College Student Grant Study. The Enrolment and Attendance Impacts of Student Grant and Scholarship Programs', Journal of Higher Education, Vol. XLV, no. 9, Dec. 1974, pp.651-671 on p. 651.

- 1) Cf. Section 4.3.2. 'User charging' or the practice of exacting payments from the beneficiaries of a good, (in this case, for higher education) will not be inequitable in a majority of cases, because it is a well established result "... that college attendance rates are greater for the rich than for the poor...". In cases of need, grants could supplement user charging. Hartman, R.W.: 'Equity Implications of State Tuition Policy and Student Loans', Journal of Political Economy, Vol. 80, no. 3, Part II, Supplement, May/June 1972, pp. S.142-S.171 on p. S.145.

reached an equal level of satisfaction at a lower cost.¹⁾ The fact that he would then probably have chosen a combination of goods that contained less education than he would have done if education had been subsidized, will only be detrimental to social welfare if sufficient externalities are generated in compensation. Despite the uncertainties involved, the case for educational subsidies depends on just those grounds.

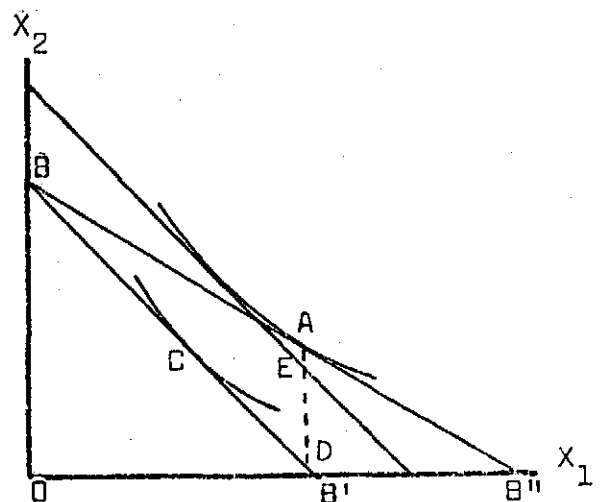
5.2.2 Loans

5.2.2.1 General Considerations

Loans differ from grants in that money is borrowed and must be paid back at a later date. Interest is usually charged as payment for the use of the money, although in the case of student loans, interest charges are often waived until the student begins earning²⁾ or subtracted directly from the principal sum.

Loans enable impecunious students to further their academic careers by borrowing now against their future earnings. The economic effect is that more real resources are devoted to education in the current period. The repayment of the loan at a later

- 1) Let X_1 = education; X_2 = the sum of other consumer goods; BB' = the consumer's budget line before subsidization and BB'' the budget line after education has been subsidized. After receiving the subsidy, the consumer moves from C to A , indicating higher welfare. The real cost of producing that amount of education is DA , whereas additional income of DE would have raised the consumer to an equivalent level of welfare, and $DA > DE$. See: Windham, D.M.: 'Social Benefits and the Subsidization of Higher Education: A Critique', Higher Education, Vol.5, no. 3, pp. 237-252, on p. 250.



- 2) This is tantamount to subsidizing interest rates, the effects of which are analysed below.

date is merely a transfer payment from one person to another, which brings no truly economic costs for the future community. Nevertheless, from the point of view of the individual borrower, the transfer payments involved are of major importance and because the student is required to repay the capital sum plus interest, loans clearly differ markedly from grants. Their effect is not to equalize the financial positions of students, but partially to eliminate one of the major obstacles to equal opportunities of obtaining a higher education.¹⁾

5.2.2.2 Possible Positive Effects of Loans

Loan schemes have several beneficial attributes. The first important benefit from such a scheme is that the incentives of students are minimally distorted by its use. The arguments on 'optimal' pricing submitted in the previous chapter were essentially that prices or fees lower than (marginal) costs could lead to an inefficient use of scarce resources. Once provision has been made for the social benefits generated by education by means of appropriate subsidies, students should be required to shoulder the costs caused by their own education. However, the application of these pricing 'rules' could lead to hardship or even possibly the discouragement of students from seeking university admission, despite a price elasticity of demand less than unity, if students are unable to borrow the necessary funds. A loan scheme would in principle overcome this difficulty, whilst maintaining economically justifiable pricing to ensure optimal resource use. Students would not be misled by low prices as to the true costs of their university careers,²⁾ neither would they

- 1) Cf. Verry, D.: 'Some Distributional and Equity Aspects of the Student Loans Debate', The Open University: Education, Equity and Income Distribution, Milton Keynes, The Open University Press, 1977.
- 2) In terms of the standard budget line analysis of consumer choice, grants cause distortionary 'kinks' to appear by altering the opportunity costs of a specific level of education in terms of other consumption goods. Loans, on the other hand, allow the whole budget line to move in a parallel fashion away from the origin so that relative prices are not distorted and consumer decisions not unduly influenced. See Krueger, A. : 'Comment', Journal of Political Economy, Vol. 80, no. 3, Part II, Supplement, May/June 1972, pp. S.31 - S.33.

be prevented from taking the opportunity of a university education by a lack of money. Loans combine the twin advantages of a high degree of equality of opportunity regardless of financial position with user charging that encourages the judicious use of resources.¹⁾

A further advantage attributable to a student loan scheme is that its implementation would help to alleviate the financial plight common to most modern universities without resulting in any loss of autonomy.²⁾ Although short-term fluctuations occur, the long-term trend of university costs is likely to rise at a rate greater than the national average because of the labour intensive nature of teaching and the teaching methods traditionally employed. Because quality in teaching is widely (but often erroneously)³⁾ considered to depend upon student to staff ratios, maintaining or even reducing class sizes results in static or diminishing productivity.⁴⁾ However, as it is not socially justifiable to disallow an important professional group from sharing in a nation's growing affluence, salaries of (university) teachers must rise in concert with increases in the national wealth. But salary rises that are not offset by productivity increases of necessity imply higher than average costs.⁵⁾ This effect is aggravated by the normal inflationary pressures upon all university inputs.

In the quarter century preceding 1970 expenditure per student in the O E C D countries as a whole grew at an annual rate of

-
- 1) Hinson, J.P.: 'Higher Education - How to Pay', New England Economic Review, March/April 1971, pp. 3-22 on p. 6.
 - 2) Ibid.
 - 3) See Section 3.4.2 above.
 - 4) Cf. Balderston, F.E.: Managing Today's University, San Francisco, Jossey-Bass Publishers, 1975, p. 196; also Sheenen, J.: The Economics of Education, London, George Allen & Unwin, no date, p. 12-15.
 - 5) Carnegie Commission on Higher Education: The More Effective Use of Resources, New York, McGraw-Hill, 1972, p. 4.

9,0 per cent, whereas the G. N. P. price index grew at an average rate of 4,3 per cent. This implies that in real terms unit costs in higher education in those countries rose by almost 5 per cent per year.¹⁾ In South Africa university price inflation is exacerbated by the shortage of skilled manpower that forces university salaries to rise so as to draw staff of the required calibre. The results of these spiraling costs can be viewed in the perpetual shortage of money in the universities and a corresponding pressure upon the fiscus to increase subsidies. Despite financial stringency, universities have in the past been reluctant to raise student fees. Although increasing fees could have negative consequences under certain circumstances, it is submitted that many of these, as described below, can be overcome by the judicious use of loans, which will allow universities to increase their incomes and the financial burden to be partially shifted from the public to the private sector.²⁾

This argument is valid. Nevertheless, it is important to distinguish between the budgetary relief offered by student loans to universities and the fiscus, and relief of pressure on the overall resources in the economy. Loans do not provide the latter. The cost of education to society is the value of resources used for that as opposed to other purposes in a specific period of time. In these terms costs remain the same whether education is paid for with the aid of loans or by some other means.³⁾ In fact, by diminishing the financial obstacles of students, loans could have the effect of increasing the resources used for education.

-
- 1) O. E. C. D. Conference on Future Structures of Post-Secondary Education. General Report: Policies for Higher Education, Paris, O. E. C. D., 1974, p. 128. Cf. also: Williams, B.: 'University Finance in a Period of Rapid Inflation', Higher Education, Vol. 5, no. 4, Nov. 1976, pp. 351-362.
 - 2) O. E. C. D. Report: Policies for Higher Education. Op. Cit., p. 130-131; also Glurman, M.: 'Does Higher Education Need More Money?' in Joint Economic Committee, Congress of the United States: The Economics and Financing of Higher Education in the U.S.A., Washington, D. C., Government Printing Office, 1969, p. 632 et seq.
 - 3) Cf. Committee on Higher Education: Report (The Robbins Report), London, H.M. Stationery Office, Cmd. 2154, 1963, p. 209.

In some cases loans could have the additional advantage above grants that weaker students could decide for themselves whether or not to go to university, rather than having the decisions made for them by some selection committee, as would be necessary if education were to be 'free'. Thereby the serious students would be separated from those who have a casual approach to their studies and a sense of responsibility would be established. Again, whereas grants are often given for specific subjects, loans generally do not have similar stipulations that restrict a student's choice of discipline.¹⁾

5.2.2.3 Possible Negative Effects of Loans

The negative attributes of loans are said to include the aspect that loans discriminate against weaker students in a way that, for example, low tuition fees do not do, because the brighter ones would be able to get grants so as to avoid their getting into debt; that students' choices of careers could be influenced to the more lucrative fields to minimize the effects of the loan;²⁾ and that family obligations to give financial aid to students will be weakened.³⁾

A disadvantage of a loan scheme which is often believed to be of importance, is that it produces students that begin their careers with debt, which could perhaps influence the decisions of lower income students, whether or not to go to university. An objective measure for the 'burdensomeness' of debt is difficult to find, but one suggested by Hartman is the relationship between future payments and income.⁴⁾ The ratio between these two is

- 1) O'Donoghue, M.: Economic Dimensions in Education, Dublin, Gill and Macmillan Ltd., 1971, p. 198.
- 2) The reasoning behind a rate of return approach to educational planning is, of course, just that: the lucrative fields are those where additional manpower is required. And the determination of what is lucrative cannot be achieved without reference to costs. Cf. Section 2.6.2.
- 3) Ibid.
- 4) Hartman, R.W.: 'Student Loans for Higher Education', in Orwig, M.D.: Financing Higher Education : Alternatives for the Federal Government, Iowa, Monograph 5, The American College Testing Program, 1971, pp. 281-298.

defined as the 'repayment rate' and where this rate becomes burdensome, the 'repayment ceiling' is reached. Danière has suggested that the ceiling is reached if 7,5 per cent of income is repaid annually, on the grounds that an average family retains 10 per cent of its income for discretionary purposes once it has honoured all its contractual commitments.¹⁾

The factors that determine the size of the repayment instalments are the interest rate, the repayment period and the size of the debt. If a debt of R3000 and an annual income of R9000 is assumed, the effects of different interest rates over ten and twenty year repayment periods respectively can be illustrated. As is shown in Table 1 a debt equal to one third of a student's future annual income generates repayment instalments significantly lower than the repayment ceiling, even if repaid over the relatively short period of ten years at a rate as high as 10 per cent. If repayments are made over the longer period of twenty years the limitation of the repayment ceiling is even more remote.

TABLE 1

PERCENTAGE OF ANNUAL INCOME PAYABLE AS
INTEREST AND REDEMPTION ON A LOAN EQUAL
TO ONE THIRD OF ANNUAL INCOME AT DIFFE-
RENT RATES OVER 10 YEAR AND 20 YEAR
REPAYMENT PERIODS RESPECTIVELY

Interest Rate	Repayment Instalment as % of Annual Income	
	10 Year Redemption	20 Year Redemption
3%	3,9%	2,2%
7%	4,7%	3,1%
10%	5,4%	3,9%

Source: Hartman, R.W.: Op. Cit., p. 190.

1) Danière, A. as quoted by Hartman, loc. cit.

One can, therefore, conclude that loans that are apparently onerous need not necessarily be so and that, consequently, the (partial) use of a loan scheme is to be advocated. For example, if higher tuition fees are economically justified, a loan scheme could be used to offset the disadvantage involved in raising fees. Needless to say, if full university costs were to be charged to students their indebtedness would probably become burdensome, but as has been argued in Section 4.3.2, pricing in that way would be economically undesirable as well. Provision must be made for the subtraction of research costs as also for the costs of the benefits that accrue to society and the residual used as basis for determining tuition fees. Loans that need not be excessive can have an important effect upon students' abilities to afford such fees and simultaneously allow universities to charge an economically realistic tuition fee.

5.2.2.4 Some Possible General Effects of Loans

Several effects of loans upon the development and operation of financial markets should be noted, some of which would seem to indicate a need for a measure of governmental action. Firstly, if the repayment period were to be long, private financiers would probably not be inclined to support the scheme, especially not if repayments were made income contingent and accordingly were to vary from year to year. If the latter were the case, it would also be very difficult to establish a secondary market for loans, which would discourage private financiers further.¹⁾ In addition, the private supply of loans would be likely to fluctuate with money market conditions in a cyclical fashion, whereas in fact, the demand for loans could increase during recessionary phases.²⁾ However, a government operated loan scheme or one that is run by a public agency which raises capital by issuing government guaranteed debt,³⁾ would not imply that an unlimited supply of credit to

-
- 1) However, some private financial institutions appear to have found student loans a profitable business in terms of soliciting future clients.
 - 2) Hinson, J.P.: Op. Cit., p. 19.
 - 3) Vide Section 5.2.2.5.

students would be forthcoming. If the demand for loans were great, the effects on other financial markets, especially those for housing loans and for state and local government debt would have to be ascertained.¹⁾ The implications could be significant, if unlimited credit were to be made available to all would-be students.

5.2.2.5 The Implementation of Loan Schemes

The stumbling-block in the path of student loans is the market failure, spoken of above in Chapter 4, which makes it difficult for poor students to obtain the loans they require, even if they are prepared to pay market rates of interest on the sums they borrow. The risks involved for the lender of default by the student arising from his possible failure to obtain a degree, the normal hazards of lending and the impossibility of offering human capital as collateral for security purposes, render student loans an unpopular business. And the difficulty of distinguishing the potentially good from the potentially bad students makes it difficult for both groups to acquire the resources they need. Therein lies the market failure: a potentially profitable investment in human capital remains unmade and 'too few' resources are devoted to education.

If this were found to be the case, the remedy would be partially to remove the administration of student loans from the market or at least to supplement the free market mechanism by pooling the risks in the form of a student loan bank.²⁾ If necessary, such

1) Hinson, J.P.: Op. Cit., p. 19.

2) The Carnegie Commission advised that fees should be gradually raised and student aid increased through the creation of a National Student Loan Bank, with income-contingent repayments spread over a long period. Carnegie Commission on Higher Education: Higher Education : Who Pays? Who Benefits? Who should Pay?, New York, McGraw-Hill, 1973. For a discussion of these proposals see Hughes, J.F. (Ed.): Education and the State. Washington D C , American Council on Education, 1975, pp. 63 et seq.

an institution could have governmental support in the form of provision of the initial capital.¹⁾ It has also been suggested by some that governmental support could take the form of subsidized interest rates. That should, however, not be necessary in principle. Two forms of market failure are at issue: one caused by the public benefits of education, for which subsidies are necessary, and one caused by the non-availability of funds, for which loans offer a solution. If loans were to be subsidized, these two issues would become confused. Neither would it be certain that subsidized interest rates would have beneficial consequences. General subsidized interest rates on loans would have effects similar to low tuition in that subsidies would be given regardless of need. In effect, a subsidy would be placed upon attendance rather than need.

Given time, a bank of this nature could become self-financing if the demographic pressure of new students did not perpetuate an excess demand for loans over the supply thereof.²⁾ As loans were redeemed by past students, funds would become available for present ones, giving rise to a perpetual rotation of the money required by successive generations to finance their respective educations and allowing each to spread his personal direct costs over a period in which he has the ability to pay.³⁾ Of course, in a dynamic world of rising educational costs additional funds

-
- 1) A student bank should naturally not be founded unnecessarily. In the event of commercial banks being able to supply sufficient student loans, no centralized action would be required. It could, for example, prove profitable for private banks to woo future clients by offering student loans on favourable terms.
 - 2) Past experience indicates that a long period is necessary before this occurs. "For example, in 1961 in Japan only 14 per cent of expenditure on student loans was derived from past loan repayments; by 1971 the proportion was still only 20 per cent." Woodhall, M.: Op. Cit., p. 130. (Japan provides all its student aid in the form of loans).
 - 3) Bowen, H.R.: 'Who Pays the Education Bill?', in Oriwig, M.D.: Op. Cit., pp. 281-298 on p. 293.

would be required to ensure the solvency of the scheme. Inflation would also erode the capital base, thus necessitating the periodic refurbishment of the bank's capital, unless interest rates were set to avoid such an eventuality.

One of the difficulties with loans is that not all would-be students are assured of the average or median income of their prospective professions, as has been tacitly assumed so far. Those who earn more, present no problems, but those who earn less, either by failing to pass their university examinations or by not entering or leaving the particular profession for personal reasons, may find their repayment rates exceeding their repayment ceilings as defined above. If such a possibility is contemplated and seems subjectively probable, a student will be under strong incentives not to accept a loan so as not to encumber himself in the future. To overcome this, proposals have been made to the effect that repayments should not be made on the usual interest plus amortization basis, but on the grounds of the higher income received because of the education made possible by the loan. A specific suggestion for an income-contingent loan scheme by Vickrey is that funds should be made available liberally to would-be students in return for an agreement to pay what could be described as 'dividends' to the investors who had provided the funds. These 'dividends' would be computed as a percentage of the student's later earnings on a basis similar to that used for income taxation.¹⁾

The terms of the dividend payments, suggested by Vickrey, would be such that an initial sum would be exempted, so that the dividend calculations would be made on the income earned by the former student in excess of the average earned by those without the additional education. For example, if the average income of a matriculant were R5000, and a sum had been borrowed to finance

-
- 1) Vickrey, W.: 'A Proposal for Student Loans', in Mushkin, S.J. (Ed.): Op. Cit., Chapter 16. The University of Yale operates a successful income-contingent loan scheme for its own students. See: West, E.G.: 'The Yale Tuition Postponement Plan in the Mid-Seventies', Higher Education, Vol. 5, no. 2, May 1976, pp.169-175.

a bachelor's degree, dividend payments would be calculated as a percentage of income once allowance has been made for an exemption of R5000. Vickrey believes that the rate for the determination of the dividend could possibly increase progressively, but should be set so as to attract sufficient funds from investors to meet the demand for loans by students. However, rates should be adjusted so as not to be unfair on those making repayments. Vickrey adds that the principle of a mutual fund could be employed so that payments over and above a certain amount could be made to a fund on the former student's behalf, from which he would be able to make pension withdrawals later.¹⁾

The scheme has the important advantage of reducing the risk element that characterizes other types of loan. It's similarity with insurance schemes on the one hand and income tax on the other does, however, imply that some of the complications of each are experienced. Risk pooling can tempt an insured person to bring about deliberately the occurrence against which he is insured, if he stands to gain thereby and, therefore, entails what has come to be known as 'moral hazard'. In the case of Vickrey's loan scheme graduates may be tempted to accept lower paid jobs than they would otherwise have done, so as to minimize their repayment liabilities, if they receive some psychic, non-monetary satisfaction in so doing. A progressive rate would have similar effects upon the incentives to work of loan holders as modern income tax does. If the repayment amounts were to become excessive in the eyes of the loan holder, he would be very likely to take extended holidays so as to reduce his income, or to request in natura payment for his efforts so as to diminish the base upon which his repayment assessment is made. It would be of particular importance to ensure that the combined marginal income tax payments and loan repayments did not become 'excessive', otherwise the disincentives to work would be aggravated. The effects of the tax structure upon the provision of loan funds by investors would also require investigation. If the income used

1) The administrative complications would count against the implementation of some of these suggestions.

to invest in the scheme were taxed and the money received in repayment of the loans also taxed, investors could become disinterested in the scheme.

Difficulty could also be experienced in defining income for the purposes of the scheme. It appears conceptually easy, at first, to distinguish between earned income and total income where the latter includes, for example, inherited income, and to assume that the former is the product of the higher education. However, ambiguous situations could arise. For example, certain increases in wealth, such as the capital appreciation of assets could be attributable to judicious investments made on the basis of knowledge acquired at, say, a business school and should, strictly speaking, be included for the purposes of assessing repayments of the loan.

The pooling of risks could make the scheme attractive to the mediocre and poorer students but not so for the brighter ones unless some differentiation is incorporated. Vickrey suggests that this could be done through an insurance approach to rating the risks of individual loan applicants. On application an assessment could be made of the earnings potential of each student and the exemption limit (on his future income before repayments begin) determined for each in turn. The potentially high earners would be given high exemption and vice versa for the potentially low earners.¹⁾ It would also be possible to overcome this 'adverse selection problem' by allowing participators to withdraw from the scheme after a certain point had been reached in their payments so as not to discourage potentially high earners from participating in the scheme.

Such 'opt-out' procedures²⁾ could, however, prove complicated to

1) Vickrey, W.: Op. Cit., p. 275.

2) 'Opt-out' provisions ensure that potential high earners participate in loan schemes to provide the surpluses that must balance the losses on low earners. Cf. Hartman, R.W.: 'Equity Implications of State Tuition Policy and Student Loans', Op. Cit., p. S164.

apply in practice and, accordingly, an alternative system of 'variable term' student loans has been advocated.¹⁾ This would also require a certain percentage of annual income to be paid in redemption of the loan. However, these payments would cease once the full amount had been repaid. Because each borrower would, therefore, repay only his own loan, the problems described above of attracting poor students and of opt-out procedures would be avoided without the loss of the benefits of income contingent plans: repayments would still be less in years of diminished income. In practice some limit would necessarily need to be placed on the repayment period, so that exemption from further payments would be granted after that period had elapsed. If many failed to redeem their entire loans, it would however prove necessary for normal repayments to exceed 100 per cent of the original loan.

Whereas ordinary loan schemes could disincline women to enter universities for fear of jeopardizing their marriage prospects by acquiring a negative dowry of debt,²⁾ the Vickrey scheme need not necessarily do so. The risk rating given to women to enable the scheme to be profitable enough to attract the required funds, could, however, be so high as to have a similar effect. If women who have loan debts marry and do not continue working, their husbands may be in the position of having to pay off two loans. Nevertheless, the principle of user charging is not violated thereby, because it has been shown that the major benefit of the woman's education is still enjoyed by her immediate family.³⁾

-
- 1) Hinson, J.P.: Op. Cit., p. 17 et seq.
 - 2) Cf. Robbins Report: Op. Cit., p. 211.
 - 3) Hinson, J.P.: Op. Cit., p. 18. In the Scandinavian countries where most student aid is given in the form of loans (plus zero tuition charges) no insuperable difficulties were found in dealing with this problem, nor with those of defaulters or emigrants. Woodhall, M.: 'Methods of Financing Higher Education', in Butcher, H.J. and Rudd, E. (Eds.): Contemporary Problems in Higher Education, London, McGraw-Hill, 1972.

An important disadvantage of any loan scheme is the administrative burden entailed in working the system. Extensive records will be required over a fairly long period of time. This point would have particular force in Third World countries in which communication systems and facilities for financial transactions are not fully developed. The problems would be aggravated if a complicated system, for example that proposed by Vickrey, were instituted. Suggestions of using the facilities of the Receiver of Revenue for collecting loan repayments have been made in the past. However, in developing countries tax collectors would generally not be able to shoulder additional burdens.

The loan and grant systems could be combined so as to provide incentives for students to complete their degrees in the shortest time available or to obtain the highest marks possible by converting loans to grants for those who qualify. For example, a student could be offered a loan for a three year degree with the qualifications that, if he obtains his degree within three years, he will be absolved from a portion of his debt and if he, in addition, obtains an average mark higher than some pre-determined level, he will be absolved from a greater portion of his debt.¹⁾ Besides a general loan scheme, grants and subsidized interest payments on loans could also be effectively used in combination with a means test to overcome cases of real need. The beneficial aspects of each could be combined to give an eclectic system that should prove acceptable to a majority of interested persons.²⁾

1) Cf. Kaysen, C.: 'Some General Observations on the Pricing of Higher Education', The Review of Economics and Statistics, Vol. XLII, no. 3, part II, Supplement, August 1960, pp. 55-60 on p. 58.

2) Cf. Blaug, M. and Woodhall, M.: 'Patterns of Subsidies to Higher Education in Europe', Higher Education, Vol. 7, no. 3, August 1978, pp. 331-362, particularly on pp. 355-358.

5.2.3 Vouchers

5.2.3.1 Possible Positive Effects of Vouchers

The protagonists of the introduction of free market principles into the financing of education acknowledge that some public funding is necessary to make provision for the spillover or neighbourhood effects of education.¹⁾ In their opinion that does not, however, imply that subsidies should be given directly to universities and other institutions of learning. It is argued that a more effective means of subsidizing education would be to give the subsidies to students in the form of educational vouchers redeemable at any institution of their choice.²⁾ Upon enrolment the student would be required to render up his voucher to the specific university, which would then be eligible to collect a certain sum of money from the central government in lieu of (or as partial payment of) tuition fees by the student.

If such a scheme were to be followed, it is alleged that education would reap the free market benefits of freedom of choice, and that a diverse provision of education to suit all requirements and efficiency of resource use would result, the pros and cons of which were discussed in Chapter 4.

The advocates of vouchers substantiate their claims by referring to those countries where private universities operate adjacently to a public education system. Parents that send their children to the private institutions must in effect pay twice for the education they purchase, once in the form of taxation, which is used to finance the public system, and a second time in the form of tuition fees. The price for opting out of the public system

1) Cf. Section 4.1 above.

2) Friedman, M.: 'The Role of Government in Education', in Solo, R.A. (Ed.): Economics and the Public Interest, New Brunswick, N.J., Rutgers University Press, 1955.

is, accordingly, disproportionately high in relation to the real economic costs involved, which explains why relatively few decide to follow this path. The distortion in relative prices between a subsidized 'free' public university and an 'expensive' private one caused by such double payments interferes with students' abilities to choose the institutions they would prefer and must be viewed as detracting from economic welfare.¹⁾ It is believed that vouchers should be introduced for the express purpose of removing these restrictions upon what many regard as a valid area for the exercise of individual volition. Probably the best known example of a voucher scheme used in practice is that that was made possible by the so-called 'G I Bill' in the United States of America.

The G I Bill²⁾ was aimed at providing education benefits for veterans by authorizing a flat monthly allowance for up to forty-five months of education undertaken within ten years of discharge from the armed forces.³⁾ Payments were made to the student himself, who was free to select an institution but who was required to pay the tuition fees and other expenses such as those for books and board and lodging himself. Of the \$5.23 billion used for this purpose in 1976, \$4.3 billion was spent on higher education. Eligibility for the benefits did not depend upon financial need.⁴⁾

-
- 1) Parish, R.M.: 'The Economics of State Aid to Education', Economic Record, September 1963, pp. 292-305.
 - 2) Initially the Serviceman's Readjustment Act of 1944 (58 Stat. 284) and later the Veterans' Readjustment Benefits Act of 1966 (80 Stat. 12) as amended by the Veterans' Education and Employment Act of 1976 (90 Stat. 2383).
 - 3) Breneman, D.W. and Finn, C.E.: Public Policy and Private Higher Education, Washington, D C, The Brookings Institution, 1978, p. 454.
 - 4) Ibid. For those men and women entering the Armed Forces after 1 January, 1977, a different system applies. Those wishing to qualify for educational benefits upon being discharged are required to contribute for at least twelve months to a fund from which they are entitled to draw \$2 for each \$1 contributed.

5.2.3.2 Possible Negative Effects of Vouchers

Vouchers undoubtedly appear to achieve the objective of allowing free choice in education. This could, however, be illusory. It has been pointed out that free choice implies that a measure of 'slack' must exist in the provision of education. If the number of university places does not exceed the number of students, some students will be forced to accept places in unpopular institutions against their wishes. To such students vouchers merely present a Hobson's choice.¹⁾ Vouchers would certainly complicate students' choices and, if unqualified or unregulated,²⁾ could result in more resources being devoted to education than otherwise would have been the case. This would occur if students tried to secure relatively good positions in the job market by investing in above average education, thereby raising the average.³⁾

In addition, it is not clear that vouchers are effective in achieving some of the other goals sometimes associated with educational policy. Unqualified vouchers may, in fact, contribute to inequality along racial or financial lines. Because vouchers are expressly designed to allow individuality to come to the fore, they enable communities to form educational units that are so constructed as to exclude outsiders. For instance, the use

- 1) Wagner, L.: 'Vouchers - are they the Answer for Parental Choice?' Education, Vol. 144, no. 24, Dec. 1974, quoted extensively in The Open University: The Finance of Education, Milton Keynes, The Open University Press, 1977, pp. 86-89.
- 2) i.e. not qualified according to the income of the voucher recipient, the possibility of supplementary payments, etc. Cf. The Open University: Op. Cit., p. 71.
- 3) Because differential advantages accrue '... to those children whose parents are successful in securing relatively more education ... parents are faced with a "prisoners" dilemma. For each parent, the optimal response ... is to seek ever more education. By imposing uniformity ... public financing removes the dilemma and permits parents to choose lower levels of education.' Stubblebine, W.C.: 'Institutional Elements in the Financing of Education', Southern Economic Journal, Vol. 32, July 1965, pp. 15-35.

of vouchers lent impetus to the founding of racially segregated institutions in the American state of Louisiana.¹⁾ In a country in which ethnic diversity is accentuated this could possibly be considered a positive attribute, but in one striving to achieve a uniform national character it would not be.

Unqualified vouchers could also be used to accentuate financial inequality along both district and family lines. If students or their parents were able to supplement the educational vouchers they receive from the government, and their universities asked fees that exceeded the voucher value, the children of low-income families would effectively be denied access to those universities. It is also probable that the standard of education provided at such institutions, both in terms of teaching and facilities, would be superior to that available in universities where parents were unable to supplement their vouchers.

Inevitably, the quality of universities will vary and will depend partially on the characteristics of the community they serve. However, the standardization of salaries in nationalized education systems would be sufficient to maintain a semblance of equality. If, on the other hand, educational institutions were privately run and could charge fees and pay salaries as they saw fit, the brake that prevents inequality from increasing, would be released. Much would depend upon the attitudes adopted by students and their parents and the sacrifices they were prepared to make to supplement the centrally financed vouchers. But because lower income parents tend to be those who are less concerned about their offspring's education,²⁾ inequality could be exacerbated by a voucher scheme.

-
- 1) La Noue, G.R.: Educational Vouchers : Concepts and Controversies, New York, Columbia University Teacher College Press, 1972, p.39 et seq. See also: Goddard, F.O. and Goffman, I.J.: 'The Public Financing of Non-Public Education', Review of Social Economy, October 1973, Vol. 31(2), pp. 152-166; and Lindelow, J.: Educational Vouchers, Virginia, National Association of Secondary School Principals, Research Analysis Series No. 45, no date.
 - 2) Cf. Section 4.4.2.1 above.

Proposals have been advanced to diminish the tendency of vouchers to increase inequality. They are based primarily on the equalization of power either of districts or of families plus several other safeguards.¹⁾ These proposals amount to attempts to equalize educational options and opportunities despite differences in community or family financial abilities. They imply that the tuition fees payable by voucher should be set with respect to either community or family income, necessitating therefore a means test. The relationship between family income and fees would, naturally, be an inverse one, but would also vary in accordance with the category of institution chosen by the family, so as to allow a measure of differentiation to accommodate different tastes for education.

It has been suggested that additional safeguards could be attached to power equalizing proposals in the form of prohibiting institutions from charging more than the face value of the vouchers. This, as has been mentioned above, would dilute the freedom of choice in educational matters to the few options envisaged in the respective schemes and so largely obstruct variation in response to student choice. It would also leave the actual fee amounts to be determined by the political process via the centralization that vouchers were designed to avoid. In pursuance of equity it has also been suggested that any institutions

-
- 1) For example: Coon, J.E., Sugerman, S.D. and Clune, W.H.: 'Reslicing the School Pie', in La Nove, G.R.: Op. Cit.; Stern, S.: 'Effects of Alternative State Aid Formulas on the Distribution of Public School Expenditures in Massachusetts', Review of Economics and Statistics, Vol. 55, no. 1, Feb. 1973, pp. 91-97; Michelson, S.: 'What is a "Just" System for Financing Schools? An Evaluation of Alternative Reforms', Law and Contemporary Problems, Winter/Spring, 1974, Vol. 38, no. 3, pp. 436-458; Pauly, M.V.: 'Mixed Public and Private Financing of Education: Efficiency and Feasibility', American Economic Review, March 1967, pp. 120-130. For a discussion of Pauly's suggestions see Goddard, F.O., and Goffman, I.J.: Op. Cit., p. 159 et seq. A similar proposal was made by Chambers, J., a discussion of which is to be found in: Benson, C.S.: The Economics of Public Education, (3rd Edition), Boston, Houghton Mifflin Co., 1978, pp. 171-174.

making use of vouchers, should be compelled to accept all candidates that qualify academically. If the demand for places were to exceed the supply, the selection of successful applicants should be a random process so as to eliminate any prejudice that could arise.¹⁾ Several other potential problems with vouchers could be mentioned.²⁾ For instance, the possibility of a free market supply of education raises the problems of consumer protection and minimum standards, which would possibly require enforcement through a system of inspection. Advertising could also possibly need some measure of control.

Additional factors may militate against the practical implementation of a voucher scheme. For example, if the population density of a district is relatively low, economies of scale may enforce the use of one institution only, thereby limiting students' choice.³⁾ It may also prove impossible to find sufficient 'educational entrepreneurs' to undertake the work of providing alternative institutions, especially as profits are likely to be low.⁴⁾ One experiment in performance contracting to establish whether market incentives improved educational institutions, as is predicted by theoretical models, proved to be inconclusive of the superiority of a market system and, therefore, of the profit motive.⁵⁾ Educational agents were paid on the basis of results

- 1) Arons, S.: 'The Peaceful Use of Education Vouchers', in La Noue, G.R.: Op. Cit., p. 82.
- 2) Hansen, W.L. and Lampman, R.J.: 'Basic Opportunity Grants for Higher Education: Good Intentions and Mixed Results', in Haveman, R.H. and Margolis, J.: Public Expenditure and Policy Analysis, Chicago, Rand McNally College Publishing Co., 2nd Edition 1977.
- 3) Moor R.C.: 'The Economic Efficiency of Mixed Financing of Education in Economic Space', Public Finance Quarterly, Oct. 1973, Vol. 1, no. 4, pp. 399-408.
- 4) Ginzberg, E.: 'The Economics of the Voucher System', in La Noue, G.R.: Op. Cit., on p. 105.
- 5) Gramlich, E.M. and Koshel, P.P.: 'Is Real-World Experimentation Possible? The Case of Educational Performance Contracting', in Haveman, R.H. and Margolis, J.: Op. Cit.; Hiller, J. and Tollison, R.D.: 'An Economic Model of Performance Contracting in Education', Public Finance, Vol. 29, no. 1, 1974, pp. 36-48 presents a theoretical analysis.

rather than costs so that staff salaries depended upon educational output. The results showed that there were only slight differences between the experimental and control students, although the haste with which the experiment was implemented and its limited duration of one year, may have invalidated or biased the results.¹⁾ Another factor likely to be problematical would be that of the future financing of universities' capital costs.

5.2.3.3 The Use of Vouchers for Financing South African Universities

In South Africa the autonomous universities, which are not centrally controlled but are administered by their councils, are in a sense exposed to the market mechanism. It is, accordingly, necessary to decide whether the reservations expressed above are likely to apply in their case. The first of these is in respect of the probability of inequalities being perpetuated or aggravated.

The autonomous South African universities are free to establish their own fees and significant variations occur. They are, however, not permitted to establish their own staff salary scales, except that salaries can be supplemented with donations for that purpose.²⁾ Some room for the development of inequality does, therefore exist. Nevertheless, the internal diversity of a modern university could tend on average to diminish the disparities. In any case, university variety and individuality of character could be regarded to be more of an asset than of a liability (in contrast to the case of schools, through which national cohesion in some sense must be established). In general, it is also not

- 1) Ibid. A voucher system was introduced on an experimental basis in the school district of Alum Rock, California. Because of the limitations involved with social experimentation and the small number of schools that took part, the experiment became more one of testing decentralization than vouchers. D. Weiler et al.: 'The First Year at Alum Rock', in Baxter, C., O'Leary, P.J. and Westoby, A.: Economics and Education Policy : a Reader, London, Longman, 1977.
- 2) Louw, J.B.Z.: Owerheidsbeleid en -Administrasie van Universiteite in Suid-Afrika, D.Phil Thesis, University of Pretoria, 1978, p. 373.

prohibitively difficult for university students to borrow funds to supplement vouchers, if they should wish to enrol at high cost institutions. The inequality raising potential of vouchers would, therefore, probably be of less consequence to universities than to other educational institutions, provided freedom of access to the institution of the student's choice were assured. For if that is so, the benefits of a voucher scheme of accentuating individuality are reaped without great negative consequences. Where the negative side of inequality did come to the fore, it could be counteracted by a student power equalizing scheme, such as the judicious use of grants, scholarships and loans.¹⁾

The importance of the proviso requiring freedom of access bears being stressed. If restrictions were placed upon access to the better universities, for whatever reason, the use of unregulated vouchers could prove discriminatory. It would, under such circumstances, be desirable to institute some measure of power equalization. Those universities drawing their students from poorer neighbourhoods would be likely to have a less 'educatable' student body than their more affluent counterparts, because of the importance of pre-university education for successful academic performance. Students having had poor schooling and possibly also originating from culturally deprived homes, are on average handi-

-
- 1) Ironically, although vouchers normally allow inequality to increase, if extreme inequality already exists, their use could, under certain circumstances, herald a move towards greater equality. In South Africa, for example, where the white population group has enjoyed a high subsidy per scholar in comparison to the other population groups, (but not, relatively, per university student), vouchers may offer a method of alleviating the imbalance. Because insufficient funds are available to subsidize the schools of all groups at a level equal to those of the Whites, and because an enforced lowering of white educational standards would not be feasible politically, vouchers of equal but modest value for all groups could be issued, whilst allowing whites to supplement their vouchers to maintain their desired standards. In the process inequality would not be removed, but official discrimination through the differential provision of funds would be eliminated, which could be the first step towards greater equality.

capped in the academic race.¹⁾ Unregulated vouchers, through which a flat allowance per student is payable, would be to the disadvantage of the universities drawing poorer students, because they would be less inclined to raise their tuition fees, although their requirements would probably be greater as a result of their need to apply remedial teaching, bridging courses and the like. Consequently, the standard of education received at such institutions would in all likelihood be lower than elsewhere, as fewer resources would be spread over greater needs.

The argument just advanced does not imply that a uniform standard of education at university level is either necessary or desirable. As has already been stressed, diversity is of the essence in the university community. And of course, variations in intellectual abilities must come to the fore at the pinnacle of the educational hierarchy. However, if students of high intellect are unable to attend high quality universities because of restricted access, the case for unregulated vouchers is significantly weakened. Inequality of the unequal is to be expected, but inequality of equals is not to be condoned and, consequently, restrictions upon access imply that vouchers would have to be regulated to equalize the opportunities of students having equal intellects. This would probably need to be done by increasing the value of all the vouchers used at those universities to achieve district equalizing. Family or student equalizing would be ineffectual, if higher value vouchers were not redeemable at high quality institutions.

Scrutiny of the current South African practice of financing universities reveals that, in fact, an adapted voucher system is in use for the autonomous universities. It is currently administered

- 1) Hartman, R.W.: 'Student Loans for Higher Education', Op. Cit., constructed a model based on U S A data, in which he indicated that "... the probability of earning a bachelor's degree is almost six times greater for the children of the rich than for the progeny of the poor." (p. S.145). See also: Hansen, W.L.: 'Equity and the Finance of Higher Education', Journal of Political Economy, Vol. 80, no. 3, Part II, Supplement, May/June 1972, pp. S.260-S.273 on p. S.264.

through two financing formulas, one of which applies primarily to current university expenditure and one to capital expenditure. It is essentially an unregulated voucher scheme in the sense in which that term has been used above, although differentiation is made with respect to subject groupings and undergraduate and post-graduate levels, with 'vouchers' of differing values given by the authorities along those lines. It differs from what is normally regarded as a voucher scheme in two respects: firstly, the vouchers are not paid to students individually but are claimed by the universities directly as a lump sum from the authorities on the grounds of the student numbers enrolled in each of the respective categories;¹⁾ and secondly, the magnitude of the 'voucher' decreases if used at larger universities, which in a sense could be viewed as the power equalization of universities to compensate for the economies of scale that are assumed to arise with increasing enrolments.

Having the universities collect a lump sum rather than having the vouchers paid individually to students makes for administrative ease. Because the universities are administratively geared to handling the relevant student statistics, whereas the Department of National Education, which dispenses the 'vouchers', is not, an unnecessary duplication of the administrative machinery is avoided.²⁾

The economic effect of the procedure is little different from the normal voucher method. Universities must compete for students in the 'educational market place' which results in, on the one hand, the universities' attempting to produce their respective educational packages cheaply and efficiently, and on the other, in the universities' wishing to offer as wide and as varied a programme of courses as possible in an attempt to attract students.

-
- 1) Although the components of the formula for current expenditure are adjusted annually, the rationale thereof is expounded in the Van Wyk de Vries Report, Department of National Education: Main Report of the Commission of Enquiry into the Universities, Pretoria, Government Printer, RP. 25/1974, Chapter IX.
 - 2) Vide Section 5.3.1.4, 'The Number of Successfully Completed Credits.

Whether vouchers are handed to individual students or are administered in groups does not change their effect upon how universities react to them. Although the profit motive in the normal sense does not play an important positive role in university affairs, what may be described as the 'solvency motive' does. Universities would always be able to spend more on their existing programmes, and the importance of university management, therefore, often lies therein that solvency be assured at all times. Prestige is, in addition, an important motivating force and is often indicated by university size, both in terms of student numbers and research programmes.¹⁾ These forces may at times be conflicting in that, although the variety of courses offered by a university can be attractive to students, the inevitable subdivision of teaching activities can increase costs and, therefore, either lead to higher tuition fees or endanger solvency. The role of a university's management is to obtain balance between these, because the market should ideally allocate students to the institution that delivers the best result so as to penalize those universities that do not organize themselves effectively and to reward those that do.

Likewise, there is little reason to expect that the effect upon students will be vastly different, if the vouchers do not pass through their hands directly. If it is assumed that the value of the voucher would be set so as to match the externalities generated by education, as has been suggested in Chapter 4, paying the voucher individually to students would imply that universities' tuition fees would be set to equal (marginal) social teaching costs. If the vouchers were paid directly to the universities, tuition fees would equal (marginal) private teaching costs and would therefore be lower. The net effect upon the student should, however, be the same. The former procedure places greater emphasis upon the costliness of higher education to society as a whole rather than upon the costs caused by the student. The latter are, of course, the relevant costs,

1) Cf. Section 3.4.1 above.

because students' decisions to enrol are made in their private capacities. The costs attributable¹⁾ to benefits received by society at large, are not those that require being emphasized to the student. Therefore, in so far as students act irrationally by not taking only their net costs into consideration the better system appears to be to make vouchers collectively redeemable at the universities rather than payable to students, so as to avoid influencing students' decisions adversely.

The use of formulae in the financing of universities is discussed in greater detail in Section 5.3.1 below.

5.2.4 Tax Concessions to Parents.²⁾

Aid to students and their families can take the form of tax concessions to parents or guardians of students. Conceptually a primary distinction can be made between tax credits and tax deductions.³⁾

The former applies when, after a taxpayer's normal liability has been calculated, a certain sum is credited to the income tax account of that taxpayer for each student that he supports at university. The amount will depend upon the particular circumstances but would generally not exceed the average fees payable by the student. In its simplest version the same amount is credited to all parents and guardians who support students. A more sophisticated method would be to adjust the amount of tax credit

- 1) All the benefits are produced jointly, thus the costs are not separable. Cf. Section 3.4.3.
- 2) Leslie, L.L.: 'Higher Education Tax Allowances : An Analysis', Journal of Higher Education, Vol. XLVII, no. 5, Sept/Oct. 1976, pp. 497-522; and Blum, V.C.: 'Freedom of Choice in Education', in La Noue, G.R.: Op. Cit., p. 21, et. seq.
- 3) 'Tax deferments' can be regarded as a special type of loan because the taxpayer is granted temporary tax relief without a diminution of his tax responsibilities. 'Amortized Tax credits' make provision for an increased period, but do not otherwise differ from conventional tax credits. Credits for educational deposits are granted before and during the years spent at university. Cf. Leslie, L.L.: Op. Cit., pp. 512-518.

according to the costs of the particular higher education institution chosen, so as to give credit for a high percentage of the costs of a low-cost institution and a lower percentage for additional costs. For example, 75 per cent of the first R200, 25 per cent of the next R300 and 10 per cent of the next R1000 has been suggested.¹⁾ This would mean that a credit of R175 would be allowed for university expenses of R300 whereas, if expenses were R1 500, a credit of R325 would be allowed.²⁾ The lower income family, which sends its children to moderately priced institutions, would benefit by such an arrangement by having a large percentage of its costs covered, whereas those, who choose the expensive institutions, benefit proportionately less and would still have to pay a significant part of the expenses themselves.

Tax reductions occur when the tax base, i.e. gross taxable income, is adjusted to allow for dependents of the taxpayer. If the size of the tax allowance were made to depend upon the average tax bracket of the parent, the effect would be that, if say, university fees were R800, a parent in the 20 per cent bracket would save R160, whereas a parent in the 50 per cent bracket would save R400. Clearly, any such proposal is regressive in the sense that those who earn less and are, therefore, in a lower tax bracket, save less through the scheme than their more affluent counterparts do. If the amount of the allowance were also to vary in response to different educational expenses, the regressive nature of the proposal would be emphasized, as those who could afford to spend more on education would also save more in absolute terms.

Both tax credits and tax deductions suffer from the defect that neither helps the very poor, that is, those who do not pay income tax at all. This is a serious defect, because obviously those are the people most in need of assistance. Tax concessions have the additional disadvantages that they complicate the income tax system and tend to open loopholes that could be exploited. They

-
- 1) Freeman, R.A.: 'Last Chance to Save Private Colleges', in Orwig, M.D.: Op. Cit., p. 215.
 - 2) Ibid.

can also be very costly to the Treasury in terms of forgone revenue. Because the subsidies they entail are 'hidden' in the sense that the total amount is difficult to calculate due to the different amounts creditable to different taxpayers, they are also inclined to be forgotten, despite the magnitude of the expense incurred.

The tax system is generally used to provide an 'invisible' subsidy to higher education, even if no tax credit or deduction scheme is in operation for direct educational expenses. It exists through parents being able to consider their adult children, who are full-time students, as dependents for the purposes of their income tax calculations. The result is that the parents of students pay less income tax than they otherwise would have done.

In the fiscal years preceding 1980/81, a child older than 21 but below 26 years of age, that was financially dependent upon its parents, a full-time student and not liable for payment of income tax, qualified for a child abatement. Abatements were designed to diminish the parent's taxable income with the diminution becoming progressively smaller the larger the taxpayer's taxable income became.¹⁾ Because of this variance between taxpayers, accurate computation of the total amount of the implicit subsidy is not possible for those years. However, as from 1980/81 the system of abatements has been replaced with one of tax credits, whereby taxpayers who support children in this category are entitled to subtract R100 from the sum of the tax they owe for each of their first five children. R150 is subtractable for additional offspring²⁾ supported by the parent.

-
- 1) Silke, A.S., Divaris, C. and Stein, M.L.: Silke on South African Income Tax, Cape Town, Juta and Co. Ltd, Ninth Edition, 1978, p. 541.
 - 2) Section 6, no.3(a) of the Income Tax Act, (Act no. 58 of 1962 as amended). Cf. Stein, M.L. and Divaris, C.: Ou Mutual Inkomste - Belastinggids, 1980/81 Hersiene Uitgawe, Ou Mutual Drukkery, p. 11.

Under the new dispensation it is relatively easy to estimate the amount of the implicit subsidy. If it is assumed that parents with children at university that qualify for tax credits generally support less than five children at any one time, the amount of R100 per child can be used. Further, if it is assumed that only full-time students will be eligible for tax credits, because part-time students generally earn and are, therefore, liable for payment of income tax in their own capacities, the numbers of full-time students can be used. Another assumption required is that all the parents of full-time students pay income tax, which may, in fact only be a reasonable assumption to make in the case of white South Africans. In addition, although Coloureds, Asians and Whites are taxed alike,¹⁾ a separate act²⁾ governs the taxation of Blacks in South Africa. Although no general provision is made for tax credits, Blacks who attend approved educational institutions are entitled to exemption from tax liability on producing certified statements to that effect from the relevant institutions.³⁾ If, to reduce uncertainty, the estimate of the implicit subsidy is limited to students under the jurisdiction of the Department of National Education, whereby the majority of black students is excluded, more than 80 000 full-time students can nevertheless be presumed to qualify for tax relief, implying an implicit subsidy of over R8 million to students and their families from this source. This is clearly a significant sum.

However, the tax system discriminates against education in a different sense. If education is viewed as human capital embodied in a particular person, and the tax treatment thereof compared to the treatment of physical capital, the absence of depreciation allowances for human capital is noticeable. Nevertheless, knowledge is susceptible to depreciation and obsolescence, no less than is physical capital. Doubtless the difficulties of quantification, combined with the ephemeral nature of some knowledge, would make the practical implementation of amortisation of

1) The Income Tax Act.

2) Taxation of Blacks Act. (Act. no. 92 of 1969).

3) Section 13. Cf. Stein, M.L. and Divaris, C.: Op. Cit., pp. 186-187.

human capital prohibitively problematical.

An analysis of tax concessions that stimulate donations to universities, as opposed to those that aid students' families, is to be found in Section 5.3.2 below.

5.3 Financial Aid to Institutions

5.3.1 Formulas

5.3.1.1 Introduction

In Section 5.2.3.3 it was suggested that formulas that allocate specific sums to universities on the grounds of the number of students enrolled at a particular time could be viewed analytically as equivalent to vouchers treated collectively. Not all formulas have this characteristic, as the basis for the formula could conceivably be some magnitude other than student numbers. In this section formula financing of universities will be treated broadly to illustrate the nature and different forms of formulas possible.

The need for public subsidization of universities to account for the externalities generated by teaching and for the provision of basic research has been established above. If that subsidization is to be paid directly to the relevant institutions, the sum involved can be calculated either on an annual budgetary basis or by using a carefully formulated set of rules by which the budgetary mechanism would be standardized. The financing formula comprises such a set of rules and is, therefore, a budgetary aid that is based upon an analysis of the institutions' needs. Formulas should be founded upon the principles of rationality, objectivity and quantification.¹⁾

- 1) Miller, J.L.: State Budgeting for Higher Education. The Use of Formulas and Cost Analysis. Monograph, University of Michigan, 1964, p. 150. See also Meisinger, R.J.: State Budgeting for Higher Education : The Use of Formulas, Berkely, Centre for Research and Development in Higher Education, University of California, 1976; Karol, N.H., and Ginsburg, S.G.: Managing the Higher Education Enterprise, New York, Ronald Press, 1980.

Formulas have the important attributes of removing the process of public funding of universities from the political arena, thereby diminishing the possibilities of ad hoc decisions on behalf of and special pleading by single institutions. In addition, a carefully planned formula provides a system for the equitable division of the available resources along lines that have been established and agreed upon by the interested parties themselves. Formulas facilitate comparisons amongst institutions and activities; they generally ensure the adequacy of financial support while leaving universities free to establish their own fees as they see fit; they serve to emphasize the policy decisions necessary by requiring explicit quantification; by enforcing detailed analyses of institutional structures and operations they foster the attainment of efficiency; they reduce what would have been a complicated line-budgetary process to one that is relatively easy to administer; they foster certainty, which facilitates planning by university authorities; and they lay down a set of procedures that are generally widely accepted.¹⁾ The complaint of the adversaries of formulas that all institutions become constrained within the confines of the formula and that the freedom and individuality of institutions are forfeited thereby can be overcome by allowing the universities to spend their resources as they see fit, irrespective of the basis of calculation.²⁾

(Footnote 1, p.177 continued)... pp. 35-38; and Moss, C.E. and Gaither, G.H.: 'Formula Budgeting: Requiem or Renaissance?' Journal of Higher Education, Vol. XLVII, no. 5, Sept/Oct. 1976, pp. 543-563.

- 1) Ibid.; also Halstead, D.K.: Statewide Planning in Higher Education, U S Government Printing Office, 1974, p. 662, and Report of a Commission to the Association of Universities and Colleges of Canada; Financing Higher Education in Canada, (Chairman: Bladen, V.W.), Toronto, University of Toronto Press, 1965, pp. 42-44.
- 2) This is the position in South African universities. It is also a fundamental assumption for the application of regression analysis to designing a new formula that universities optimize internally, irrespective of the formula by which their funds are calculated. See Section 3.4.1 above. Cf. also Millet, J.D.: The Budget Formula as the Basis for State Appropriations in Support of Higher Education, Indiana, Commission for Higher Education, 1974, p. 11.

In what follows below, little attention will be given to formulas for the provision of new university buildings because provision is made for those expenditures via a separate formula. Section 5.3.1.4 is, however, devoted to a brief description of that formula so as to emphasize its importance. Provision is not made by formula for the provision of land to the universities because of the extent of regional variations. Accordingly, this aspect will not be discussed.

5.3.1.2 Exogenously and Endogenously Determined Formulas

As an initial differentiation, different formulas can be distinguished by whether the independent variables, upon which they depend, are exogenously or endogenously determined. For example, if the sum of the subsidy calculated by a formula, for example the dependent variable, depends upon the number of students enrolled at that university, the independent variable is endogenous to the university system. On the other hand, if the subsidy depends upon some factor external to the university system, such as, for example, the growth rate in national income or gross national product (G N P), the formula can be classified as being exogenously determined.

Although the coupling of subsidies to G N P has the positive attribute, if seen from the viewpoint of the Treasury, of relieving the budgetary pressure caused by university financial demands in recessionary times, it could entail severe disadvantages for the universities. These stem primarily from the lack of connection between the subsidy generated and the actual requirements of the universities. Student enrolments need not be positively correlated with G N P growth rates and may even, in fact, be inversely related to the cyclical swings of the national economy. Recessionary phases, with their accompanying increases in unemployment, may witness a greater willingness amongst students to spend an extra year at university so as to await improved employment possibilities or so as to enhance employment prospects by investing in a post-graduate qualification. If that were in-

deed to occur,¹⁾ an exogenously based formula determined by G N P growth rates would precipitate periodic financial crises amongst universities, because increased requirements would be met with decreased provision. Again, although the prima facie logic of spending less on university subsidies when less is available seems to be plausible, investment in university education should preferably be viewed as a long-term phenomenon and shielded from short-term fluctuations.

If subsidies were to be tied to a percentage of G N P in a demographically young country in which a relatively large proportion of the population was of university going age, the per student amount available to the universities would be less than in a comparable but demographically older country. A situation could also be experienced in which the growth rate of the student population exceeds that of the G N P, which would obviously be financially unsatisfactory for the universities. Even if the two rates were equal, there is reason to expect that university costs will rise more quickly than will average costs of the economy as a whole, because of static university productivity and the labour intensive nature of university production.²⁾ A 'growth difference' formula has been proposed as solution to these problems.³⁾ It has been suggested that the percentage increase in G N P could be used to hypothesize a figure for what expenditure per student would have been, if the latter had grown at the same rate as G N P had. The amount by which the actual figure exceeded the hypothetical figure would indicate the effort expended in excess of that that could have been expected through the normal growth of the economy. It should also indicate the amount needed in subsidies to avoid increases in tuition fees.

- 1) Handa, M.L. and Skolnik, M.L. found the relationship between youth unemployment and enrolments to be weak. 'Unemployment, Expected Returns, and the Demand for University Education in Ontario: Some Empirical Results', Higher Education, Vol. 4, no. 1, Feb. 1975, pp. 27-43.
- 2) See Section 5.2.2 above.
- 3) Farrell, R.L. and Andersen, C.J.: 'General Federal Support for Higher Education : An Analysis of Five Formulas', in Orwig, M.D.: Op. Cit., pp. 219-268 on p. 258.

As has been pointed out at various stages in this dissertation,¹⁾ the fact that a country can afford a subsidy to education of a particular magnitude does not indicate that such a sum is desirable. The problem comes to the fore again with the consideration of exogenously determined formulas, for the sum actually generated by such formulas is not shown to be either necessary or sufficient for maximizing society's welfare. Although the difficulties experienced with quantification and market failures render the practicality of all planning procedures subject to doubt, it is submitted that the essentially decentralized procedure of allowing students to choose the level of education they prefer, at fees equal to marginal costs after the deduction of social costs, is the most satisfactory approximation available. Each student would thereby be required to conduct his own cost-benefit analysis on the desirability of his own education.²⁾ This does not imply that overall financial constraints are unimportant, but it does imply that there is no particular justification from a welfare point of view for a constraint equal to the growth rate of G N P. As has been argued above, it is conceivable that university costs could grow at a higher rate on the one hand, and on the other, depending upon demographic trends, an overprovision could result, if subsidies were tied to G N P growth. In first world countries where the population growth rate has fallen to negligible levels, it could, for example, prove more fruitful to invest in old age homes than in universities. And if, nevertheless, subsidies were calculated by this method, universities would have few incentives to spend their funds economically or to conduct their affairs efficiently.

It is very difficult to conceive of any other magnitude to which

1) E.g. in Sections 2.6.1 and 4.4.2 above.

2) Cf. Carter, C.F. and Williams, B.R.: 'Proposals for Reform in University Finance', Manchester School, Vol. 31, no. 3, Sept. 1963, pp. 255-261. See also Sections 2.6.3 and 2.6.4 above.

subsidies could be exogenously correlated, that would not be entirely arbitrary.¹⁾ This would be especially so if universities were obliged to have an 'open door' policy of admitting all who satisfied the minimum entrance requirements, without being allowed to select students of their choice. If, however, a numerus clausus principle were followed, a relatively static subsidy in the form of an annual lump sum, that could merely be adjusted for cost increases, would be possible.²⁾

Although the limitations of physical facilities could necessitate a numerus clausus in certain fields, its general application with its attendant lump sum subsidy could only be considered a solution to the problems of planning universities and determining subsidy amounts if continual adjustments were made. However, this proviso effectively side-steps the problem because it postpones the question of how this should be done. The alternatives that could be considered were discussed in Section 2.6 as being applications of either the manpower or the rate of return approaches, the respective pros and cons of which were aired at that juncture. If the manpower technique were to be used, estimates would be made of the future numbers of trained persons required in the relevant categories and the numerus clausus adjusted accordingly. If the rate of return method is employed, central planners would be required to calculate the social returns for the different categories and to increase the numerus clausus of those groups that had a relatively high social return and to decrease that of the groups with low social returns. In both cases the students actually admitted to the universities would be chosen by selection committees, who would act upon the advice of

-
- 1) The Carnegie Commission accordingly recommended that "(the) institutional allocation ... (be) based upon some quantitative dimension of the institution", i.e. that formulas should be endogenous. Carnegie Commission on Higher Education : Institutional Aid. Federal Support to Colleges and Universities, New York, McGraw-Hill Book Co., 1972, p. 17.
 - 2) Cf. Pellegrin, J.P.: 'Admission Policies in Post-Secondary Education', in O E C D : Towards Mass Higher Education, (Issues and Dilemmas), Paris, 1974, pp. 87-94.

the central planners as to whether to admit more or less students. And if insufficient students applied for admission, the demand for places could be stimulated by increasing subsidies to the relevant subject groupings. In neither case would the decision be left to the student, as would be the case if the modus operandi of marginal cost pricing were adhered to.¹⁾ Because the latter method requires the student himself to perform the cost benefit analysis, instead of the central planner, it avoids some of the problems of centralized decision making whilst maintaining individual freedoms.

5.3.1.3 Base Formulas and Functional Formulas

Educational costs are, of course, endogenous to the university system and, consequently, a subsidy based upon the social costs entailed by a student's private decision to pursue his studies will likewise be endogenous. Endogenous formulas can conveniently be grouped into two broad categories, namely base formulas and functional formulas.²⁾ The former calculates the subsidy for a particular activity, say auxiliary services or libraries as some percentage of a certain base, which is often taken as the sum of expenditures for instructional purposes. This method has the advantage of simplicity, but is difficult to justify analytically, unless the base activity is strictly correlated with the other activities that depend upon it in percentage terms. As this correlation could be spurious, the optimality of the base method could be subject to doubt.

As the name suggests, functional formulas are so constructed that the amount of subsidy available for each university activity is calculated on the grounds of factors that are of relevance to that particular activity itself. Although the latter procedure

1) Cf. Carter, C.F. and Williams, B.R.: Op. Cit.

2) Miller, J.L.: Op. Cit., p. 104 et seq. and Halstead, D.K.: Op. Cit., p. 666 et seq.

is analytically superior to the former, its use depends upon whether the data are available to make the required calculations. It is also to be preferred because formulas are required to estimate the total of universities' expenditures for the future on the grounds of their past activities. It is, therefore, essential that the projections be based upon as accurate an estimate of the pattern of costs as possible.

Functional formulas project workload measurements for each activity priced at the expected unit cost. The planned total load of, say, books to be purchased for the library is multiplied by the average cost to determine the sum required. A particular variation of this kind of formula is that which projects a staffing pattern by determining the numbers of staff, both academic and administrative, that are required for each activity and calculating the subsidy by means of multiplying the number thus determined by the unit salary costs. The staff positions decided upon take the place of the load measurements of the more general case.

It goes without saying that both the functional type formula and the base type can be combined in one comprehensive formula so that some activities are subsidized using one of the methods and other activities by using the other. In fact, the starting point of base type formulas is usually instructional expenditure, which has been calculated on a functional basis. The combined form is, for example, advocated by the van Wyk de Vries Report¹⁾ and has been used for a number of years in South Africa.

Functional formulas are by their nature endogenously determined, because the internal requirements of the system are what determines the subsidy generated. And, because base type formulas are generally connected to an initial functional element, they are usually also of an endogenous nature. The question, therefore, becomes one of deciding which independent variable (or variables)

1) Van Wyk de Vries Report: Op. Cit.

is best suited for the purposes of the formula. If the functional procedure is considered superior and consequently used as a point of departure, an analysis of each activity, of which instruction and research have priority, is implied.

Subsidies should ideally be based upon the relationship between the universities' costs, when acting efficiently, and the chosen independent variable(s). However, the determination of costs to be subsidized could not be left to the discretion of the universities. Such an arrangement would amount to an invitation to financial licentiousness. The remedy is to base the subsidy upon what is agreed to be reasonable costs for the particular activity.¹⁾ This could be achieved by calculating a reasonable cost per unit for each activity and (multiplying by the number of) units concerned to estimate the total costs expected from that activity. Clearly, the activities grouped together for the purposes of such a calculation must be sufficiently numerous and similar to give an accurate approximation of the central tendencies involved, for the resulting formula to be meaningful.

5.3.1.4 The Basis for the Payment of University Subsidies and the Effects upon Efficiency

The number of units referred to in the previous paragraph, by which the unit costs are to be multiplied, refers to the independent variable chosen as basis for the subsidization of the particular activity. The factor which prima facie seems appropriate for this purpose is university output. This is because the public purse should preferably not be held responsible for a portion of university costs unless outputs beneficial to society are produced. University outputs can be divided broadly into the categories of instruction, research and public service, of which the first two are of overriding importance.

1) Miller, J.L.: Op. Cit., p. 40 terms this procedure 'factorial estimating'. Cf. Vaizey, J. and Chesswas, J.D.: The Costing of Educational Plans, UNESCO, International Institute for Educational Planning, no date. Cf. Section 5.3.1.5.

The subsidization of outputs is in principle superior to that of inputs because of its inherent efficiency enhancing effects. Universities, in their capacities of users of scarce resources, should be encouraged to husband those resources to the best of their abilities, including the oft overlooked, yet major input of student time. Subsidies coupled to outputs have the effect of rewarding universities only if their inputs have been put to effective use, in the sense of having produced final academic products. Equally, students should in principle only be supported with public money, if they have put the resources of the university to optimal use. However, although subsidization based upon outputs appears to be desirable, its implementation is not devoid of either disadvantages or practical difficulties. In what follows, several possible methods of coupling subsidies to outputs are considered, before the alternatives, based upon using inputs, are discussed.¹⁾

The Numbers of Graduated Students: Various aspects of the measurement of outputs and inputs were discussed in Sections 3.2 and 3.3. There it was concluded that the accurate measurement of teaching outputs, in the sense of determining the amount of knowledge gained in the educational process, was practically insurmountable because of the difficulties of measuring the initial inputs (for example the student's existing knowledge, his aptitudes and intelligence) and comparing them to the outputs to arrive at an estimate for 'value added'. Therefore, if the number of graduated students were to be used as output measure, the magnitude calculated would be a measure of gross output. And if subsidization were based upon gross output, because of it not being practicable to distil the value added component from production, the basis for subsidization would include inputs besides

- 1) The Carnegie Commission identified five possibilities: (i) Allocations tied to general inputs (e.g. enrolments); (ii) Allocations tied to general outputs (e.g. degrees); (iii) Special increments for smaller colleges; (iv) Formulas tied to specific groups of students (e.g. poor, or very able students); and (v) Allocations based on growth factors or increases in costs (e.g. the growth differential formula described above in Section 5.3.1.2). Carnegie Commission on Higher Education: Op. Cit., p. 18.

outputs.

It could be argued that the procedure would, nevertheless, encourage a more stringent selection of students by the universities, because only successful candidates would earn subsidies for the university. However, effects could possibly be introduced that could distort universities' incentives, by placing them under financial pressure to act in ways contrary to their academic convictions. If, for example, instruction output were to be measured in terms of graduates, a degree of risk could be introduced, because a university that had borne the costs of an unsuccessful student would not be reimbursed proportionally by the state. The financial risk involved in failing students could result in pressure being placed on examiners to avoid doing so, a result that would clearly not be desirable.

Although the judicious use of external examiners could present a solution for this problem, the conditions necessary for such a system's effective use could be regarded as restricting university autonomy. This would be so, because to be truly effective, the system would require the separation of the teaching and examining functions of universities by requiring the external examiner to set the examination questions himself.

The Number of Successfully Completed Credits: This proposal is essentially a variation upon the preceding one. It suggests that subsidies be paid to the universities on the completion of credits¹⁾ by students (as opposed to degrees). For example, if a student were to complete 0,5 credits in a particular year, the subsidies paid on his behalf by the state would be only half of the normal subsidy.

1) In the SAPSE system it is assumed that the total credit for all instructional offerings of a full-time student equals one per year. Report SAPSE-005: Student Manual, Pretoria, Department of National Education, First Edition, 1982.

Through the use of an annual measure, the computational period required in comparison to basing subsidization upon numbers of graduated students, would be reduced and the risk, spoken of in the previous paragraph, correspondingly diminished.

In this respect it has been suggested that the risk element, entailed for the universities, could be eliminated by the use of vouchers in conjunction with an output measure, for example, the completion of credits by the student. It is said that, because the student would then be responsible for paying full (unsubsidized) fees to his university, irrespective of whether he failed or passed his examinations, no incentives to condone failures would be generated. The fact that the subsidizing authority would reduce the amounts paid to those students who failed, would pass unnoticed in the universities. However, it is submitted that that would be unlikely to happen. Students who foresaw their subsidies being reduced would be unlikely to seek enrolment at those universities having stringent standards. Therefore, those universities that were sensitive to fluctuations in enrolments would not be shielded from the risk of forfeiting income through dwindling enrolments. The use of vouchers in this way could cause administrative difficulties, besides those arising from duplicated student records mentioned in Section 5.2.3. Because of the high level of fees that would result from this method of subsidization, it would only be feasible to withhold a small portion of the total amount until the student's examination results became known. This would tend to detract from the effectiveness of the scheme. Alternatively, if students were required to repay subsidies on failing, administrative complications of having to collect the money owing by such students would arise.

The Number of Enrolled Students: Because of the difficulties encountered in quantifying university outputs, formula compilers have almost invariably taken refuge in the use of student numbers as basis for subsidy calculations, despite the fact that this

implies the use of an input as a surrogate for outputs.¹⁾

As may be expected, if one input (students) is used to generate a second input (subsidies) the incentives of both students and university administrators can become distorted. Thrift becomes a less pertinent virtue than would have been the case, had outputs been subsidized instead. Inefficiencies could result: from the point of view of the student, the need to complete a degree in the shortest time possible is diminished and from the point of view of the university, the need to select suitable student material is lessened.

Unfortunately, although competition between universities should ideally be in the field of academic excellence, it can equally be conceived as being in that of campus grandeur; and subsidies on inputs, such as enrolments, can lend financial credence to such notions. Increasing student numbers can be conceived as the easiest way of turning grandiose dreams into financial reality. And in a small country, which is unable to house more than a few universities endowed with all faculties, the fulfilment of such dreams could only occur to the detriment of the public exchequer. The aim of formula builders should, therefore, be to reduce these distortionary effects and to encourage efficiency as much as possible.

1) Millett, J.D.: Op. Cit., p. 49 concludes: "There does not appear to be any way by which the objectives of equity and adequacy in the distribution of state appropriations can be achieved other than by an enrollment-driven (sic) formula." Although other factors can also be useful in determining subsidies, if larger universities are to receive more than smaller ones, enrolments will continue to play an important role in subsidy formulas. In 1980 some 25 states in the U S A budgeted for higher education by formula, the majority of which were related to enrolments. Karol, N.H. and Ginsburg, S.G.: Managing the Higher Education Enterprise, New York, Ronald Press, 1980, p. 35.

The Number of Enrolled Students Weighted for Matriculation Grade:

One way of inducing universities to be more selective about their students would be to reward those that admitted students having higher than average school leaving grades, which could be achieved by introducing a system of weights for the subsidies of first-time entering students.¹⁾

Such a scheme would be administratively feasible. However, it would not be entirely devoid of negative aspects. On its own, it would, for example, only encourage students to be diligent up to the point where they had gained entry to the institution of their choice. Secondly, it is possible that some students' academic potential only becomes apparent within a suitably stimulating environment (which is often lacking in pre-university education), whereas other students achieve high grades on the strength only of intensive coaching at school. Accordingly, a weighted subsidy scheme would require the weights to be adjusted annually as students progressed from being freshers to seniors and as they possibly improved their academic standing in the process. But, if that were allowed, universities could be induced to upgrade their marking of examinations so as to reap the higher subsidies available, unless an extensive and effective system of external examining were devised. As the degradation of standards would clearly be a lamentable consequence, the use of weighted subsidies could only be contemplated for first year students. Alternatively, the weights established for the class of a certain year would have to be retained for subsequent years. As it is possible for the composition of a class to change as the weaker students leave and late developers improve, this option would not be entirely satis-

- 1) A proposal for differentiated subsidies according to academic merit has been made for Indian universities, where a combination of an 'open door' policy plus low tuition fees resulted in overcrowded universities and low quality tuition. Higher fees paid by the academically unable would discourage their attendance and free resources for the use of the more competent. Azad, J.L.: 'Financing Institutions of Higher Education in India: the Need for a Realistic Fee Policy', Higher Education, Vol. 5, no. 1, Feb. 1976, pp. 1-7. Cf. the discussion on discriminatory pricing in Section 4.4.2 above. It could be argued that if universities are compelled to accept all students having university entrance certificates, the system cannot be applied.

factory either.

A logical objection to weighted subsidies could be raised by noting that less able students are likely to require greater assistance than the more able and that, therefore, subsidies should be inversely related to matriculation grades of first year admissions.¹⁾ However, this argument tacitly assumes that all students of whatever academic ability that satisfy the minimum requirements for admission, should be accepted by the universities, rather than encouraged to enrol at the other available institutions of tertiary education. It could, indeed, be asked if it would not be beneficial to oblige weaker students to enrol at those other institutions by increasing the minimum university entrance requirements, if a positive correlation were found to exist between Matriculation grades and university failures. In addition, it could be argued that a system of differentiated subsidies based upon academic merit would be no more pernicious than that of granting scholarships to brighter students.

The Number of Enrolled Students Plus a Penalty for Failure: The introduction of a financial penalty for failure, the burden of which would be borne by the student and not the university, would induce students both to assess their own capabilities more realistically and to be more diligent. Various possibilities for achieving this exist.

The first possibility consists of paying subsidies in instalments. The initial sum would be advanced with the proviso that the remaining amount would become available once a successful year of study had been completed (or in proportion to the credits successfully completed). If the student were to fail, he would have to pay the amount of the outstanding subsidy to the university himself.

Because students that perceived that they would, or had already actually failed and had consequently decided to forgo a university education, would be loath to pay the remaining instalment on their fees after the prospects of success had faded, consideration

1) Cf. Section 3.3.1.

could be given to introducing a system of deposits on initial registration. If the student were to pass, his deposit would be transferred to the coming year. If he were to fail, his deposit would be forfeited to the university in lieu of the lost subsidy and he would be required to pay another deposit before being allowed to reregister. Alternatively, a loan account could be opened for each student and debited with the amount of the provisional subsidy. If the student were to pass and the subsidy were paid, his loan account would be credited and he would owe nothing. If he were to fail, the student would incur a liability equal to the forfeited subsidy, which would then be paid to the university by the state as a loan and not as a subsidy. In either case, the university would not be affected financially by the success or failure of the student, except that in the long run weaker students would be discouraged from registering. But that, of course, would be the effect desired.

Another possibility would be to subsidize universities on the basis of their enrolments, but, in addition, to exact higher payments from students who had failed previously and wished to reregister. Thereby students would be allowed to fail once without incurring additional obligations, but would be required to demonstrate their bona fides as serious students by paying a penalty upon reregistration. On reregistering, an unsuccessful student would be required to pay a sum equal to his normal fee for his second year, plus an amount of his first year subsidy times the fraction of credits failed.

The aim of this scheme would be to make the student body aware of the stringencies of financial accountability by bringing pressure to bear on the ultimate beneficiaries of public funds, namely the students, rather than upon the universities. If this were done, students would be encouraged to scrutinize their aptitudes and inclinations before entering the university, and once there, to apply themselves assiduously.

The benefits of the proposal are that students would be given an opportunity to attempt the first year of university without additional financial constraints, such as the payment of deposits. However, if unsuccessful yet determined to attempt the course again, they would be required to pay higher fees. Academically unsuitable students would be discouraged from wasting scarce resources, yet would be given a fair opportunity to show their mettle.

By rights the total of the additional fees, exacted from returning students who had failed previously, would have to be transferred to the government as forfeited subsidies, possibly by subtracting the amount from the current year's subsidy for the relevant university. In that way the position of the university would remain unaffected, whether students passed or failed.

The disadvantages of the proposal arise from its administrative consequences.¹⁾ In the first instance, if it were incorporated in a formula method of paying subsidies, an ad hoc element would be introduced, because the sum of the forfeited subsidies would only be known ex post. In the second place, difficulties would probably be encountered if students, who had failed, transferred their studies from one university to another.

The Number of Passed Credits Plus a Fraction of Failures: The scheme proposed in the previous paragraphs could be viewed positively rather than negatively in terms of a premium for success instead of a penalty for failure.²⁾ If, as was argued above, public funds should only be spent on those students likely to be successful, yet the dangers of subsidizing outputs were considered to be serious, a compromise could be reached by basing subsidies upon success (measured in terms of passed credits) plus a fraction of failures. The degree by which the subsidization of successes

1) This insight is primarily attributable to Prof. I.A. Bunting.

2) This insight is attributable to Dr. R.H. Venter.

exceeded that of failures would constitute the 'premium for success.'

If P is taken to denote the number of successful students and U the number of unsuccessful ones, this conclusion is reflected in the following expression:

$$Y = P + \alpha U,$$

where the number of subsidy students, Y , is the endogenous variable, upon which subsidization should be based, and $0 < \alpha < 1$.¹⁾ Because the number of unsuccessful students equals the difference between the number of enrolled and successful students, for example

$$U = E - P$$

$$Y = \alpha E + (1 - \alpha)P,$$

which says that subsidization should be based partially upon enrolled student numbers, unqualified by success, and partially upon the number of successful students.²⁾

The combination of the various magnitudes, as determined by the numerical value of α , should be such as to maximize the potential advantages and to minimize the corresponding disadvantages of basing subsidies on either outputs or inputs. Both diligence on the part of students and the careful selections and counselling of students by the universities should be encouraged, but without placing undue financial pressure upon the universities to condone failures.

This does not necessarily imply that α should tend towards the numerical value of one. The use of both inputs and outputs as basis for subsidization contains an in-built mechanism for discounting possible financial pressures.³⁾ This occurs firstly because subsidization based partially on enrolments would make it

-
- 1) Ibid. Cf. model E, in Chapter 8 below. Also SAPSE Report-110: An Investigation of Government Financing of Universities, Pretoria; Department of National Education, First Edition, 1981, p.33 et seq.
 - 2) Ibid.
 - 3) Ibid.

possible for a student, that is required to repeat credits, but who finally completes his degree, to generate more subsidy income in total for the university than a student who passes without having to repeat.¹⁾ Because the costs caused by such students could, at the discretion of the university, be less than average,²⁾ a value of α smaller than one need not be financially detrimental to the universities.

A second factor that would eliminate any financial ill effects, arising from the subsidization procedure placing a premium on success, would be the equivalent of that referred to above as a 'penalty for failure'. By asking higher fees of those students who had been unsuccessful the preceding year, the universities would be able to shift the burden of the reduced subsidy onto those who had been responsible for causing it. In fact, if the forfeiture of subsidies, occasioned by unsuccessful students, were not recouped by the university from such students, the adverse results of incorrect resource allocation decisions would not be brought to bear upon the relevant decision makers. As a result decision making in the future would not be improved. The consequences of such a scheme would not be harsh, if students were counselled to enrol only for as many credits as they reasonably considered themselves capable of passing.

The Number of Students Using Auxiliary Services: In Section 4.4.4 it was argued that students should bear the costs of those ancillary services they use, of which the public benefits are negligible, for example the provision of housing and culinary services. Services of this nature are generally produced by the 'auxiliary enterprises' programme of a university.³⁾ However, it was also argued that market failure in the provision of such services would necessitate the subsidization of their capital costs. It is, therefore, necessary to identify variable(s) that could be used as basis for the payment of these subsidies.

- 1) A student, who repeats credits but who finally graduates, would earn as much subsidy as one who did not repeat plus half a year's subsidy for each year repeated.
- 2) For example, class sizes could be increased.
- 3) See Chapter 7 below.

The primary distinction to be drawn in this regard is that between the provision of student housing and other auxiliary services, because of the implied cost differentials. The appropriate variables to be used for subsidizing these activities should, accordingly, be the number of students using university provided housing facilities and the number of students not doing so.

Research Outputs and Inputs: Besides subsidization coupled to student numbers, subsidies are required for the universities' research activities. In Section 4.4.3 it was argued that research subsidization should, for various reasons, be coupled to both research outputs and inputs. That conclusion would be of particular importance, if the basis for subsidizing instruction included both outputs and inputs, as suggested above for efficiency reasons. If a symmetry between the funding of instruction and research were not maintained, universities might be unduly influenced to concentrate their attentions on one of those fields to the detriment of the other. For example, if instruction were to be financed on the basis of inputs and research on the basis of outputs, it might prove profitable to concentrate upon research (and vice versa).¹⁾

Research outputs should be measured by using the citations approach²⁾, supplemented where necessary to allow for those South African disciplines, which, because of their indigenous natures, are unlikely to earn international acclaim. Research inputs should be measured in terms of the time used by university academic staff for research purposes.³⁾

1) This insight is attributable to Dr. R.H. Venter.

2) Cf. Section 3.3.2.

3) Cf. Section 5.3.1.5.

Possible Additional Factors: Under certain circumstances it may prove desirable to base university subsidies upon additional factors. Two possible cases where that could occur are in respect of libraries, for which (besides student numbers) the number of volumes to be stored could become an important variable,¹⁾ and the maintenance of buildings and grounds, the costs of which could depend upon the physical properties of the campus site, the type of construction used and the environmental and atmospheric conditions of the neighbourhood, as well as on the number of students.²⁾ The solution would be to construct a scale which would take account of these differences and which could be included in the formula as a parameter, while maintaining the number of students as independent variable. However, in South African universities significant variations with respect to these factors are unlikely to be experienced and the use of such variables will, therefore, not be necessary.

5.3.1.5 Procedures for Estimating the Parameters of a Subsidy Formula

If subsidies are to be based upon costs, it must be decided what 'reasonable' costs for the various university programmes are. Various methods could be of use in defining 'reasonableness' under different circumstances.

The first of these methods entails an ex ante specification by an independent body of experts of what could be considered to be both pedagogically and financially reasonable for a particular programme. If this were repeated for every possible subsidizable university activity, a subsidy formula could be constructed.

The second method entails discerning the ex post patterns in

1) Halstead, D.K.: Op. Cit., pp. 697-710.

2) Weber, G.O. and Horsey, W.H.: Formula Budgeting for Physical Plants of Universities and Colleges, Maryland, University of Maryland, Mimeograph, no date.

university expenditure and using these as basis for developing a formula. The justification for the procedure is its relative simplicity and objective generality. Whereas the first technique could give rise to acrimonious and lengthy debate on the relative importance of the different factors to be taken into account, the second assumes that that debate has already taken place within the universities themselves.

All that is required, as first step in constructing a formula, is for the analyst to synthesize the results of each university's internal resource allocation procedures. This assumption is grounded on the fact that universities must themselves decide how to allocate their scarce resources amongst many competing ends and that, accordingly, the outcomes are the result of an intricate decentralized optimization process. Even if universities do not optimize anything more concrete than their own prestige, their allocation decisions are invariably subjected to some form of cost effectiveness test. No university would wittingly allocate its resources inefficiently, although, of course, inefficiencies are bound to occur in practice.

This second method implies that the production and/or cost functions of the universities will be determined in a way equivalent to that described in Section 3.4. The procedure entails fitting equations to the relevant data¹⁾, which should be stratified to allow for the differences that exist naturally between a university's different programmes. (A programme can be described as a set of activities that are collectively aimed at achieving

-
- 1) A similar procedure is advocated by Dunworth, J. and Cook, R.: 'Budgetary Devolution as an Aid to University Efficiency', Higher Education, Vol. 5, no. 2, May 1976, pp. 153-167. See also Verry, D.: 'Planning Higher Education at the Sectoral Level: With Special Reference to Higher Education Costs in Britain', in Baxter, C., O'Leary, P.J. and Westoby, A.: Op. Cit., pp.192-205. For procedures on how to calculate average costs see: CUA/COU Joint sub-committee on Finance/Operating Grants: Financing University Programs in Education, Report on the Special Study of Requirements for the Formula Financing of Education Programs in Ontario Universities, Ontario, 1971.

one of the institution's objectives.¹⁾ The term 'programme budgeting' describes the accounting technique whereby all the sources of income and expenditure pertaining to a particular programme are grouped together so as to bring the benefits and costs of each programme to the fore clearly.)

However, the stratification of the data would not be devoid of difficulties, as was pointed out in Chapter 3. In particular, the allocation of university staff (costs) to the different programmes, say instruction and research, was seen to present theoretical problems related to jointness in production. Similar problems would arise in making allocations for the different possible instructional levels, say undergraduate and post-graduate. Nevertheless, the procedure of simply asking faculty staff to estimate the percentages of their time spent on these various activities was seen to present a practical, if inaccurate, solution to a theoretically insoluble problem and has given satisfactory results in the past.²⁾

A third procedure, of possible use in determining the parameters of a subsidy formula, could be added to the previous two, because, although the universities' internal optimization process is sure to reveal the correct relative magnitudes of resource allocations between resource categories and activities, doubts could exist

- 1) Cf. Chapter 7 below; also Millett, J.D.: Op. Cit., p. 15; and O E C D : Programme Budgets for Graduate Training, (Project Leader: Appelquist, C.G.), Paris, O E C D , Centre for Educational Research and Innovation, 1974.
- 2) Cf. CUA/COU Joint Sub-committee on Finance/Operating Grants: Op. Cit., pp. 30-35. Also Minahan, J.P.: 'Administrative Cost Accounting: Whose Cost and Whose Accounting?' Journal of Higher Education, Vol. XLV, no. 1, Jan. 1974, pp. 38-47. The Robbins Commission found that a small percentage of time is devoted to teaching. Out of a 40½ hour week, 7½ were on average spent on teaching and 5½ on preparation and marking. The Carnegie Commission found that on average teaching loads were approximately 50 per cent higher in the 1930's than in the 1970's. Quoted by Magnussen, O. in O E C D Report: Towards Mass Higher Education, Paris, O E C D , 1974, p. 186.

about the overall constraint under which the optimization is performed.¹⁾ It could, for example, be asked whether a more generous total provision of resources to the universities than in the past is not warranted. Theoretically, that would be the case, if it could be demonstrated that the marginal social product of additional investment in the universities is greater than elsewhere in the economy. Alas, however, reliable calculations of that kind cannot be made in practice.

What could, however, be of use for indicating whether the total provision of resources is adequate or not, is to compare the situations that exist in different countries.²⁾ International comparisons of this kind must be made with great circumspection and can never be considered to be prescriptive. In particular, the statistical bases of the data, the socio-economic structures and patterns of competing demands upon national resources are often, internationally, not strictly comparable. Nevertheless, such comparisons are useful for indicating what has been considered to be possible, or perhaps even desirable, abroad.

5.3.1.6 Staff to Student Ratios

The foregoing section implied that costs should be determined by a formula. Somewhat surprisingly, however, this could entail disadvantages and would, therefore, not necessarily be the best procedure to follow. The most important of these is that both inflation and rising living standards necessitate periodic wage and salary increases. If a formula were to estimate costs directly, its continual adjustment would become necessary in order to ensure realistic cost estimates. A satisfactory method of avoiding the problem, or at least, of separating the rising cost

1) This insight is attributable to Dr. R.H. Venter.

2) Cf. Section 2.6.1 above.

phenomena from the working of the formula is for the formula to estimate input requirements in physical rather than monetary terms. For teaching purposes this means that the number of staff necessary to teach a given number of students is estimated instead of the costs for a particular year. When salary adjustments are made, the total subsidy will, consequently, adapt automatically without the need for interference with the formula itself. This device means that, instead of a sum of money being allocated per student, some ratio of the required number of staff to students is established, from which the total provision is deduced.

Cost Units: The procedure of specifying inputs in physical terms, before computation of the monetary value of those inputs for a specific year, necessitates the construction of a hypothetical yet representative basket of inputs to be used for these purposes. Such a representative basket of inputs is termed a 'cost unit'. Its value for a particular year is determined by using the prevailing values for the different inputs, of which the basket is comprised.

Consider, for example, the case where a formula specifies a student to staff ratio of 13 : 1, as a result of which a total of 100 instruction/research staff members are provided for a particular university. To convert this staff provision into subsidies, an assumption concerning the relative numbers of the different university staff ranks is required. It could, for instance, be assumed that, of the total of 100, 20 are professors, 10 are associate professors, 15 are senior lecturers, 40 are lecturers and 15 are junior lecturers. These assumed divisions would then be taken as defining the basket of instruction/research staff members.

To determine the monetary value of the basket, further assumptions about the salaries, pensions, medical aid provisions, bonuses and housing subsidies, of the people comprising the basket, are necessary. It could, for example, be assumed that each of the

persons, of whom the basket is comprised, is on the penultimate notch of the salary scale for the relevant rank. The value of the cost unit would thereafter be determined by combining these various magnitudes.

Allowance for Salary Differentials: Unfortunately, estimates of the number of teaching positions needed in a particular discipline in terms of staff to student ratios overlook the important characteristic of market differentiation in capitalist economies, in which the prices of factors and commodities, for example also wages and salaries, are determined by supply and demand. Undeniably, the staff in some disciplines are in greater demand or scarcer supply than those in other fields and, accordingly, wage differentiation must be expected, even if salary scales are ostensibly the same for all.¹⁾ If uniform scales are in use, this differentiation is often achieved simply by the earlier promotion of staff of the scarcer variety. Under the circumstances, a blanket provision of teaching positions could be inappropriate and disadvantage those universities that offer courses, for which only 'expensive' staff can be attracted. In the case of personnel, other than those engaged in instruction and research, salary differentials are likely to be marked and will probably also vary according to university subprogramme. Therefore, it would be preferable to determine what the relationship of senior to junior staff in each subject category and (sub)programme is, and whether that relationship tends to vary with student numbers. If significant variations are found to exist, allowance should be made for that fact, by incorporating relative remuneration factors in the formula, to be used when calculating the sum of money generated as subsidies.

1) Bowen, W.G.: 'British University Salaries : Subject Differentials', Economica, Vol. 30, November 1963, pp. 341-359 supports this idea. However, Metcalf, D. and Bibby, J.: 'Salaries of Recruits to University Teaching in Britain', Higher Education, Vol. 1, no. 3, August 1972, pp. 287-298, do not.

Needless to say, staff to student ratios only partially specify the production functions in physical terms, because other inputs are also required. If these other inputs are specified in either physical or monetary terms, the cost spiral, mentioned above, will necessitate regular adjustments with the aid of indices, for example of laboratory costs or library purchases. A possibly less accurate, but administratively simpler alternative would be to establish the relationship between these costs and instruction/research staff salaries and, if a sufficiently stable relationship were found to exist, to specify these additional inputs in terms of instruction/research inputs. Such a procedure would be likely to be successful in the case of personnel other than those engaged in instruction and research at least, because a stable relationship could be expected between these two personnel categories. If this could be achieved for all university inputs, the formula would calculate a global sum in terms of a staff to student ratio and the current staff salary structure, but out of which all expenses, not just salary payments, would have to be met. Clearly, the 'staff to student ratio' terminology would become inappropriate, if this were done, and a term such as 'subsidy unit to student ratio' could be preferable.

5.3.1.7 Percentage Contribution by the State

Once the relationship of dependent to independent variables has been established, a decision must be taken on what the percentage to be paid by the state should be. In Section 4.4.2 it was argued that, in principle, it should equal the percentage of the total benefits that accrue to the public from the educational process. Because of the difficulties of quantifying externalities, it was suggested that resort would have to be had to the political process in establishing a percentage.¹⁾

-
- 1) It has also been argued that, because of the inability to quantify the public benefits of education accurately, every subject category should receive the same amount of subsidy. West, E.G.: 'Differential Versus Equal Student Subsidies in Post-Secondary Education : A Current Canadian Dispute', Higher Education, Vol. 3, no. 1, February 1974, pp. 25-42.

Besides the problem of deciding upon actual percentages to be used for these purposes, the question arises of whether the percentage should vary according to university size; in particular, whether the larger institutions should be awarded a lower percentage of their costs than the smaller ones. The answer to this question depends upon the circumstances. On the one hand, a varied state contribution should not be introduced to reflect the falling average costs associated with increasing size. That phenomenon is an essential attribute of the pattern of costs and should, therefore, be identified in the relationship between costs and student numbers. The equation, describing this relationship, will make provision for decreasing average costs, even if its form is linear, provided the line described by the equation has some positive intercept on the vertical axis and a slope of less than unity.¹⁾ Accordingly, no need exists for the state's percentage contribution also to be adjusted for decreasing average costs. In addition, it could be argued that the ratio of social to private gains from education does not reflect variations in university size and accordingly, a uniform percentage for the state's contribution to both small and large universities is called for.

On the other hand, on account of the decreasing cost phenomenon, the same percentage contributions for small and large universities alike mean that the absolute amount of the universities' costs, that must be covered in the form of tuition fees, will be bigger for small universities than for the large ones.²⁾

Because higher fees at small universities could have the effect of channeling students to the large universities, where capacity utilization of many facilities could already exist, it could be

1) Empirical evidence exists to justify the use of linear functions in this regard. If y denotes costs and x student numbers, the equation $y = a + bx$ implies a fixed cost element equal to a , constant marginal costs equal to b and average costs that fall asymptotically towards marginal costs. See Dunworth, J. and Cook, R.: Op. Cit., p. 159, and Verry, D. and Davies, B.: University Costs and Outputs, Amsterdam, Elsevier, 1976, Chapter 6. Linear functions have the important additional advantage of simplicity.

2) This insight is attributable to Mr. G.J.J. Steenkamp.

argued that the state percentage contribution should vary inversely with university size. If that were the case, a more intensive use of the facilities created at the smaller universities would be encouraged.

The reasoning of the previous paragraph only applies in a static setting, that is, if it is assumed that the number of universities is held constant. If it were possible for new universities to enter and for existing ones to exit the educational market, higher state contributions to small institutions could invite the founding of new universities, before the benefits of decreasing costs in the existing ones had been exhausted. In South Africa, where the founding of a new university normally requires considerable financial support from the government and, consequently, state approval, this would be unlikely to occur. It could, therefore, be submitted that a variable percentage state contribution should be used to enable the residential universities which serve similar client groups, to ask approximately the same tuition fees.

The uniformity with respect to tuition fees, just mentioned, applies to the subjects within the different groupings, irrespective of university. This does not imply that the natural sciences should necessarily generate the same social benefits as the humanities so that the (variable) percentage contribution by the state should be equal for these two or any other subject groupings. It could be argued that, under certain circumstances, different percentage state contributions could be made for different subjects or subject groups.¹⁾

With respect to correspondence universities, the magnitude of the percentage contribution by the state should be devised along lines similar to those developed for the residential universities:

1) Vide, however West, E.G.: Op. Cit.

the state should pay the costs of public benefits. There are two reasons why the percentage contributions could possibly differ from those devised for the residential universities. Firstly, it could be argued that actual residence at a campus university exposes the student to innumerable educational influences, in addition to the narrower acquisition of knowledge. The benefits from enrolling at a residential university, including social benefits, could therefore be greater than those generated by correspondence universities. Secondly, the economic costs of a residential university education are greater than those of a correspondence university education because of the income forgone by students who enrol at residential universities. Strictly, the state's percentage contribution should be to total costs. However, in practice, the percentage contribution is based upon the university's accounting costs only. One could argue that a higher percentage contribution to the residential university's accounting costs is, therefore, warranted in compensation.

5.3.1.8 Enrolment Projections

If a formula is based upon student numbers, several complications could come to the fore, unless enrolments increase continuously. Although many of these difficulties fall within the domain of the universities' internal managements, they are discussed briefly below.

Although static enrolments would appear to present no financial difficulties, that may not always be the case. Firstly, because the subsidy to the university would remain constant, except for the adjustments made on the grounds of cost increases, difficulty could be experienced with the introduction of new disciplines, as they develop, unless room is made for them by terminating other departments.¹⁾ If the latter did not occur and new courses

1) See Trow, M.: 'The Implications of Low Growth Rates for Higher Education', Higher Education, Vol. 5, no. 4, Nov. 1976, pp. 377-396. Solutions suggested for the problems that arise include the sharing of facilities amongst universities, the employment of more part-time faculty members on non-incremental scales, the recruitment of adult students and the introduction of professionally orientated degrees.

were introduced, while the old were maintained, the increased number of lectures would imply falling average class sizes and increased teaching duties for the lecturing staff. This could result in research being detrimentally affected. Thus, in order to make provision for accommodating new fields, universities could be influenced to grow by increasing their enrolments.

A second possible problem, experienced when enrolments remain static, occurs because of the annual stepwise increase in salaries. Staff are generally appointed at a certain 'notch' on an incremental salary scale and, notwithstanding any general increases that are announced, proceed to climb up the scale at the rate of one notch per year. If the formula were to calculate the required number of staff for a given student body and the subsidy were calculated at the maximum (or near maximum) salary notch for that number, universities could gain by appointing persons below the maximum and using the surplus for other purposes. However, if enrolments were thereafter to remain static, the annual stepwise salary increase would eventually 'squeeze' away this surplus, and therefore, diminish the university's financial freedom. The situation would be aggravated if the surplus had been used for the appointment of additional staff. If, on the other hand, enrolments were to grow, the situation just described could be avoided.

A third possible effect of static enrolments would be that the creation of new, particularly senior, faculty positions could be impaired, and thereby also the opportunities of promotion for young academics of merit. Where the way to a chair has been blocked by a relatively young incumbent, his junior could easily be lost to rival institutions, to avoid which universities may wish to attain some positive growth rate.

In the case of increasing enrolments, the problem becomes one of avoiding the lag that exists between actual student numbers and the payment of the subsidy based on those numbers. Because it takes some time at the beginning of each year before all the late enrolments and early withdrawals by students have been accounted

for and the numbers have stabilized, it is often not considered possible to use a particular year's actual figure for the basis of subsidy calculations until the following year. If subsidies were also partially based upon success rates, the delay would be increased, because the final pass rate would only be known at the beginning of the following year. In periods of expansion the result would be that the subsidy received would be less than that calculated by the formula as the amount approximately required. The solution for this problem is to estimate the current year's enrolment by projecting the particular university's growth rate from the immediate past and basing the subsidy on that projected figure.

The application of such techniques can, however, lead to two problems. The first is that, if the rate of change in enrolments is not constant, the number of projected enrolments will differ from the actual number. The discrepancy between these two numbers will be particularly pronounced when the growth of enrolments changes from positive to negative, or vice versa. For example, when enrolments pass a maximum level and begin to decline, projections based on positive growth rates of the past, will indicate higher rather than lower enrolments, despite the actual decline. In the case where enrolments begin to increase after an earlier decline, the projected number will be smaller than the actual one.

The second problem relates to the existence of lags in the budgetary process. Most university academic staff members in South Africa have life tenure, which helps maintain academic freedoms, but simultaneously adds a fixed cost element to what would otherwise have been variable personnel costs. In practical terms, it implies that universities are normally unable to dismiss such staff members as soon as student numbers fall and must, instead, wait for attrition to run its course, thus introducing complicating lags in the adjustment mechanism. These lags could result in university costs not falling as quickly as subsidies do, which would, of course, lead to university deficits. Consequently, universities could be encouraged to enrol academically unsuitable students, even if those who are unsuccessful are only partially subsidized. If class sizes are simply increased, negligible costs are incurred, although subsidies are earned.

A scheme, designed to overcome this problem, could be based upon the idea that, because a university requires time to rationalize its use of academic staff, a fall in enrolments will be met by a decrease in subsidies equal to only some fraction of the actual change.¹⁾ In subsequent years the discrepancy between the actual enrolments and the number used for subsidy purposes would be decreased further by applying the same fraction. The number, upon which subsidization would be based, would thereby tend to approach asymptotically the level at which actual enrolments stabilized. Therefore, use of a scheme, based upon these or similar principles, would allow the universities time to adjust, yet would follow the actual trend of enrolments.

The procedure does, however, rest upon an important assumption, namely, that the actual figures will stabilize at some new level and that the decline will not continue indefinitely. If the latter were to occur, the discrepancy between actual and subsidized numbers would be ever increasing. In practice this is, of course, unlikely to happen. It also entails the disadvantage that, if the same mechanism were to be used in growth periods, a smaller subsidy would be generated than would otherwise have been the case. The actual effect would depend upon the choice of fraction used as damping factor for achieving the retardation, required during periods of decline. Unless different procedures were used under conditions of increasing and falling student numbers, a damping factor equal to $\frac{1}{2}$ would seem the most appropriate for reconciling the conflicting requirements of the two.

If a damping factor of $\frac{1}{2}$ were used in conjunction with the method of basing subsidies upon enrolments plus pass rates, thus causing a delay of two years before the figures could be used,²⁾ sufficient time would arguably be allowed for the universities to

-
- 1) Based on an idea of Prof. J.W.R. de Villiers. Millet, J.D.: Op. Cit., advocates a similar procedure on p. 53.
 - 2) The reasons for the delay were discussed above.

adjust to a decline in enrolments. Under such circumstances, university administrators would be able to ascertain, early in each year, whether enrolments had decreased and approximately by how much, yet only half the decrease would be taken into consideration two years later for subsidy purposes.¹⁾ In addition, the general trends in enrolments can be predicted well in advance by inspecting the population birth rate of some 18 years earlier. Whether or not a period of longer than two years could be necessary for the universities to rationalize their budgets in the face of declining enrolments, is debatable. It could, however, be argued that prudent university administrators are unlikely to find a constraint of two years restrictive. In addition, university autonomy seems to suggest that the public exchequer should not be held liable for the universities' every financial vicissitude.

5.3.1.9 Capital Expenditure

General Approach: When economists speak of 'capital' they refer to man-made, durable assets that are used as inputs in the production process. As was pointed out in Section 2.3, capital formation includes investment in human resources in the form of education as well as that in physical assets. However, in this section the term is taken to refer to investment in physical assets. In this sense capital includes assets such as buildings, and land improvements other than buildings, equipment, and construction in progress. As is to be expected, the general principles enunciated in Chapter 4 above apply to determining whether financial support by the state in the form of subsidies for fixed asset expenditure is appropriate or not.

Those principles state that subsidies are economically justified if a situation is characterized by market failure, a prominent

-
- 1) An hypothetical example will illustrate this point. If a 'subsidy student' is defined as the unit for subsidization, once provision has been made for enrolments and pass rates, let the number of subsidy students in 1981 = 10,000; and that in 1982 = 9,800. Because the 1982 figure will only stabilize after the supplementary examinations in February/March 1983, they can only be used for the payment of subsidies in 1984. And in 1984 only half the actual fall in numbers of 200 (= 10,000-9,800) will be taken into account. The number of subsidy students in 1984 will, therefore, be 9,900, although the university would have been aware of a decrease since early in 1982.

cause of which is the prevalence of public benefits deriving from a private person's education and not fully reflected in market prices. If subsidies were not forthcoming under such conditions, the total amount of education chosen by people in their private capacities would be less than the optimal amount required by society. A similar situation of market failure could arise, if conditions were to exist that made it unprofitable for private entrepreneurs to provide a service that would nevertheless be beneficial to society. This could, for example, happen with the provision of student boarding facilities in small university towns, because the facilities are only occupied by students for part of the year.

It was argued above that where such situations that do warrant public support arise, subsidies should be based on the costs of providing a particular service. It was also considered necessary to establish what 'reasonable' costs for this purpose are. It, therefore, becomes important to re-emphasize the nature and the extent of the universities' capital costs - aspects that were touched upon in Section 3.2 above.

On purchasing a capital asset, an institution incurs a certain cost that could be described as an 'historic' or 'accounting' cost, but which is to be distinguished from the concept of 'economic cost'. Economic costs refer to the use of real resources and can exist even where no accounting costs are present, as for example where a building has been fully paid for. In the latter case the term 'opportunity cost' is also used, because the use of a seemingly 'free' building is still considered to incur costs equal to the forfeiture of its next best use. These terms are relevant in judging the nature of the costs attributable to university fixed assets.

Consider the case where the erection of a building is undertaken by negotiating a long-term loan on the capital market. Clearly, because resources are used in erecting a building, economic costs

are entailed. And even in the case of non-depletable natural resources such as the ground upon which the building rests, opportunity costs are incurred, because the ground could have been put to some other profitable use. In principle these economic costs can be distinguished from the interest and redemption payments on the loan required to purchase the asset, because those payments are, in fact, transfer payments arising from a particular method of financing the purchase. Nevertheless, because the actual economic costs are generally adequately reflected in the interest and redemption payments payable, no distinction is made between these two concepts in practice.

Because an asset's effective lifespan is generally limited, its eventual replacement or renewal becomes necessary. The economic cost, which derives from the consumption or final use of the asset, is different from that of providing the asset in the first place, and may be defined as the amount which is required to replace the portion of the asset used up during the period of account. The magnitude of these costs depends upon the expected life span of the asset and provides for foreseen obsolescence, loss of value through accidental damage, and normal wear and tear. These economic costs normally correspond to an accounting concept, in this case to that of 'depreciation' and accordingly, for practical reasons, the latter is generally used to indicate the costs of renewing an asset.

Often annual provision for depreciation is made by calculating a sum that will keep the money value of an asset intact by spreading the historic cost of the asset over its expected economic life span. However, if either or both of prices and technology change over the course of the period, this method is deficient and, therefore, the annual allocation of costs should preferably be made on the basis of the asset's replacement cost.¹⁾

- 1) This statement requires qualification. If the purchase of assets is financed with loans, the real debt of the borrower diminishes at a rate equivalent to the inflation rate. Under such circumstances the basing of depreciation on replacement costs would amount to making provision for inflation twice over. Pechman, J.A.: Federal Tax Policy, Washington, D C, The Brookings Institution, Third Edition, 1977, p. 165.

In summary, there are two categories of costs relevant to the problem on hand: firstly, the initial costs of establishing an asset and, secondly, the costs of replacing or renewing the asset as it is used up over its effective life span. Therefore, although interest and redemption charges usually run concurrently with the provision made for capital depreciation, no duplication results, because conceptually provision must be made for two kinds of economic costs. Duplication would only result if, after provision had been made for capital depreciation, the renewal of the asset were to be financed again by loans, upon which interest and redemption were payable once more.

The distinction between establishing and replacing or renewing an asset can conveniently be extended to subsidization procedures. Generally an asset is first required when a group of students enrolls for a particular course; and after that, further assets are required as student numbers increase. On the other hand, if the number of students at an institution were to remain at a constant level, the assets would require renewal after some specific period of time, even though the total required would not increase. Accordingly, the provision of subsidies for increasing the total assets in the possession of the institution is best based upon the change in the number of students enrolled, that is, the creation of new physical capacity should be coupled to enrolment growth. However, the provision for the renewal of those assets already possessed by the institution is best based on the replacement cost of the existing assets and, for convenience, coupled to the current enrolment figures of the particular university.

Within the SAPSE system ¹⁾ provision is made via a separate formula ²⁾ for new buildings and for land improvements other than buildings on account of an increase in student numbers or a

1) Vide Chapter 6 below.

2) SAPSE Report-101: Nation-Wide Building Space Planning System Manual, Pretoria, Department of National Education.

change in norms. Although an analysis of problems of this nature does not fall within the scope of this dissertation, a brief description of that formula is presented below.

However, the provision of new movable assets, being less intricate than that of buildings and other land improvements, can be made conveniently on an annual basis via a subsidy formula. Similarly, the major factors necessitating replacement or renewal of all fixed assets - with the exception of land, which needs no renewal - can be foreseen and, therefore, conveniently treated annually on a depreciation basis in the subsidy formula.

It goes without saying that the subsidies, to which the preceding paragraphs refer, are solely in respect of those university assets which are necessary for what are considered to be subsidizable activities,¹⁾ that is, those activities judged to be so by applying the general principles of subsidization. As has been pointed out, this means that subsidies are not normally available for activities, the benefits of which accrue to persons in their private capacities. As already noted, the major exception to this rule is where the market fails to provide a necessary service, the benefits of which would have accrued to private persons. Nevertheless, because the benefits of such services are privately reaped, it is fitting that the percentage of their costs contributed by the state in the form of subsidies should be less than in other cases.²⁾

Buildings and Other Land Improvements: The building space formula³⁾, which has been specifically designed to indicate

-
- 1) Vide Chapter 7.
 - 2) Cf. Section 5.3.1.7 above.
 - 3) SAPSE Report-101: Op. Cit.

what reasonable costs are for the purpose of subsidizing the erection of buildings and land improvements other than buildings, is based upon norms for university building space requirements, according to the function expected of each room. These norms are applied to the full-time equivalent (FTE) student numbers to determine the costs subsidizable by the state.

The importance of the application of norms to university capital projects arises, firstly, from the magnitude of the amounts annually appropriated by the Treasury for this purpose and, secondly, from the need to allocate these scarce resources equitably and effectively amongst the competing institutions. It has been calculated that between the years 1956 and 1977 an historical sum of R576,0 million was spent by the eleven universities under the jurisdiction of the Department of Education on capital projects. If a building cost index is used to express this amount in 1977 rand values, the sum becomes one of R936,7 million, implying that it cost R16 289 per student to create new facilities at those universities.¹⁾ Although these statistics were partially distorted by the intensive building programmes of the two new universities of Port Elizabeth and R A U,²⁾ the costliness of university real estate requirements is emphasized thereby.

Besides the great sums of money involved, building norms are useful for judging the validity of an individual university's application for funds vis-à-vis that of another institution. The formula provides a generalized form, within which decisions can be taken by using an explicit process and well defined, mutually

1). Louw, J.B.Z.: Op. Cit., pp. 231-234.

2) By 1977 the actual capital expenditure on constructing these two universities exceeded the estimated expenditure by factors of 7 and 4 for U P E and R A U respectively, which substantiates the need for effective building norms to enable the Treasury to judge applications of this nature. Louw, J.B.Z.: Op. Cit., p.230.

consistent data elements, provided by the SAPSE system. Provision is made for legitimate differences, such as are caused by the physical nature of the site, the environmental conditions of the position where the building will be situated and the location in the country, because of their effects upon building costs. Emphasis is placed upon the flexible use of the sum, derived by the formula for a specific building, to allow for variations in institutional preferences and traditions, as also for the existence of trade-offs in operating techniques.¹⁾ For example, it is possible that, under certain circumstances, higher capital costs can lead to lower future operating costs.

The formula makes use of building space norms,²⁾ which were devised in consultation with and upon the advice of a selection of educational planners from across the country, as to what constitutes reasonable average space use criteria for each of the programmes,³⁾ identified by the SAPSE system, and according to the different functions⁴⁾ into which university room use can be divided. In the case of the instructional and research programmes, further distinction is made according to subject categories⁵⁾ and in the remaining programmes according to subprogrammes and acti-

-
- 1) SAPSE Report-101: Op. Cit., passim, but especially pp. 1.2 - 1.5 and 3.1. A strong economic argument can be advanced against the separation of the current and capital accounts because of the existence of trade-offs. If a single subsidy rather than two separate ones were made, a university would be encouraged to be frugal in its use of capital resources by its ability of employing what it had saved on, say, buildings for other ventures, possibly for research. Because this dissertation concentrates upon universities' current costs, this point is not pursued. Cf. Carter, C.: Higher Education for the Future, Op. Cit., p. 114.
 - 2) Norms are similarly used in Britain. See Committee on Higher Education: Higher Education (Robbins Report), London H.M. Stationery Office, Cmd. 2154, Appendix IV, pp. 8-9.
 - 3) SAPSE Report-002. Cf. Chapter 6 below.
 - 4) Classrooms, class laboratories, non-class (research) laboratories, office and conference space, study space (libraries), and special general and supporting space. SAPSE Report-101: Op. Cit., p.2.1.
 - 5) SAPSE Report-003. Cf. Chapter 6 below.

vities. For example, in the first space category, that of classrooms, the space planning criterion is the assignable square metres per annual student hour of classroom instruction, which is a composite of the three elements, assignable square meters per station (for example classroom seat), the room utilization rate and the station occupancy rate.¹⁾ In the case of non-class laboratory (for example research) space, the criterion proposed is assignable square metres per F T E academic staff member engaged in research.²⁾ In the case of the category for study space (for example libraries), the suggested criterion for stack space is assignable square metres per bound volume; for seating space, assignable square metres per station; and for library service processing space, a percentage of stack space plus seating space.³⁾

These definitional criteria were used to establish standard values⁴⁾ for the assignable square metres per F T E student for each programme, subprogramme, activity or subject category as described above. Building costs per assignable square metre were determined for each of these possibilities and reduced to a uniform building cost unit, the monetary value of which is annually adjusted with the use of a buildings cost index. The values for the cost units per F T E student are obtained by combining the former two magnitudes. Finally, the basis for subsidy purposes is obtained by calculation of the product between the cost units per F T E student and the relevant number of F T E students.⁵⁾

1) SAPSE Report-101: Op. Cit., pp. 2-3.

2) Ibid., p. 2.12.

3) Ibid., p. 2.18.

4) These standard values are corrected for institutional variations if so required, as already explained above.

5) SAPSE Report-101: Op. Cit., p. 3.1.

The procedure used by the universities to obtain the capital funds corresponding to the amounts calculated by the formula is that, on the advice of the Department of National Education, the Treasury grants universities rights to negotiate long-term loans on the capital market. The interest and redemption payments on loans, that have been contracted in this way with Treasury approval, qualify for subsidies normally amounting to 85 per cent, but in the case of the new universities amounting to 96 per cent during their initial stages of development.¹⁾ Although in recent years the sum authorized by the Treasury has diminished, especially in real terms,²⁾ the total debt of the universities has risen so rapidly, that in 1977 the amount, owed for interest and redemption payments, almost equalled that authorized for new loans.³⁾

The design and architectural qualities of the buildings are the responsibilities of the particular institution, which must only comply with the provisions, firstly, that space must not be created for fewer F.T.E. students than were used as basis for the subsidy calculations and, secondly, that the assignable square metres and standard cost units of space must not be less than the subsidy supposes.⁴⁾ A university is, of course, entitled to add money from its free funds, if it should so desire.

As may be deduced from the above abbreviated description of the formula used for determining subsidies for university building programmes, the basis thereof is the calculation of reasonable costs under the particular circumstances. In the discussion on which percentage of costs should be contributed by the state in the form of subsidies,⁵⁾ it was argued that the ratio should equal that of social to private benefits from that education. The same logic is applicable to the case of capital costs. There is, therefore, no reason for the state's percentage contribution to interest and redemption payments on loans, that it has authorized, to differ from its percentage contribution to other costs.

1) Louw, J.B.Z.: Op. Cit., p. 220 and p. 239.

2) Ibid., Table 5.5, p. 234.

3) Ibid., p. 236.

4) SAPSE Report-101: Op. Cit., p. 3.2.

5) Section 5.3.1.7 above.

As was argued in Section 5.3.1.7 above, the uncompromising application of this principle may lead to deficiencies in the case of many auxiliary services, the current costs of which are not subsidizable.¹⁾ This would occur on account of the market failure associated with the provision of such facilities, especially in small university towns. The alternative solutions are to instigate year round university operations or to subsidize the provision of these facilities. A second reason, why some subsidy is called for under such circumstances, is that, because the facilities of the university in such towns are often the only ones available to the townsfolk, considerable externalities exist. The university theatre, concert hall and even at times sports facilities fall in this category.

5.3.2 Tax Concessions that Stimulate Donations to Universities

In Section 5.2.4 tax concessions that are designed to aid the parents and guardians of students were discussed. In this section the closely related issue of tax concessions, that stimulate donations to universities, is considered.

An important, indirect method of channeling funds to universities is to allow persons or companies, that make donations to educational institutions, either a tax credit, by which their calculated tax liability is reduced, or a tax allowance (or deduction) by which the tax base, used for calculating the tax liability, is diminished. In South Africa, for example, for the 1980/81 and preceding fiscal years, Section 18A of the Income Tax Act provided that taxpayers, who made donations to universities, colleges (as defined by the act), and the National Study Loans and Bursaries Fund, were entitled to a tax allowance. The deduction was limited, in the case of natural persons, to the greater of either R500 or 2 per cent of the donor's taxable income prior to any deductions under the section of the act. In the case of companies the deductible limit was 5 per cent of the companies' taxable income, again

1) In Section 4.4.4.

prior to deductions under the section.¹⁾ In both cases the limit applied to the sum of the donations made in the fiscal year as opposed to individual gifts.

The effect of these and similar provisions is that taxpayers are encouraged to give money to universities, because firstly, their taxable income and, therefore, the sum owed to the fiscus is diminished and, secondly, because the goodwill, established by their philanthropy, costs them less than it would otherwise have done. The latter occurs because if, say, a particular taxpayer's average rate of taxation is 40 per cent and he donates a sum of R100 to a university, he is absolved from having to pay R40 in taxes. In effect, therefore, whereas the donor would have had to earn R140 to have been able to give R100 to the university in the absence of the provision of the special deduction for donations, he can now do so by earning just R100. His opportunity costs are accordingly reduced, enabling him to be more 'generous' than he otherwise would have been.

The other side of the coin is, however, that the state coffers have been deprived of the R40, that they formerly would have had; the university has been enriched at the expense of the fiscus. Clearly this is tantamount to a subsidy from state funds, which, depending upon the magnitude of the charity received by universities, could amount to a considerable sum. Unfortunately, an implicit subsidy of this nature, by being concealed, can easily be overlooked, the more so because quantification of the sums entailed by these and other similar implicit subsidies²⁾ is not easily achieved.

-
- 1) Cf. Silke, A.S., Divaris, C. and Stein, M.L.: Op. Cit., pp.440-444. In the case of mining companies the percentage limit on taxable income was to be calculated prior to deductions allowable for capital expenditure as well as those allowable under Section 18.
 - 2) Cf. Section 5.2.4 in respect of taxpayers who can consider their adult children who are full-time students, as dependents for tax purposes.

The difficulty is that, in the South African income tax system, concessions of this nature have, up to the 1980/81 fiscal year, been in the form of tax allowances rather than tax credits.¹⁾

If tax credits had been used, the size of the subsidy could have been calculated by the simple procedure of summing all the donations made and calculating whatever percentage was allowable as a tax credit. In the case of tax allowances, however, the cost to the fiscus depends upon the average tax rate of each donor; the higher this rate is (for example the richer the donor), the more the donation costs the state. Because these rates vary between taxpayers and the data on each donor are not available, estimates of the size of the subsidy must be made on the basis of an assumed rate. Despite the apparently uniform average tax rate for companies, the effective rate also varies from one company to another, depending upon the magnitude of their other allowable deductions, for example for capital expenditure. Calculations of the subsidies in this case are consequently equally problematical.

An additional complication is that, in the universities' financial accounts, the amounts received as donations are shown together with those for contracts. The sum received by the universities for contracts includes payments for research undertaken by the universities (often by the research institutes attached to the universities) on a commercial basis. It is, therefore, difficult to estimate the total sum received in the form of donations.

Despite these problems, a tentative estimate of the amounts have been made on the basis of a number of assumptions. Firstly, it was assumed that 31 per cent of the total amount, shown in the universities' financial statements under the heading 'private gifts, grants and contracts', was in the form of donations. This assumption was based upon the actual situation at one of the larger

1) Tax credits are applicable as from 1980/81 to taxpayers' dependents who are full-time students, whereas deductions still apply to donations to universities.

residential universities in 1981. Furthermore, it was assumed that 80 per cent of the donated sum was received from companies with an average taxation rate of 42 per cent; 15 per cent from private persons with an average taxation rate of 25 per cent; and 5 per cent from deceased estates, on which an average estate duty of 20 per cent was payable. On combining these assumptions it appears that a sum of R5,25 million could possibly have been forgone by the exchequer in 1981 on account of donations to the universities.

CHAPTER 6

THE SOUTH AFRICAN POST-SECONDARY EDUCATION
(SAPSE) INFORMATION SYSTEM6.1 Introduction

No planning system, whether in the field of education or not, can operate effectively without adequate and accurate information. This applies even to the case where planning is based primarily upon decentralized decision making, as has been advocated for the university system in this dissertation.¹⁾ For example, although it has been suggested that students should be permitted to conduct their own cost-benefit analyses as to whether it would be to their advantage to go to university or not, information on university costs is required, because the subsidies, necessary to correct market failures, should be based upon costs. And clearly, acceptable and comparable information on university costs cannot be obtained unless all institutions use the same unambiguous definitions of the various activities undertaken by the institution and arrange that information according to a generally accepted and logical structure.

Similarly, the payment of subsidies to the different institutions, comprising the university system, cannot be achieved fairly, unless the factors, upon which subsidization is based, are uniformly defined for all. For instance, if student numbers were to serve as basis for subsidization and part-time students were not expressed as full-time equivalents, a bias in favour of the universities having large part-time enrolments would ensue. These and other inconsistencies can only be eliminated by applying a standardized delineation and classification of the university sector's activities.

The South African Post-Secondary Education (SAPSE) system was introduced by the Department of National Education, Pretoria, with

1) Cf. Section 2.6.4 and Chapter 4.

just such objectives in mind. Although the publications appearing under the SAPSE insignia have encompassed a wide range of topics relevant to education planning, the basic series is devoted to defining an information system of the kind outlined above. The constituent components of the system are contained in a series of publications, each devoted to a specific aspect of the comprehensive structure.¹⁾ In what follows below some of the more salient aspects of the SAPSE system of particular pertinence for this dissertation, are described briefly.

6.2 Programme Classification Structure²⁾

The SAPSE Programme Classification Structure is defined as "... a logical framework that enables an institution to array information in a hierarchical disaggregation of programmes, in which 'programme' is defined as an aggregation of activities serving a common set of objectives."³⁾

One of the primary reasons for arranging (university) activities according to programmes is so that those activities can be brought into relationship with the institution's stated objectives. The programme budgeting and accounting procedures, that become possible if this is done, enable managers to ascertain the costs of their decisions with regard to achieving the institution's aims. Unless a logical programme structure is adhered to, valuable information of this kind is concealed in the accounting process.

The SAPSE system identifies eleven programmes, most of which are subdivisible into subprogrammes. The basic programme structure is shown in Table 2.

-
- 1) SAPSE Reports 001 to 011, Pretoria, Department of National Education, First Editions, 1982. SAPSE Report-001: Information System Introductory Manual, contains a survey of the entire system.
 - 2) SAPSE Report-002: Programme Classification Structure Manual, Pretoria, Department of National Education, First Edition, 1982.
 - 3) Ibid., p. 1.

TABLE 2

UNIVERSITY PROGRAMME CLASSIFICATION
STRUCTURE ¹⁾

<u>Educational and General Programmes</u>	
1.0	Instruction
2.0	Research
3.0	Public Service
4.0	Academic Support
5.0	Student Services
6.0	Institutional Support
7.0	Operation and Maintenance of Plant
8.0	Bursaries
<u>Other Programmes</u>	
9.0	Auxiliary Enterprises
10.0	Hospitals
11.0	Independent Operations

1) SAPSE Report-002: Op. Cit., p. 1

Of the educational and general programmes, the instruction, research and public service programmes allow the classification of those activities which produce the primary output of a university, whereas the programmes 4.0 to 8.0 directly facilitate the operation of the primary programmes. For example, the academic support programme caters, amongst other things, for library services, academic administration and curriculum development, whereas the institutional support programme includes the activities of a university's executive management, financial administration and student examinations.

Of the programmes not classified as educational and general, the auxiliary enterprises programme provides for activities such as the provision of student housing and food services; the hospitals programme is designed to provide facilities for medical care in as far

as that is required for the institution's primary programmes; the independent operations programme caters for those university activities which are not related to the institution's primary objectives. A detailed discussion of the subprogrammes of each of these is contained in Chapter 7 below.

6.3 Classification of Educational Subject Matter (CESM)¹⁾

For the purposes of recording, reporting and comparing data between educational institutions, the SAPSE system proposes the classification of educational subject matter into twenty-two main (CESM) groups. These groups, which are of particular relevance to the formal instruction subprogramme and to the research programme, can be disaggregated by identifying second, third or fourth order subcategories according to the accepted subdivisions of the major areas of knowledge. The result is an hierarchical array of subject matter elements, which are arranged in order of normal usage rather than according to any normative conception of intrinsic importance.

The twenty-two first order categories can be aggregated to give two groups, namely, the Human Sciences Group and the Natural Sciences Group. This distinction is shown in Table 3.

6.4 Formal Degree/Diploma Programme Classification Structure²⁾

With respect to university qualification type, the SAPSE system distinguishes between undergraduate diplomas, general academic first bachelor's degrees of three years duration, professional first bachelor's degrees of four years duration, post-graduate diplomas, post-graduate bachelor's degrees and honours, master's and doctoral degrees.

-
- 1) SAPSE Report-003: Classification of Educational Subject Matter, Pretoria, Department of National Education, First Edition, 1982.
 - 2) SAPSE Report-004: Formal Degree/Diploma/Certificate Programme Classification Structure Manual, Pretoria, Department of National Education, First Edition, 1982.

TABLE 3

SAPSE CLASSIFICATION OF SUBJECT MATTER INTO TWENTY-TWO
CESM CATEGORIES AND THEIR DIVISION INTO HUMAN SCIENCES
AND NATURAL SCIENCES GROUPS ¹⁾

Human Sciences	CESM Code	Natural Sciences
	01	Agriculture and Renewable Natural Resources
	02	Architecture and Environmental Design
Arts, Visual and Performing	03	
Business, Commerce and Management Sciences	04	
Communication	05	
	06	Computer Science and Data Processing
Education	07	
	08	Engineering and Engineering Technology
	09	Health Care and Health Science
	10	Home Economics
	11	Industrial Arts, Trade and Technology
Languages, Linguistics and Literature	12	
Law	13	
Libraries and Museums	14	
	15	Life Sciences and Physical Sciences
	16	Mathematical Sciences
	17	Military Sciences
Philosophy, Religion and Theology	18	
Physical Education, Health Education and Leisure	19	
Psychology	20	
Public Administration and Social Services	21	
Social Sciences and Social Studies	22	

1) SAPSE Report-110: An Investigation of Government Financing of Universities, Pretoria, Department of National Education, First Edition, 1982, p. 76.

The minimum full-time study necessary for acquiring any of these qualifications can be divided into two sections, namely, the minimum formal time and the minimum experiential time. Experiential learning is defined as the "... methods which afford the learner an opportunity of acquiring or applying previously acquired knowledge and skills ..."¹⁾ An example of directed experiential learning is hospital internship, and one of independent experiential learning is the period spent by architectural students working in an architect's office.

A component of a formal instruction programme, leading to any of the qualification types identified above, is defined as an instructional offering.²⁾ The level of educational complexity of an instructional offering is described by one of the course levels defined in the SAPSE system.³⁾ The first such course level is that of lower undergraduate, which implies an educational standard equivalent to that of an undergraduate diploma and excludes all instructional offerings that can contribute towards a degree. Intermediate undergraduate refers to a standard normally expected in a general academic first degree. The higher undergraduate level refers to instructional offerings of the fourth (and subsequent) year(s) of a professional first bachelor's degree, excluding those able to be included in a general academic first degree.

The preparatory post-graduate level refers to instructional offerings taken by post-graduate students, but having a level of complexity equivalent to undergraduate offerings. The lower post-graduate level is associated with the standard of an honours degree; the intermediate post-graduate levels (both research and non-research) are associated with the standard of a master's degree; and the higher post-graduate levels (both research and non-research) are

1) SAPSE Report-004: Op. Cit., p. 5.

2) Ibid., p. 7.

3) Ibid., pp. 7-8.

associated with that of a doctor's degree.

Each instructional offering is assigned a credit value on the assumption that, on average, the total of the credit values of all the instructional offerings, taken by a full-time student, equal one per annum.¹⁾ A credit value for a single instructional offering is calculated by dividing the "... credit for formal instruction in each year of study²⁾ ... among all the formal instructional offerings (non-experiential) in that year of study ... in such a way that it reflects the fraction of the academic year which the offering counts towards the qualification for which it is offered."³⁾

6.5 Student Statistics⁴⁾

The SAPSE system defines head-count student enrolments as the total number of unweighted students enrolled at an institution on the relevant census date, irrespective of their course load.⁵⁾ In contrast, the number of full-time equivalent (FTE) enrolments for an instructional offering is defined as "... the product of the students enrolled for that instructional offering and the credit of that instructional offering."⁶⁾ In the case of research offerings, the credit value to be used annually for these calculations is determined by dividing the total credit value of the offering, (which by definition equals the minimum formal time), by the average time taken to complete that offering by all the students who actually completed it during the previous three years.⁷⁾

1) Ibid., p. 11.

2) This normally equals one unless experiential training is involved.

3) SAPSE Report-004 : Op. Cit., p. 11.

4) SAPSE Report-005: Student Statistics Manual, Pretoria, Department of National Education, First Edition, 1982.

5) Ibid., p. 4.

6) Ibid., p. 8.

7) For example, if over the past three years 5 students have completed a 2 credit instructional offering (possibly a thesis) and on average required 3 years to do so, the credit value to be used each year for calculating the number of FTE enrolments equals 2/3.

The number of FTE degree-credit students for an instructional offering is defined as "... the product of the students who have obtained credit for that instructional offering during the reporting year towards a degree/diploma/certificate and the credit of that instructional offering."¹⁾ In the case of research offerings the full credit is assigned as FTE degree-credit on completion of the relevant thesis.

6.6 Financial Data²⁾

The SAPSE system describes a detailed system of financial accounting for post-secondary institutions. The system differs from that generally used in commercial enterprises because of the unique circumstances under which educational institutions operate. Because a variety of persons contributes to the funds of such institutions and many of these place restrictions upon the way in which the funds they have contributed may be used, a system of fund accounting is used by universities. Five principal funds are proposed, each of which is divided into restricted and unrestricted components.

The first fund is the current funds group, in which are placed the moneys that are available for the normal functioning of the university. The second fund is the loan funds group, which contains the moneys which have been lent to, or are available for lending to students or staff. The third fund is the endowment funds group, which contains all the moneys owned by the university, but of which only the annual earnings are expendable. The fourth fund group, that for fixed assets funds, contains data on the institution's investments in fixed assets, which are defined to include both movable and immovable assets. The final fund group, that for agency funds, makes provision for moneys held by the university on

1) SAPSE Report-005: Op. Cit., p. 9.

2) SAPSE Report-006: Finance Manual, Pretoria, Department of National Education, First Edition, 1982.

behalf of persons to whom the money actually belongs.

The financial data of a university are displayed in a series of statements, of which three are of primary importance. The balance sheet, in which data for each fund are shown separately, indicates the state of the institution's financial well-being at a particular date. It includes, amongst other things, data on the various fund balances and inter-fund borrowing.

The statement of changes in fund balances, which illustrates the dynamics of the institution's finances, is used "... to describe the total institutional flow of funds into, out of, and among all the various fund groups."¹⁾

In order to provide more information than provided by this statement, in particular more data on the current funds group, another statement, known as the statement of current funds' revenues, expenditures, and other changes is compiled. Besides referring to the current funds group only, this statement differs from the statement of changes in fund balances in that it reports current funds revenues rather than additions. The distinction is required, because restricted funds are only considered to be earned once all the provisos stipulated for the donation of the money, including those related to the spending of it, are met. Accordingly, restricted funds are at first recorded as additions, and only become revenues once the money has been spent in compliance with all the relevant conditions initially laid down.

6.7 Personpower Resources²⁾

A professional employee is defined in the SAPSE system as "... any employee in a position that requires educational attainment equivalent to at least four years of full-time post-secondary study."³⁾

1) Ibid., p. 37.

2) SAPSE Report-007: Personpower Resources Budgeting and Accounting Manual, Pretoria, Department of National Education, First Edition, 1982.

3) Ibid., p. 7.

A fundamental distinction is drawn between instruction/research professionals and administrative/support professionals. Instruction/research professionals are divided into the ranks of professor, associate professor, senior lecturer, lecturer, junior lecturer and a rank below that of junior lecturer. Administrative/support professionals can be subdivided into executive/administrative/managerial professionals (e.g. the university principal), or specialist support professionals, (e.g. librarians, accountants). All other workers are regarded as being non-professionals. Nevertheless, amongst this non-professional group an important distinction is drawn between service-workers and other non-professional workers.

In the interests of simplicity a threefold distinction is sometimes employed. The groups so distinguished are then: instruction/research professionals; other workers, excluding instruction/research professionals and service workers; and service workers.¹⁾

For reasons similar to those advanced above for calculating FTE student members, it is important to calculate full-time equivalent personpower numbers. In so doing, the services of, say part-time workers, can be reduced to a basis comparable to that of their full-time colleagues. This is done by assigning a full-time employee, who is employed by the institution for the period of a whole year, an FTE value of one. Part-time employees are assigned FTE values that correspond to the fraction of the work load normally carried by a comparable full-time worker.

Further, in order to obtain the number of FTE personpower resources deployed in a particular (sub)programme, each employee is required to complete a timesheet, in which he estimates the fraction of his time, spent on university activities, devoted to each (sub)programme.²⁾

1) Cf. SAPSE Report 110: Op. Cit., Chapter 4.

2) Cf. Section 3.2 for a discussion of this and other related procedures.

6.8 Fixed Assets Data¹⁾

Fixed assets are defined in the SAPSE system to include immovable property, movable property and construction in progress. Because investment in fixed assets forms an important part of university expenditure, it is essential that adequate records of the transactions concerning them be kept. This is partially achieved with the 'fixed assets fund' statement, shown together with the institution's other financial statements. The data contained in that statement are, however, based upon the definitions and valuation procedures set out in a separate SAPSE report.²⁾

6.9 Building and Space Inventory Data³⁾

The SAPSE system includes a set of definitions, classification systems and codes "... for describing and quantifying buildings and building space in terms of statistical aggregations that are meaningful and useful for planning at all levels of resource allocation."⁴⁾

6.10 Information Survey Format

The survey forms necessary for tabulating the data generated by the SAPSE information system are contained in the publications: Information Survey Manual (Universities) and the accompanying Notes to Information Survey Manual (Universities).⁵⁾

-
- 1) SAPSE Report-008: Fixed Assets Manual, Pretoria, Department of National Education, First Edition, 1982.
 - 2) Ibid. Cf. Section 8.2.5.4.
 - 3) SAPSE Report-009: Building and Space Inventory and Classification Manual, Pretoria, Department of National Education, First Edition, 1982.
 - 4) Ibid., Preface.
 - 5) SAPSE Reports-010(U) and 011(U), Pretoria, Department of National Education, First Editions, 1982.

6.11 Conclusion

The SAPSE information system provides a set of consistent definitions of university activities and a framework for the collection of data about those activities. As such it provides the underlying structure for the analysis of the remaining chapters of the dissertation. In Chapter 7 the principles of subsidization are applied to the subprogrammes, identified above in the SAPSE programme structure,¹⁾ to ascertain which university activities merit subsidization. And in Chapter 8 the SAPSE system forms the basis for developing the models used for constructing university subsidy formulas.

1) Cf. Section 6.2.

CHAPTER 7

THE IDENTIFICATION OF THE UNIVERSITY ACTIVITIES
TO BE SUPPORTED BY THE GOVERNMENT

7.1 Introduction

This chapter is devoted to analysing the problem of which university activities should receive governmental support in the form of subsidies. The criterion for judging whether a particular programme warrants subsidization or not is that developed in the earlier sections of this dissertation, namely, whether significant public benefits are likely to ensue or not.

The SAPSE system¹⁾ makes provision for eleven university programmes. The structure established by these programmes can conveniently be used as basis for determining which university activities should be subsidized by the government.

7.2 Instruction Programme

The instruction programme "... includes those activities carried out for the express purpose of eliciting some measure of 'educational change' in a learner or group of learners. Educational change is defined to include (1) the acquisition or improved understanding of some portion of a body of knowledge, (2) the adoption of new or different attitudes, and (3) the acquisition or increased mastery of a skill or set of skills."²⁾

The instruction programme is comprised of three subprogrammes, namely, formal instruction, community instruction and preparatory/remedial instruction. The formal instruction subprogramme includes all instructional offerings, forming part of the institution's formal post-secondary degree/diploma/certificate programmes, for which approval has been granted by the relevant

-
- 1) SAPSE Report-002: Programme Classification Structure Manual, Pretoria, Department of National Education, First Edition, 1982. Cf. Chapter 6, Table 2.
 - 2) Ibid., programme 1.0.

government authority. A standard 10 certificate, or equivalent qualification, is the minimum entrance prerequisite for initial admission to study leading to any university diploma or certificate; a matriculation certificate, or a certificate of exemption from the matriculation examination, is the minimum entrance prerequisite for initial admission to study leading to any degree. Undoubtedly, as formal instruction is a primary raison d'être of universities, subsidies are called for in its case. The general principles on subsidization enunciated above support this view. The position of the other two subprogrammes, namely, community instruction and preparatory/remedial instruction, for which entrance requirements equivalent to a standard 10 certificate are not normally necessary, is less clear, however. Although it is possible that both will generate public benefits to some extent, difficulties would be incurred if their subsidization were to be attempted via the university subsidy formula.

The diversity of activities that may be included under the heading of community instruction, render it impossible to formalize public support via a formula in an uncontentious manner, especially in cases where the courses offered appear to be on the fringe of a university's normal activities.¹⁾ The benefits of this subprogramme also tend to accrue to persons in their private capacities on account of the type of course generally provided, rendering subsidization unnecessary. Where public benefits do ensue, the difficulties of estimating the extent of such benefits, experienced with the formal instruction subprogramme, are compounded a fortiori. It is, in addition, the primary task of a university to provide higher education to matriculated students and, as those participating in community instruction, often do not fall within this category, subsidization via the university subsidy

1) Breneman, D.W. and Nelson, S.C. have phrased it thus: "The courses that have outraged legislators when publicly supported - macrame, poodle grooming, fly-tying, belly dancing - would generally be considered personal enrichment." Financing Community Colleges. An Economic Perspective, Washington, D C , The Brookings Institution, 1981, p. 53.

formula would be inappropriate.¹⁾

Some part of community instruction will be in the form of short courses and seminars provided for the specific benefit of persons external to the university and to the exclusion of the normal student body. Courses of this nature are normally aimed at transmitting a particular and marketable skill and can generally command a price sufficient to cover costs. Although, undoubtedly, the results of this kind of activity can be of great ultimate benefit to the community, if their benefits are adequately reflected in market prices, the payment of subsidies is not required. Therefore, despite the fact that such activities appear prima facie to be similar to those of the formal instruction subprogramme, economic reasons for subsidization are absent. The same reasoning applies to co-operative extension services provided primarily in agriculture and other related industries.

Problems of a somewhat different nature are encountered with the subprogramme, Preparatory/Remedial Instruction, although once again universities that embark upon such courses may be said to be on the fringe of their normal activities or even to be encroaching upon the terrain of other educational institutions. Nevertheless, this case could also be viewed as one dealing with a necessary input for what has already been argued to be a subsidizable output and, therefore, also as one warranting subsidization in its own right.

For practical reasons some preparatory or remedial teaching has long been accepted at South African universities, as for example, occurs with the introductory courses in Latin for law students, who did not include that subject in their school curricula. The opinion has also been voiced that this established tradition should in future be extended to other subject areas, in which de-

1) This insight is attributable to Dr. J.B.Z. Louw.

ficiencies in pre-university training are identified.¹⁾ The question is, thus, one of how and with which delineations this category should be included, whether for example, provision should be made at university level or at some other educational level.

The problem is compounded by the diversity of procedures used in remedial instruction, procedures that range from traditional lecturing to computerized audio-visual, selfstudy guides. This diversity, coupled with the variation in subjects in which remedial courses are currently offered at the different universities, is not germane to formula subsidization by the government. In addition it is to be doubted whether remedial courses, which extend the total time required for graduation, other than possibly by approximately a month prior to commencement of a degree course, could be considered the prerogative of universities. Although public benefits are likely to be generated, one would, in general, also expect that, if poor schooling gives rise to learning difficulties at university, remedial action at the school level is called for. Although increasing university subsidies may be advantageous to those who survived alleged deprivation at school, it achieves nothing for those who, albeit innately capable, did not do so. Therefore, although the need for remedial instruction is acknowledged, it is argued that such teaching should be received by a student prior to his entering a university. If universities wish to provide instruction at a pre-university level, subsidization should be provided by the government via channels other than the university subsidy formula. In so doing, the distinction between secondary and university education will be maintained. For example, where special merit is perceived to exist, consideration could be given to exceptional ad hoc grants, rather than the general incorporation of the subprogramme in the subsidy formula.

-
- 1) The Report of the Human Sciences Research Council on the Inquiry into the Provision of Education in the R.S.A., (the De Lange Report), Pretoria, July 1981, for example, expresses concern in Section 4.9 about the teaching of and interest for the natural sciences and mathematics.

In as far as preparatory/remedial instruction is provided by universities, in the sense that students enrol for a drastically diminished number of subjects, thereby allowing themselves time to become accustomed to university academic requirements, subsidies will be provided via the formula. The prerequisite for subsidization via the government's university programme is, however, that the subjects so taken should contribute towards a student's formal degree or diploma and should, therefore, be at least on a level higher than standard 10.

Corroboration for this conclusion is provided by the fact that, generally, introductory or remedial courses do not contribute towards a student's degree.¹⁾ If such courses were to contribute without the total number of courses required for a degree being increased, a fall in the proficiency level of some or other of the subjects offered for the degree would be implied. On the other hand, if they were to contribute, but at the same time the total number of courses for a particular year were to be increased, no overall effect would be felt on the total subsidy. This follows from the definition of an F T E student, which would result in the subsidy for a particular student in a particular year simply being spread over more courses, but not itself being increased. This conclusion would, of course, be different if the duration of the degree course were to be extended by, say, a year by the incorporation of remedial courses, but that possibly was not considered appropriate above.

7.3 Research Programme

The research programme "... includes those activities intended to produce one or more research outcomes including the creation of knowledge, the reorganization of knowledge, and the application of knowledge."²⁾ The exceptions are where research is

-
- 1) Anomalies unfortunately exist in this regard. In some universities introductory Latin has no credit value, whereas introductory German (French) has.
 - 2) SAPSE Report-002: Op. Cit., programme 2.0.

undertaken primarily as an instruction activity or on a consultation or contract basis, in which case the relevant activities are classified under the instruction and public service programmes respectively. It was pointed out above, in Section 3.3.2, that research, particularly that of a fundamental nature, generates public benefits in excess of the private advantages gained by the researchers. Clearly, therefore, the research programme warrants public support.

7.4 Public Service Programme

The public service programme is defined so as to include those activities that "... make available to the public the various unique resources and capabilities of the institution ..."¹⁾ If activities undertaken by a university were initiated and funded by and are largely for the benefit of a group external to the institution, those activities should be classified as public service. Much public service will be in the form of consulting activities, where a specific problem is identified by and solved for a client, who also pays a fee for the services rendered. As was the case with community instruction in Section 7.2 above, if the criterion on benefits that are not accounted for in market prices is applied, it is found that no economic justification for subsidies exists, because work of this nature can command a market price.

An exception to the general rule that public and community services do not warrant subsidization may be found in the visual and performing arts. Although both performing and visual arts do command market prices, it has become well-established that many facets of the arts are unable to exist without public financial support, because the prices they command are either insufficient to cover costs or do not reflect public benefits adequately.²⁾ It is, nevertheless, suggested that, because of the

1) Ibid., programme 3.0.

2) Blaug, M. (Ed.): The Economics of the Arts, London, Martin Robertson, 1976, and Netzer, D.: The Subsidized Muse : Public Support for the Arts in the United States, Cambridge, Cambridge University Press, 1978.

difficulties encountered in establishing norms in this regard, subsidization of the arts be limited to those bodies created specifically for that purpose, and not attempted via the university subsidy formula.

In conclusion, it is not recommended that the programme, public service, be subsidized via the current costs formula. This conclusion should not be seen as a denial of the importance of this programme. It should rather be viewed as recognition of the availability of other funds for the financing of these important activities.

7.5 Academic Support Programme

The academic support programme is comprised of "... those activities carried out in direct support of one or more of the three primary programmes. (Instruction, Research, Public Service)."¹⁾ It includes, for example, library and museum services, educational media services, academic computing support, ancillary support, the administration of academic programmes, the development of academic curricula, and the professional development of academic personnel. These activities are clearly directly related to and are, in fact, essential for the operation of what have already been decided to be mainly subsidizable programmes and, consequently, warrant subsidization themselves in as far as they refer to the subsidizable elements of the primary programmes.

7.6 Student Services Programme

The Student Services programme is defined as "... those activities carried out with the objective of contributing to the emotional and physical well-being of the students as well as their intellectual, cultural, and social development outside the context of the institution's formal instruction programme."²⁾ It is comprised

1) Ibid., programme 4.0.

2) Ibid., programme 5.0.

of four subprogrammes: student services administration, which includes the administrative activities associated with, say, the dean of students, disadvantaged student services and foreign student services (to name a few); social and cultural development, which includes the administrative support for student associations, clubs and publications, concerts, art exhibitions and student government; counselling and career guidance, including personal counselling and psychological testing; and student health services, in the form of student infirmaries rather than (teaching) hospitals.

With respect to the subprogramme of social and cultural development of students, a distinction must be drawn between two possibilities. On the one hand, activities may be directed towards developing students having the necessary depth of experience to enable them to meet the challenges and responsibilities of the morrow. For example, it can well be argued that attendance at concerts and art exhibitions broadens students' cultural horizons; that participation in athletic games fosters a sense of team spirit and mutual co-operation; and that membership of university societies adds the garnishing of general knowledge to formal instruction. (Indeed, it has been remarked that he who has never whistled the subject of a Bach fugue nor kicked a rugby ball cannot be said to have experienced university life to the full.) On the other hand, it cannot be considered to be the task of a university to develop athletic prowess to the point where it begins to predominate over academic achievements. In the latter case, the rounded education of the student is no longer at issue. Subsidization of this subprogramme should, therefore, only be provided in as far as it makes the first of these two contrasted situations possible.¹⁾

With respect to the subprogramme of counselling and career guidance, other considerations are of importance. Under the auspices of that subprogramme, advice is given to (prospective)

1.) This insight is attributable to Prof. N.J. Swart.

students on which career possibilities exist, with due consideration given to both the students' aptitudes and the current and expected labour market situation. This service has a very important economic function in that the market mechanism cannot operate effectively unless the individual market participants have sufficiently correct information upon which to base their decisions.

Now, one of the basic hypotheses of this dissertation¹⁾ is that the complexities of the educational and labour markets and the great extent to which they are intertwined, are such that detailed 'management' of the supply of education, other than through indicative planning, is not to be recommended above the alternative system of free individual choice. Indicative planning, which aims to indicate from a centralized source to the decentralized decision makers (in this case the students) what would be in the interests of themselves and the community, could be undertaken by combining analyses based upon both manpower and rate of return models.²⁾ However, a decentralized system (in particular) relies heavily upon the adequate flow of accurate information and it is this vital aspect which is supplemented by the counselling and career guidance services of universities. In a sense, the position is akin to the incidence of market failure, discussed in Section 4.2, because the high costs to the individual, especially in time and effort, often prevent his acquiring sufficient information and, therefore, jeopardize optimal decision making. Just as the market failure, caused by externalities, was seen as justification for public subsidies, so also the market failure, resulting from inadequate flows of information, justifies correction via public subsidies.

In the case of the subprogramme, student health services, benefits are likely to be restricted primarily to persons in their

1) As, for example, argued intensively in Chapter 4.

2) For detail of these, see Sections 2.6.2 and 2.6.3.

private capacities. Now, as has been emphasized above, if public benefits are negligible, there is no valid justification for public costs to be incurred. Therefore, exhortations for 'free' student health services to be extended ¹⁾ cannot be endorsed on the grounds of economic logic. In as far as public benefits do ensue from the provision of health services, subsidies are provided by the government's health programme. Additional subsidies via the university subsidy formula are consequently unnecessary.

The only exceptions to this general rule appear to be that large influxes of students into small university towns could lead to positions of insufficient supply at 'peak' times, ²⁾ necessitating extra (university provided, but not publicly funded) services during term; and secondly that, because of the financial position of the majority of students, a medical aid scheme is required, possibly in the form of a small sum levied by the university on all students to provide 'free' clinical services to participants.

In conclusion, it is suggested that the student services programme be partially subsidized to provide support for the counselling and career guidance subprogramme, limited support for the social and cultural development subprogramme and the corresponding portions of the student administration subprogramme.

7.7 Institutional Support Programme

The institutional support programme is defined as "... those activities carried out to provide for both the day-to-day functioning as well as the long-range viability of the institution as an operating organisation."³⁾ It includes the subprogrammes of executive management; financial administration; financial

1) For example, the de Lange Report: Op. Cit., p. 57.

2) Because of the relatively inelastic supply schedule of medical services.

3) SAPSE-DD2: Op. Cit., programme 6.0.

aid administration; general administration and logistical services; student admissions, records and examinations; administrative computing support; public relations and fund raising; and staff social and cultural development. Most of these activities are fundamental to the basic functioning of a university and, therefore, subsidization is warranted.

Exceptions do, however, exist. An example is provided by the subprogramme 'social and cultural development of staff', the benefits of which accrue to people in their private capacities and which is, accordingly, not subsidizable. It is also necessary to distinguish between the two constituent elements of 'public relations and fund raising', because, although public relations can be considered to be an integral part of an institution's existence,¹⁾ this is not the case with fund raising. The latter operates mainly to finance activities in addition to those regarded as the minimum necessary and subsidizable by the state, and/or to alleviate the financial burden on their students. Accordingly, with these exceptions, this programme should be subsidized to the extent that its activities refer to the subsidizable portions of the primary programmes. Provision should also be made here for the management of an institution's resources that it makes available for non-subsidizable activities.

7.8 Operation and Maintenance of Plant Programme

This programme, which includes "... activities related to administering and maintaining existing grounds and facilities, providing utility services and planning and designing future expansions and modifications"²⁾ for general and academic purposes, clearly relates to the day-to-day functioning of the university as a physical entity and, therefore, justifies subsidization in as far as these facilities are used for subsidizable programmes.

1) This insight is attributable to Prof. N.J. Swart.

2) Ibid., programme 7.0.

Included are the following subprogrammes: administration of the operations and maintenance of physical plant; building maintenance; custodial services; utilities (for example heating, air conditioning, light, water); landscape and grounds maintenance; and non-capitalizable alterations and renovations.

Those activities related to the operation and maintenance of plant for other purposes, including for example student housing, are not classified under this programme.

7.9 Bursaries Programme

Included in this programme are all forms of "... financial assistance provided to ... students in the form of outright grants, stipends and prizes ..."¹⁾ To determine whether this programme should be subsidized, one is required to reconsider the conditions for obtaining the optimal use of education. The economic complexities of pricing a university's activities so as to achieve an 'optimal' allocation of resources received attention in Section 4.4 and the closely related issues of financial support for students and universities were discussed in Chapter 5. The activities of the Bursaries Programme are clearly related to these problems.

It was argued that subsidization of universities should be undertaken to correct the market failure caused by the externalities or public benefits arising from education. However, it is also important that the private beneficiaries of education (for example the students) should pay their share, for if this form 'user charging' is waived, inefficiencies can result. The problem is, unfortunately, that there may be additional forms of market failure, such as the non-availability of funds for those unable to provide collateral security for loans, or other considerations, such as those of redistributing income, which could

1) Ibid., programme 8.0.

'conflict' with these general conclusions. Nevertheless, it is suggested that the solutions to these other problems do not lie in the application of university subsidies. As is argued in Section 5.2.2, student loans administered by a student bank could alleviate many of the hardships, and the problem of an unequal division of income is best tackled at junctures other than the university subsidy formula, which itself can only have a limited effect in this respect.

The conclusion is, therefore, that because provision has already been made in the other programmes for subsidies necessary on account of externalities, no additional subsidies are warranted for the Bursaries Programme. If additional subsidies were to be paid, double subsidization would be implied. The problems that remain are best tackled directly rather than indirectly via the subsidy formula.

7.10 Auxiliary Enterprises Programme

The auxiliary enterprises programme "... includes those primary conveniences and support services needed to maintain an on-campus student body as well as those established primarily to serve the staff. Included are student and staff accommodation and food services."¹⁾ Activities for the operation and maintenance of plant for these purposes also fall within the ambit of this programme.

As was the case with the student services programme, the benefits from this programme accrue directly and solely to the specific students or staff for whom they are intended. As was argued in Section 4.4.4 above, there are no significant externalities in the provision of housing and dining facilities or any similar services. Consequently, there is no reason why the current costs of these activities should be subsidized. The fact that many students may not have sufficient cash on hand does not

1) Ibid., programme 9.0.

alter the principles of subsidization and can readily be overcome by the introduction of a loan scheme. Optimal pricing 'rules' support this conclusion by suggesting that a price should be paid that equals the marginal opportunity cost of providing a service or commodity.

These arguments are based on the assumption that the market mechanism can provide the required services. However, in small university towns this may be an invalid assumption to make, because the limited time spent by students each year in the town makes it unprofitable for private entrepreneurs to create these (expensive) facilities. It, accordingly, comes as no surprise that under such circumstances universities generally need to provide more residences than otherwise is the case. As this is clearly another case of market failure, assistance in the form of subsidies on capital for the provision of the facilities is warranted. However, the 'rule' for current costs is not affected thereby and remains that students should be charged for the auxiliary services they consume.

7.11 Hospitals Programme

This programme includes "... those activities related to the services provided by and the administration and maintenance required for a teaching hospital, clinic or health science centre."¹⁾ It comprises four subprogrammes: health care of patients, including veterinary care of animal patients; medical care supportive services; administration of hospitals, and operation and maintenance of plant for hospitals.

Although the existence of public benefits, resulting from a reduction in the incidence of disease, justifies public subsidization of hospitals via the government's health programme, subsidies via the government's education programme are only warranted in as far as patient care provides clinical material for

1) Ibid., programme 10.0.

1)
teaching and research purposes. Since the greater part of such material is provided by the provincial hospitals, the subsidies payable under this heading should be limited to those institutions, which support teaching hospitals that are not funded by the provincial administrations.

7.12 Independent Operations Programme

This programme makes it possible to classify those activities "... that are independent of, or unrelated to, the primary missions of the institution."²⁾ The subprogrammes that are included are: independent operations - institutional; independent operations - external agencies, and operations and maintenance of plant for independent operations. Examples of activities that are classified under the first subprogramme are: commercial rental property, a conference centre, a radio station. Activities that are classified under the second subprogramme are those controlled by bodies external to the university, but housed or supported in some way by the institution, for instance, a nationally funded research centre.

With respect to these activities, it follows from the definition of independent operations - that they are unrelated to the primary functions of a university - that they do not justify subsidization via the universities' subsidy formula.

1) This insight is attributable to Dr. R.H. Venter.

2) Ibid., programme 11.0.

CHAPTER 8

ALTERNATIVE MODELS FOR CONSTRUCTING A FORMULA FOR
UNIVERSITY SUBSIDIZATION8.1 Introduction

In Chapter 5 the general principles, upon which formula building could be based, were discussed; Chapter 7 was devoted to an analysis of which university activities should be subsidized. This chapter builds upon these preceding two by describing alternative models that could be used for constructing a university subsidy formula.¹⁾

Model A briefly describes the Holloway Formula, which was used to determine the universities' subsidies from 1953. After being revised several times, notably by Prof. A.C. Cilliers, the Holloway Formula was eventually superseded by the van Wyk de Vries Formula.²⁾ The van Wyk de Vries Formula, which is described in Model B below, introduced important concepts. The development of these concepts is traced through Models C and D to their culmination in the proposed Universities Advisory Council (UAC) Formula (Model E).

Each of these models is based upon the theoretical arguments advanced in Chapter 3, namely that suitable formula parameters can be deduced from the cross-sectional data provided by the universities concerning their various activities. This procedure entails discerning ex post patterns in university expenditure and using these as basis for developing a formula, as was explained in Section 5.3.1.5. It is the aim of the models, discussed below, to identify these patterns in the form of equations that summarize the information, contained in the data, about how resources are distri-

-
- 1) Because the data available for analysis in these models is drawn from the SAPSE system, the technical terms used in this chapter are largely those defined in the various SAPSE manuals. The reader is accordingly referred to Chapter 6 above, in which the SAPSE system is outlined in greater detail.
 - 2) The historical development has been well documented in Louw, J.B.Z.: Owerheidsbeleid en -Administrasie van Universiteite in Suid-Afrika, D.Phil. Thesis, University of Pretoria, 1978, Chapter 4.

buted amongst the different university resource categories and activities.

8.2 Residential Universities

8.2.1 Model A : The Holloway Formula

The subsidy formula for university current expenditure used during 1982 was that proposed by the van Wyk de Vries Commission.¹⁾ Because it was developed in reaction to some of the characteristics of the formula suggested by the Holloway Report,²⁾ it is necessary to investigate briefly the salient aspects of that formula before turning to the van Wyk de Vries Formula itself.

The Holloway Formula divided university subsidization into two main categories: the first, known as the 'basic subsidy', provided for basic instructional requirements, which were regarded as being independent of student numbers; the second, known as the 'standard provision', provided for five additional subcategories of current expenditures. These five subcategories were: instructional requirements in relation to the number of students; administrative requirements; library requirements; laboratory requirements; and other current requirements, including the upkeep of buildings and grounds, interest and redemption payments on capital, etc.

The subsidies provided by the formula for the basic instructional requirements of a university were related to the approved number of basic departments at a particular institution. The subsidies provided for the additional instructional requirements varied according to science group, of which seven

- 1) Main Report of the Commission of Enquiry into the Universities, (The van Wyk de Vries Report), Pretoria, Government Printer, RP 25/1974, Chapter IX.
- 2) Verslag van die Kommissie van Onderzoek na die Universiteitsfinansies en -Salarisse, (The Holloway Report), Pretoria, Government Printer, 1951. The Holloway formula is discussed in the van Wyk de Vries Report: Op. Cit., paragraphs 30.18 - 30.24.

were distinguished,¹⁾ and depended further, in some cases, upon the number of 'student courses', and in others, upon the number of enrolments.

A student course was defined as any 'approved' subsidy course that an enrolled student had included in his curriculum. A student taking five approved courses would, therefore, have generated five 'student courses' for subsidy purposes. The rationale for defining subsidy courses in this way was to discourage universities from offering certain applied subjects, which were not considered by the Commission to be true university material.²⁾ The Commission was of the opinion that such subjects should be offered by other educational institutions.

The subsidies provided by the formula for the remaining four subcategories of the standard subsidy provision were expressed either as a percentage of the first subcategory, namely of the (non-basic) instructional component, or as a sum of money per student (or laboratory course).

The Holloway formula's provision for the universities' basic instructional requirements can be viewed analytically as providing for the fixed or set-up costs entailed in establishing a university. Thereafter provision was made for increasing the subsidy amount as enrolments or the number of student courses, defined as N, increased. This was done by

-
- 1) Human Sciences, Natural Sciences, Commerce and Administration, Education, Applied Sciences, Medical Sciences, Dentistry.
 - 2) Holloway Report: Op. Cit., paragraphs 77-84. The use of student courses also had the effect of relating subsidies more closely to actual university teaching loads than would have been the case had enrolments been used. As such the concept is akin to that of an FTE student. However, whereas the teaching load caused by one student would normally be expressed as a fraction of an FTE, the equivalent load would be expressed as a multiple of a 'student course' in the Holloway terminology.

by determining a quadratic relationship between N and the subsidizable amount generated by the formula.¹⁾

As is well known, a fundamental property of quadratic equations is that they describe hyperbolic graphs. In terms of the subsidy generated by a formula incorporating elements of this nature, this means that both average and marginal subsidy income decline as university size increases. In order to prevent the total amount of a university's subsidy income from diminishing as the university grew beyond a certain size, the Holloway formula replaced the quadratic relationship with a positive linear relationship between N and the generated subsidizable amount before the point, where the total subsidy began to fall, had been reached.²⁾

Once a total amount had been calculated in the way described above, a fraction thereof, which was assumed to be acquired by the universities by way of student fees, was subtracted. This fraction was also made to vary according to university size.

8.2.2 Model B : The Van Wyk de Vries Formula

Several deficiencies of the Holloway Formula (as adapted by Prof. A.C. Cilliers³⁾) were identified in the van Wyk de Vries Report.⁴⁾ These included what the report describes as a 'complicated' mathematical formulation; the fact that the formula did not provide sufficiently for the strong expansionary phase through which the universities were passing

- 1) E.g. the relationship between student courses (N) and the subsidizable amount generated for the standard provision in respect of the Humanities (S) was written in the Holloway formula as: $S = N(70 - \frac{8N}{1000})$ and for $N > 4375$.
- 2) In terms of the abbreviations introduced in the preceding foot-note, $S = N \times 35$ and for $N < 4375$.
- 3) Report of the Committee of Enquiry into Quinquennial Revision of University Subsidy Formulae (1964 - 1969), (The Cilliers Report), Pretoria, Government Printer, 1963.
- 4) Van Wyk de Vries Report: Op. Cit., paragraphs 30.20 - 30.24.

at that time; the fact that the planned quinquennial adjustments to the formula did not allow for the high rates of inflation being experienced; and the restrictive effect that the concept of 'student courses' was felt to have upon the way universities compiled their different degree programmes. The formula, proposed by the van Wyk de Vries Report, attempted to eliminate these shortcomings.

The approach followed by the van Wyk de Vries Report was that the subsidy formula should establish reasonable university costs, the government's contribution to those costs and an equitable method of dividing the government's contribution. The point of departure used was the calculation of the numbers of academic personnel required by the universities. These personnel numbers were expressed in terms of student to staff ratios for the different subject groupings introduced by the report.¹⁾ The number of personnel acquired in this way were expressed in physical terms and converted into subsidizable amounts by multiplying by the appropriate salary scales. The subsidizable sums determined by the formula were, consequently, ultimately dependent upon student numbers.

Thus the van Wyk de Vries Formula accepted two principles which were subsequently destined to play important roles. Firstly, the principle of basing subsidies (partially) on student numbers, which had been accepted by the Holloway Formula, was reinforced, and secondly, the use of cost units²⁾ was established. The cost unit employed by the van Wyk de Vries Formula was defined by specifying the relative proportions, in which academic personnel were

-
- 1) This part of the formula can consequently be described as 'functional' as described in Section 5.3.1.3.
 - 2) Cf. Section 5.3.1.6.

assumed to be employed by the universities,¹⁾ and coupling their salaries to particular notches on the relevant salary scales. The difficulties experienced by the Holloway Formula in accommodating inflation were accordingly overcome by index-linking the universities' subsidizable costs to the academic personnel salaries, of which the cost unit was comprised.

The advent of the cost unit concept in South African university subsidy formulas can be described as an important occurrence. It is a concept which is developed extensively in the other models discussed in this chapter, and one that ultimately played a significant role in the U A C Formula discussed below.

The van Wyk de Vries Report accepted the need for providing a basic complement of personnel for every university, a need also identified by the Holloway Formula. However, this provision was no longer tied to the number of approved departments, as had been the former practice, but was made to vary in accordance with university size. The recognition that was given by both the Holloway and van Wyk de Vries Formulas, to the existence of fixed costs for enabling a university to perform its basic functions, is another facet which was later to be endorsed by the U A C Formula in particular.²⁾

Another characteristic of the van Wyk de Vries Formula, which was later employed in the U A C Formula, relates to the use of student numbers as basis for determining the universities' subsidizable amounts. In order to reduce instructional activities of differing complexity to a common

-
- 1) The composition of the cost unit proposed by the van Wyk de Vries Report (paragraph 31.9) was: Professors equal to 20 per cent of the instruction (and research) staff; senior lecturers equal to 25 per cent; lecturers equal to 40 per cent; and junior lecturers equal to 15 per cent.
 - 2) Vide Model E below.

subsidy basis, a system of weights was devised for the different instructional levels. For example, the van Wyk de Vries Formula allocated a weight of 2 to Honours students and 3 to Master's and Doctoral students without, however, distinguishing between different undergraduate levels.

The van Wyk de Vries Formula was designed to apply the general principles discussed in the preceding paragraphs to the total of a university's diverse activities, with the exception of those requiring capital funds, for which provision was made separately. This it did by dividing these activities into groups and creating components for each in the subsidy formula.¹⁾

Component A makes provision for instructional, technical and administrative staff in the academic departments, and calculates subsidies on a functional basis. Component B provides staff for the central administration by allocating subsidies for a set number of top officials plus assistants, the number of the latter being determined as a percentage of component A. Of the remaining components some are of the functional type, some of the base variety, whereas some are comprised of combinations.²⁾ Some components include 'blank' factors as opposed to fixed percentages. For example component C, which refers to university libraries, provides library staff as a fixed percentage of two sub-categories of component A and subsidies for books and journals by allocating a sum per student according to subject category groups. The sum allocated is a blank factor in the formula in the sense that it is annually renewed and

1) The formula is summarized in the van Wyk de Vries Report, paragraph 31.34. The parameters were adjusted regularly after the initial publication of the formula.

2) These terms are defined in Section 5.3.1.3.

adjusted with the aid of a relevant price index.¹⁾ The component for laboratory provision likewise contains blank factors; that for research returns to the base procedure as do those for current teaching costs (other than salaries) and for computing services. The provision for the current maintenance costs of buildings and grounds operates on a functional basis and contains blank elements, as does the last component that is designed to provide additional assistance to the smaller universities.

The research component of the van Wyk de Vries Formula appeared to provide only a modest percentage of the costs calculated for academic personnel. This was, however, deceptive. Because the formula did not distinguish between university activities on a programme basis, it was difficult to discern that provision for research personnel had been tacitly made as part of the academic personnel subsidy. The relatively small additional amount, allocated specifically to research, could therefore be regarded as being in respect of research expenditures other than those on research personnel.

The sevenfold distinction that had been introduced by the Holloway Formula to distinguish between the different intensities in resource use by the various subject categories or faculties was reduced by the van Wyk de Vries Report to a threefold one. The subject groups identified were the Human Sciences, the Natural Sciences and the Medical Sciences, to which a fourth was later added, namely a Special Sciences group comprised of Dentistry, Veterinary Science and Agriculture. It was argued in the report that the available data on current costs showed that further differentiations were not justifiable. It was, nevertheless, acknowledged that the applied sciences could make greater demands upon a university's capital facilities than other comparable activities²⁾

1) In reality, this procedure is equivalent to the use of ill-defined cost units.

2) Van Wyk de Vries Report: Op. Cit., paragraph 31.14.

would. However, as the formula was designed for subsidizing current expenditure, this aspect was not incorporated.

Once the formula had determined the subsidizable amount in the way just described, the actual subsidy for a particular university was calculated as a certain percentage government contribution to the estimated costs.¹⁾ This percentage was made to vary according to university size so as to enable the smaller universities to ask tuition fees of approximately the same magnitude as the larger universities²⁾ - a procedure that has also been incorporated in the U A C Formula, as demonstrated below in Model E.

A final procedure, developed in the van Wyk de Vries Report to overcome one of the objections raised against the Holloway Formula, has also been incorporated in the U A C Formula. This is the technique of extrapolating a university's growth rate of the immediate past to overcome the lag caused by not being able to use a university's enrolment figures in the actual year to which they refer.³⁾

8.2.3 Model C

Model C (like Model B) is designed primarily for estimating what 'reasonable' or 'efficient' costs for universities' current expenditures are. However, as is demonstrated in Model E below, provision can be made conveniently in a subsidy formula for the expenditures necessary for most of a university's fixed assets.

8.2.3.1 University Programmes

Instruction Programme: In Section 5.3.1.5 it was stated that

1) Ibid., paragraph 31.24.

2) Vide Section 5.3.1.7.

3) Vide Section 5.3.1.8.

consideration should be given to including two basic steps in the procedure for determining formula parameters. The first would be to estimate the required personnel numbers in physical terms, hereinafter abbreviated to *W*, so as to eliminate inflationary effects from the formula. The second would be to estimate the 'relative expensiveness' of the different subject categories so as to allow for the differences in average salaries determined by the market for the staff of the various subject categories. The logic of Model A demands that this procedure should initially be applied to each subject category separately, after which a measure of aggregation could be considered, if similarities were identified between categories.

The independent variables of the resource use relationship could be taken as undergraduate and post-graduate full-time equivalent student numbers, which can respectively be abbreviated to *U* and *P*. As the SAPSE system differentiates between nine course levels, the introduction of further independent variables could also be considered.

Although it would be possible to estimate staff requirements (*N*) prior to gauging the 'relative expensiveness' of the various subject categories by calculating the average costs per staff member for each category across all the reporting universities,¹⁾ a simpler procedure, which incorporates both elements simultaneously, is available. It entails basing the regressions upon the cross sectional-subject category costs of the reporting year so as to incorporate the relative expensiveness element immediately, but expressing costs in terms of 'subsidy units', equal to, say, the top notch of a lecturer's salary scale, so as to remove the problem of inflation from the subsidy formula by reducing costs to

1) This procedure is, for example, adopted in Model E for the expenditure category: Personnel other than instruction/research professionals and service workers.

real terms or to 'physical' units.¹⁾

The equation to be estimated for each subject category would, therefore no longer be:

$$\begin{aligned} N &= f(U, P) \text{ , but rather} \\ S &= f(U, P) \text{ , where} \\ S &= C_i/L \text{ , and} \end{aligned}$$

S = subsidy unit; C_i = current cost of formal instruction for the i -th subject category; and L = the top notch of a lecturer's salary scale for the reporting year.

Although the data per subject category should be fitted to various functional forms, it can be hypothesized that a linear form will give equations that fit the data satisfactorily.²⁾ The parameters to be estimated by regression techniques would, therefore, be b_{0i} , b_{1i} and b_{2i} of the equation for the i -th subject category of programme 1:

$$S_{1i} = b_{0i} + b_{1i}U_i + b_{2i}P_i \text{ , } i = 1, \dots, 22.$$

Once the normal tests for significance of the estimated parameters had been performed, the results of the estimates could be interpreted quite simply. Parameter b_{0i} is the (teaching) cost in real terms (i.e. in subsidy units) of establishing a particular academic department; b_{1i} is the average additional cost of teaching one more FTE undergraduate student; and b_{2i} the average additional cost per FTE post-graduate student for the i -th category.

On the basis of this model, the calculation of the subsidy for a particular university under the heading 'Formal Instruction' would amount to substituting actual FTE numbers by

-
- 1) This procedure is essentially the same as that of using cost units. Cf. Section 5.3.1.6.
 - 2) Cf. Section 5.3.1.7.

subject category for U and P for a particular year in order to calculate the sum of S_{1i} and multiplying by the value of the subsidy unit, i.e. by the top notch of a lecturer's salary scale pertaining to the year for which the subsidy is payable, (L_t), times the percentage state contribution (K); i.e. total subsidy for programme 1 (Instruction Programme) = SUB_1 is derived as:

$$SUB_1 = K \cdot L_t \cdot \sum_{i=1}^{22} S_{1i}, \text{ where}$$

$$\sum_{i=1}^{22} S_{1i} = \sum_{i=1}^{22} (b_{0i} + b_{1i}U_i + b_{2i}P_i)$$

When total subsidies for all university programmes are calculated, multiplication by L_t and K will obviously be left to last to reduce arithmetical workings.

The Effects of Salary Structure Changes: A point that requires consideration concerns the possible effects of salary changes upon the procedure advocated above. In particular, the question is whether salary adjustments would have adverse effects upon the use of a 'subsidy unit' measure. The first aspect to be emphasized is that in estimating the parameters of the subsidy formula as outlined above, the subsidy unit would equal a lecturer's salary as in the year for which the data are reported; in the calculation of the subsidy for subsequent years the actual salary scale in force for a particular year would be used. Therein, in fact, lies the raison d'être of writing the formula in real terms: inflationary effects must be separated from the formula itself. Clearly, therefore, if salaries were to rise across the board by a certain percentage, the effect would be, ceteris paribus, that the calculated number of subsidy units would remain unaltered, whereas the derived subsidy total would increase by an equal percentage. And, what is more, university costs and subsidies would rise by equal percentages.

This fortunate result does not, alas, occur if salary changes are in the form of a new salary structure; if, for example, professors were to receive higher percentage increases than lecturers. If that were to occur, university costs would increase by a greater percentage than the subsidy.¹⁾ Whether or not this would result in serious problems for the universities would depend upon the magnitude of the relative change. It would, however, at worst be a short-term problem. This is because in a dynamic setting regular adjustments of the formula parameters would be required and once the procedure for doing so had become established and the data had become regularly available, these adjustments would amount to little more than administrative changes. Each time an adjustment occurs the discrepancy between costs and subsidies referred to above would be eradicated.

However, if annual adjustments of a comprehensive nature are considered to be destabilizing, an alternative short-term procedure is at hand to overcome the problem. Teaching costs resulting from the salary structure changes can be estimated by assuming that the breakdown of teaching staff into professors, senior lecturers, lecturers and junior lecturers is the same as that for permanent instruction/research professionals, (as given in the Personpower Statistics, Table 4), and that the average salary for each category is, say, three notches from the maximum in each case. Then, by aggregating for all the reporting universities, the average ratio of estimated costs after the structural change in salaries to costs prior to the change can be calculated and the number of subsidy units increased by this ratio.²⁾ Alternatively, a procedure similar to that

- 1) This effect is, of course, avoided by using cost units.
- 2) It should be remembered that if the other programmes' subsidies (many of which are less labour intensive than programme 1) are expressed in subsidy units, i.e. are dependent upon salary scales, some of the disadvantages implied above may be spurious. This could occur because salary increases could exceed the increases of other costs (see Section 3.4.5) and the windfall 'gain' from the other programmes could compensate for the 'loss' caused by the salary structure adaptations.

used in establishing the cost units of Model E could be used. That would necessitate an assumption as to some breakdown of teaching staff for the purposes of calculating the subsidy sum.

Research Programme: The problems raised by trying to establish an equitable and efficient basis for subsidizing research have received a measure of attention in Sections 4.3.3 and 5.3.1.5 above. There it was concluded that a research subsidy should be comprised of two components: the first, related to the number of researchers, would be to provide funds irrespective of results so as to encourage experimentation in the widest sense of that term; the second, related to results, would be to encourage the efficient use of the available resources.

The procedure suggested by Model C for establishing the parameters of the first component is essentially the same as that proposed for the instruction programme. It is, however, not clear on a priori grounds whether a regression analysis disaggregated by subject category would produce usable results. It could, for example, be the case that research funds are concentrated in particular academic departments in certain years and in other departments in the remaining years, in which case cross-sectional regression analyses would give a distorted impression. The alternative procedure would be to regress aggregated research costs (available from table 4 of the annual financial statements)¹⁾ upon the number of researchers, where student numbers are taken as proxy for that number.²⁾ Even in

-
- 1) Clearly, 'research costs' in this context refers to expenditure from central university funds. A university will at any time be doing more research than indicated by that amount. Consider, for example, research on behalf of one of the statutory research councils.
 - 2) That is, if it is assumed that university staff subsidies are provided in proportion to the number of students at a particular university.

aggregated form it is possible that anomalies could exist in that some universities could be engaged in exceptionally expensive research not done by the majority as, for example, is the case with nuclear research. Accordingly, special attention would be required for the regression results, particularly the regression coefficient and standard deviation of the estimated parameters of the research equation to ensure meaningful interpretation of the data. The exact procedure to be adopted would depend upon the empirical circumstances, once these had become known.

To achieve uniformity as also to enable a final aggregation of the subsidies generated by each of the formula components, the sum for research should be expressed in subsidy units, where that term has the same meaning, mutatis mutandis, as in the previous section, and the subscript 2 refers to research, i.e. $S_2 = C_2/L$.¹⁾ And, if again U and P are taken to refer to undergraduate and post-graduate students respectively, the parameters to be estimated empirically are b_0 , b_1 and b_2 of the equation:

$$S_2 = b_0 + b_1U + b_2P$$

The second aspect to be included in the research subsidy, as was proposed above, should encourage efficient resource use and consequently be related to results. The measure of research results advocated in Section 5.3.1.5 was an indicator compiled by the Department of National Education from internationally accepted citation indices. Because there is no empirical evidence to work on in this regard, the parameters of this part of the formula would of necessity initially have to be arbitrarily defined and thereafter adjusted regularly until an 'optimal' setting had been reached in a pragmatic manner. On this basis, the additio-

1) The number of subsidy units for research used by a particular university is defined as the costs of research in relation to, or expressed in terms of, a lecturer's salary.

nal element to be included in the research component could be written as:

$$g.Cit ,$$

where Cit = Research Results Index based upon citation indices and g = the relevant parameter. With respect to this component the intercept should be zero so as to ensure that those universities which do not earn any points on the index by means of internationally accepted publications, do not earn subsidies on this count either.

The value of the parameter g would initially be relatively small. However, upon the development of the research output indicator referred to above, its value could be increased gradually in relation to b_1 and b_2 , partially by allowing inflation to diminish the real value of the latter two. In this process care will be required to ensure that the total research subsidy does not decrease in real terms in relation to the overall size of the university sector within the country. The relative importance of g to b_1 and b_2 should also not be increased beyond a point where, say, the subsidy from the first (student related) element is one half of the subsidy from the second (results related) element.¹⁾ Further shifts in relative importance could endanger the rationale behind the initial division of the research component into two elements.

In summary, the formula research component for Model C would read:

$$SUB_2 = K(L_t.S_2 + g.Cit), \text{ where}$$

$$S_2 = b_0 + b_1U + b_2P ,$$

-
- 1) Some indication of the ratio between the two could be given empirically by the relationship of 'local' to 'internationally' orientated subjects. By 'local' is meant those subjects which are of mainly local interest and consequently unlikely to attract international citations, e.g. indigenous languages.

and where b_0 , b_1 and b_2 are empirically and g , initially, arbitrarily determined. K and L_t retain their earlier meanings.

Public Service Programme: It was argued in Chapter 7 that the public service programme should not be subsidized. The subsidy suggested for this programme by Model C is, accordingly, nought, or in symbols:

$$SUB_3 = 0.$$

Academic Support Programme: It is hypothesized in Model C that all the various components of the academic support programme are related to a greater or lesser extent to the institution's size, a proxy for which is the number of students enrolled. Therefore, in the regression analyses suggested for this programme by Model C, the primary independent variable would be assumed to be FTE student numbers. The dependent variable would be the programme costs, expressed, as before, in terms of subsidy units. The details of these costs, disaggregated according to the sub-categories identified above, are to be found in Table 4 of the universities' financial statements.

Although institutional size would probably be an important determinant of the expenditure by the universities on this programme, it is also probable that several of the sub-categories could be influenced significantly by other factors. In the case of libraries, for instance, expenditure would probably to some extent be related to the size of the collection; and the size of a library's collection need not depend solely upon the size of the institution to which it belongs. These arguments could have even greater force in the case of museums, for in a young country fine collections of artworks or scientific specimens have generally come to be in the possession of individual universities because of either the munificence or the whims of donors. And in this respect fortune has not smiled on all alike.

It is, therefore, possible that the introduction of a second independent variable to the equation could be useful in order to account for this source of variation between institutions. The one that comes to the fore immediately is the number of volumes of books and periodicals. However, because sophisticated modern libraries also invest in microforms, besides the more conventional material, these must also be added. All of these could conveniently be aggregated by referring to the total inventory value of the library collection, as given in Tables 8 and 13 of the SAPSE Statements on fixed assets. Table 13 also contains the relevant information for museums, for which a similar procedure is advocated.

Whether or not it would prove useful to include this second variable in the equation eventually used for calculating the subsidy itself would depend upon the regression results obtained, specifically upon the significance of the estimated parameter for the inventory value of the various collections. If this parameter were barely to be significant, it could be judicious to dispense with the second variable in the interests of simplicity. Nevertheless, if this is presumed not to be the case, the equation to be fitted to the relevant data is, as before, of simple linear form, namely:

$$S_{4i} = b_{0i} + b_{1i}U_i + b_{2i}P_i + b_{3i}I_i .$$

S_4 refers to the costs in subsidy units caused by the academic support programme and the subscript i to the specific subprogramme. I denotes the inventory value of library or museum collections, as the case may be, and equals zero in the case of all the other subprogrammes. If the regression results proved not to be adversely affected thereby, U and P could be summed to give a simpler formulation. The total subsidy for the programme would be obtained by aggregating the various subtotals and, as before, multiplying by K and

L_t , i.e.

$$SUB_4 = K \cdot L_t \cdot \sum_{i=1}^8 S_{4i}.$$

Student Services Programme: As is the case with the other programmes, Model C suggests that the formula parameters for this programme should be estimated empirically. This would be achieved by estimating the parameters of the equation:

$$S_5 = b_0 + b_1(U + P) \text{ and by paying a subsidy of}$$

$$SUB_5 = K \cdot L_t \cdot S_5,$$

where S_5 refers to the costs of the subsidizable subprogrammes, (identified in Chapter 7) expressed in subsidy units, b_0 and b_1 are the relevant parameters to be estimated and U and P are, as before, undergraduate and postgraduate FTE student numbers. It is probable that the aggregation of student numbers would not affect the regression results in this case.

Institutional Support Programme: It is hypothesized that, with the possible exceptions of 'executive management and 'public relations/fund raising', all the various subprogrammes of the institutional support programme will be positively related to the size of the institution. In the two cases singled out as possible exceptions, it may be expected that institutional size will not have a great effect upon expenditure, because whatever the size of the university, a full complement of executive personnel will normally be required and an unchanging potential number of benefactors will exist.

Despite these possibilities it is suggested that the subsidizable portions of the eight subprogrammes be aggregated for the purposes of fitting an equation to the expenditure data generated by the SAPSE information system. If the hypothesis stated above with respect to the two exceptions

were to be upheld, all that would be implied is that the fixed cost element of the programme, i.e. the positive intercept, would be larger than otherwise. The equation to be fitted to the data would be of the form:

$$S_6 = b_0 + b_1(U + P) \text{ and the subsidy payable would be}$$

$$SUB_6 = K.L_t.S_6,$$

where the subscript 6 refers to the student services programme and the other symbols retain their prior meanings. Unless the regression results are improved by disaggregating for U and P, the expression written above could be used in the interest of simplicity.

Operation and Maintenance of Plant Programme: As the costs arising from these activities are subsidizable, the question is one of what should be used in the regression analyses as independent variable(s). As the costs of the programme are generated by the physical assets of the university, the magnitude of these assets should clearly be incorporated. Of the possibilities offered by the SAPSE Information System the 'assignable square metres by space-use categories in each programme/subprogramme'¹⁾ appears to be the most suitable, because it is the most comprehensive of the available indicators.

Because it is possible to distinguish between space-use categories with the aid of the SAPSE data, it could be profitable to differentiate between several categories. It is imaginable, for instance, that the operation and maintenance costs of laboratory facilities could differ from those of space used for classrooms, which may in turn differ from the costs of maintaining residential space or those of maintaining office space. If this fourfold generalized differentiation were to be taken as a first approximation,

1) SAPSE Information Returns: Building and Space Statistics, Table 1.

the appropriateness of the divisions would be demonstrated by the statistical significance of the estimated parameters. It goes without saying that the method having the most significant results would be the one applied.

It can be expected that the physical facilities of a university will be in proportion to the number of people who will make use of those facilities, that is to say, roughly in proportion to the number of students enrolled. It would, therefore, be advisable to test whether the use of the number of FTE students enrolled as an additional independent variable would improve the regression results. It is also conceivable that the geographical location of a campus can effect its maintenance costs. A hot climate may, for instance, necessitate the use of air conditioning, which would be unnecessary in more temperate zones. Equally, costs in metropolitan areas could differ significantly from those in small towns. If it were to appear necessary, variables could be introduced to include these factors.

However, if it were assumed that these additional considerations are not statistically significant, and as a result only four (possibly fewer) variables were used to correspond to the four space-use categories distinguished above, the regression equation would become:

$$S_7 = b_0 + b_1A + b_2B + b_3C + b_4D \text{ , from which}$$

$$SUB_7 = K.L_t.S_7$$

where SUB_6 is the subsidy payable for the Operation and Maintenance of Plant Programme; A, B, C and D are space-use categories for laboratory, classroom, residence and office space respectively; and b_0 , b_1 , b_2 , b_3 and b_4 are the parameters to be estimated.

Bursaries Programme: It was argued in Chapter 7 that the bursaries programme should not be subsidized. Accordingly, expressed in symbols,

$$SUB_8 = 0.$$

Auxiliary Enterprises Programme: In Chapter 7 it was also argued that subsidies for this programme should be in respect of the provision of capital only. Because Model A is designed to estimate university current costs, provision is not made for subsidies for this programme. Therefore, in symbols,

$$SUB_9 = 0.$$

Hospitals Programme: Because the costs of medical science instruction and research are posted to the instruction and research programmes respectively, the appropriate independent variable, which could be used for estimating the costs of this programme, would be the number of experiential students making use of the hospital facilities.¹⁾ The regression equation would then become:

$$S_{10} = b_0 + b_1 E, \text{ from which}$$

$$SUB_{10} = K.L_t S_{10}$$

where SUB_{10} is the subsidy payable for the hospitals programme; E is the number of experiential students, and b_0 and b_1 are the parameters to be estimated from the data.

Independent Operations Programme: It was argued in Chapter 7 that subsidization of this programme would not

1) 'Experiential' refers to activities that allow previously acquired knowledge to be applied, e.g. hospital internship. SAPSE Report-004 : Formal Degree/Diploma/Certificate Manual, Pretoria, Department of National Education, First Edition, 1982, p. 5.

be warranted, therefore:

$$\text{SUB}_{11} = 0.$$

8.2.3.2 An Evaluation of Model C

1. Model C requires that regression equations be fitted separately for the various university programmes. In the case of the instruction programme the procedure presupposes that separate equations will be estimated for each subject category, after which subject categories having sufficiently similar regression results could be aggregated and new equations fitted to the aggregated data.

Aggregation could, however, be taken a step further, in the sense that the regression equations eventually used as basis for the formula could be added together to simplify the numerical calculation of the final subsidy amount. This technique was adopted in Model E (the U A C Formula) and will accordingly be discussed in greater detail below.

2. Although each of the models discussed in this chapter amounts to a variation upon the general principles summarized in Section 8.1 above, that is, each is based upon the analysis of ex post university data, Model C (and Model A) are distinguishable from the others on account of their exclusive use of cost data. Whereas Models B, D and E, for example, are designed to estimate the resource requirements of universities in physical terms, after which the financial requirements are deduced, Model C begins by estimating costs directly so as to incorporate what has been referred to above as the 'relative expensiveness' of the various activities.

In effect, Model C estimates cost functions in contrast to the other models, which estimate production functions.¹⁾

1) Vide Sections 3.4 and 3.5 above for analyses of these two terms. Cf. the 'remuneration factor' of Model E.

Ultimately, this distinction becomes blurred, because Models B, D and E, after having estimated physical requirements, naturally proceed by converting those physical needs into cost estimates. Nevertheless, the importance of this methodological difference is not slight, primarily because of the recognition accorded by Model C to the 'relative expensiveness' element in the university instruction/research category.

The fact that Model C makes use of 'subsidy units', which in a sense are related to the concept of 'cost units' used in the other models, should also not detract from its essential difference in approach. The use of both 'subsidy units' and 'cost units' is in reality a method of index-linking the financial provision made by the respective models, which is an aspect not directly equivalent to that discussed above.

3. Despite whatever theoretical merits Model C could conceivably have, its application is not devoid of difficulties. Some of these derive from the institutional structure within which the university sector in South Africa operates; others derive from matters of principle.

The university sector is distinguishable as a subsystem of the greater educational system, not only because of its peculiar objectives but also because of its cherished ideals of university autonomy and academic freedom. However, the links that have in the past been established between itself and the other educational subsystems as also between itself and the civil service are substantial. These links are of particular importance with respect to salary structures.

In the present South African educational system no allowance is made for salary differentiation on the basis of the academic subject taught. In accordance with the rate of

return approach¹⁾ economists are wont to argue that, if shortages in skilled manpower are experienced at a particular level, the way to attract additional persons is the payment of higher wages rather than increased subsidization of training.

However, other arguments also exist. Educationalists argue that the intrinsic academic equality between subjects militates against rewarding the teacher of one subject more highly than the teacher of another. Secondly, within an interlinked centralized educational structure it is administratively difficult to establish guide-lines for use in salary differentiation, because skill shortages are often regional.²⁾ As the magnitude of salary differentials also depends upon the cyclical swings of the economy, (consider, for example, the salaries of architects and engineers), the administrative difficulties are compounded.

Thirdly, it has been argued that, because of the current South African situation, in which skill shortages are rife in every sector, salary increases at best offer a short-term solution and at worst could be inflationary.³⁾ On account of these skill shortages and the greater alacrity with which the private sector is able to make salary adjustments, increasing salaries within the educational sector could initiate an inflationary process of leap-frogging, from which the private sector would be sure to emerge as the winner. Accordingly, so the argument runs, a more appropriate solution under the circumstances would be to encourage the long-term development of persons having the required skills. This could be interpreted within the public benefit arguments used in Section 2.2 as a case where

1) Vide Section 2.6.3.

2) For example, it could be that Afrikaans teachers are in short supply in Durban and English teachers in Pretoria.

3) This insight is attributable to Prof. I. van W. Raubenheimer and Mr. R.H. Stumpf.

the long-term potential community benefits, derivable from diminishing certain skill shortages, warrants increased subsidization of those relevant categories. The market failure, which justifies these subsidies, arises because of the structural impediments in a partially underdeveloped economy; that prevent the market from delivering the required numbers of trained personnel.

On account of the considerations mentioned in the preceding paragraph no provision for salary differentiation is at present made in the South African educational system. Model C, which tacitly makes provision for such differentiation by allowing the relative expensiveness of different subject categories to play an influential role in determining the dimensions of the subsidy formula is, accordingly, disqualified on this account.

4. A further difficulty, that could be occasioned by the use of Model C, derives from the absence of pedagogical considerations in the procedure advocated for the aggregation of subject categories. It could be argued that, as a matter of principle, attention should be given to grouping together those subjects that display academic similarities - a result that may not necessarily ensue if Model C were to be used.

In a similar vein, it could be argued that provision should be made explicitly for incorporating an independent variable in the regression equations to account for the set-up costs of a university. The variable that comes to mind for that purpose is the number of course credits that is offered by the university.¹⁾ Although set-up costs are, of course, reflected in the constant term of the estimated equations of Model C, it could be argued that providing for set-up costs in that way implies that subsidies would

1) Cf. Model D below.

be payable, even if no courses were offered by a university. If provision were made for set-up costs by introducing credits as a variable, that would not occur, because subsidies would only be earned by a university once a particular course had been established, i.e. once a credit value had been allocated to it.

8.2.4 Model D

8.2.4.1 Personnel Requirements

Model D¹⁾ attempts to overcome the problems mentioned above. This it does by aggregating the twenty-two subject categories on the basis of a priori academic principle, rather than on similarities in cost structure. A threefold division of the subject categories is proposed by this model, based upon the arguments raised in SAPSE Report-115,²⁾ which distinguishes between three science groups: the Natural Sciences, the Social Sciences and the Humanities.

The high level of aggregation, implied by using three major groups, necessarily reduces the sensitivity of the model for accommodating the (financial) peculiarities of single subject categories. To counteract this effect, Model D suggests distinguishing between the nine course levels identified in the SAPSE system.³⁾ It effectively states, therefore, that the differences in intensity of resource

1) Proposed initially by Dr. R.H. Venter.

2) SAPSE Report-115: Die Kwalifikasie- en Studieprogramme van Universiteite in Suid-Afrika, Pretoria, Department of National Education, 1982.

3) The nine course levels identified in SAPSE-004 are: lower undergraduate, intermediate undergraduate, higher undergraduate, preparatory post-graduate, lower post-graduate, intermediate post-graduate(non-research), intermediate post-graduate(research), higher post-graduate(non-research), and higher post-graduate(research). Vide Chapter 6 below.

use, that occur between instructional activities, are adequately reflected in the different course levels, thereby enabling the aggregation of subject categories on the basis of pedagogical principle. In this respect, Model D could be viewed as the inverse of Model C, because the latter advocates a high level of aggregation with respect to course level and an initially disaggregated analysis of subject category.

The second major distinguishing feature of Model D lies in its introduction of a term that reflects course credits. On the basis of the arguments expressed in the evaluation of Model D above, an additional variable is introduced for this purpose.

A third factor, not found in Model C, but employed in this model, provides for the incorporation of both the residential university and the distance instruction university types in one model by introducing a scaling factor for the latter. In contrast, the basis of Model C was that parameters should be estimated for residential universities alone, with separate provision being made for correspondence universities.¹⁾

These different aspects of the model can be expressed mathematically, if the following relationships are assumed to hold:²⁾

$$1) \quad P_{ijk} = (\alpha_k C_{ijk} + \beta_k S_{ijk}) \gamma_i \delta_j$$

$$\text{with } \gamma_2 = \delta_3 = 1$$

$$\text{and } 2) \quad \left(\sum_{ij} \gamma_i \delta_j C_{ijk} \right) = \epsilon_k + \lambda_k \left(\sum \gamma_i \delta_j S_{ijk} \right)$$

$$\text{with } \frac{\epsilon_1}{\lambda_1} = \frac{\epsilon_2}{\lambda_2}$$

1) Vide Models F and G below.

2) Model D was formulated in this way by Dr. R.H. Venter.

where P = the provision of instruction/research personnel;
 C = course credits;
 S = FTE student numbers;
 i = course level;
 $= 1, 2, 3, 4, 5, 6, 7, 8, 9$;
 j = science group;
 $= 1, 2, 3$;
 k = university type;
 $= 1, 2$;
 α, β, λ = proportional terms; and
 ϵ = constant

From the relationships given above, it can be deduced that:

$$\begin{aligned} \sum_{ij} P_{ijk} &= \alpha_k \left(\sum_{ij} \gamma_i \delta_j C_{ijk} \right) + \beta_k \left(\sum_{ij} \gamma_j \delta_j S_{ijk} \right) \\ &= (\alpha_k \epsilon_k) + (\alpha \lambda + \beta_k) \left(\sum_{ij} \gamma_i \delta_j S_{ijk} \right) \end{aligned}$$

which implies that, on the basis of the second assumption made in equation 2 above, course credits can effectively be eliminated from the final subsidy equation and the provision of instruction/research personnel expressed as a function of student numbers (S).

This model formed the basis for the initial estimates of the various parameters for the U A C Formula (Model E). The data provided by the universities in their 1981 SAPSE information returns was used for this purpose. Two procedures were initially used: the first was a three stage, least squares regression technique in which dummy variables were introduced for the parameters γ and δ ; ¹⁾ the second was an optimizing search technique, aimed at identifying the values of the parameters that would generate a global

1) This technique was applied to the data by Mr. R.H. Stumpf.

minimum value for P, thereby indicating efficient resource use.¹⁾

The results of both these techniques were, as was expected, essentially the same. From these it was concluded that the statistical significance of the parameter for course credits was very low, which rendered it unsuitable for inclusion as an independent variable in the model.

The second, major conclusion made from these investigations was that, as hypothesized in the model, course level was indeed a highly significant indicator of the intensity of resource use in university instructional activities. In fact, in this respect it transpired that distinct groupings of these levels were discernible, on the basis of which four collective levels were distinguished and later incorporated in the final U A C Formula (Model E). Level one was defined to include the lower undergraduate, intermediate undergraduate and preparatory post-graduate levels, because of their being on a par in the intensity of their use of instruction/research professionals per subsidy student. Level two, which was found to be twice as intensive as level one in its use of resources, was defined to include the higher undergraduate and lower post-graduate levels. Levels three and four were found to be respectively approximately three and four times as intensive as level one and were defined to include the different intermediate post-graduate and advanced post-graduate levels.²⁾

8.2.4.2 An Evaluation of Model D

1. As has been pointed out, Model D, in contrast to Model C, emphasizes the existence of different intensities in university resource use according to level rather than subject

1) This technique was applied to the data by Dr. G. Erens.

2) Cf. Chapter 6 in which the SAPSE terminology is explained.

category. It is also primarily designed to estimate university production functions rather than cost functions. As such it forms the basis for Model E, which incorporates these characteristics in modified form and which could be viewed as an extended variation of Model D. The main modifications are in respect of the subject groupings advocated by Model D and the coverage of the model.

2. Although the three subject groupings incorporated in Model D are based upon long-standing academic tradition, there appeared to be few a priori financial reasons for differentiating between the personnel resource requirements of the Social Sciences and Humanities groups. Furthermore, because of the limited number of universities and thus observations, a high level of aggregation was necessary in order to estimate parameters with a sufficient degree of confidence. Because a satisfactory differentiation in resource use was found to be reflected in the various factors proposed for the different academic levels, the use of only two subject groups was found to give satisfactory results. These two groups were called the Natural Sciences and the Human Sciences Groups, the latter being comprised of the Social Sciences and the Humanities. This was, accordingly, the subject grouping finally incorporated in Model E, that is in the U A C Subsidy Formula itself.

3. Model D is restricted to estimating personnel requirements. The coverage of a subsidy formula can, however, conveniently be extended to account for all current costs plus a large portion of university fixed asset costs. Model D was consequently extended to take these different factors into consideration.

4. Finally, the elimination of course credits, referred to above, implied that university fixed or set-up costs would be reflected in the constant terms of the estimated equations. This raised the question of whether a procedure

for simplifying the administrative application of the formula by making a global provision for set-up costs per university, could not be devised.¹⁾ The procedure adopted for this purpose is discussed in the next section.

8.2.5 Model E : The Proposed Universities Advisory Council (UAC) Formula

8.2.5.1 General Considerations

Model E is that finally used for the 1982 revision of the university subsidy formula.²⁾ It can be said to be based upon the preceding models, as important elements of these are included in it.

In contrast to the preceding models, Model E, i.e. the U A C Formula, was designed to provide resources for all university activities - with the exception, on the one hand, of the acquisition of land, and on the other, the erection of new buildings and other land improvements, made necessary because of an increase in student numbers or a change in formula norms. This means that, with these exceptions, provision is made in the U A C Formula for providing new fixed assets, such as equipment and library stock, and for either renewing or replacing all fixed assets, including buildings and other land improvements, owned by a university. The scope of the U A C Formula is, therefore, broader than that of any of the preceding models.

-
- 1) Both the Holloway and van Wyk de Vries Formulas had adopted this approach. Cf. Sections 8.2.1 and 8.2.2.
 - 2) The parameters of the formula were determined by Dr. G. Erens, who also played the leading role in refining the SAPSE information system, from which the data for the analyses were derived. The U A C Formula is contained in SAPSE Report-110 : An Investigation of Government Financing of Universities, Pretoria, Department of National Education, First Edition, 1982.

Nevertheless, the general structure of Model E is based upon that of Model D, which in turn included concepts and structures inherited from earlier models. In particular, after the elimination of course credits from the equation describing university resource use patterns in Model D, one finds a simple linear relationship between university resource requirements and a single independent variable, i.e. the number of subsidy students. The equation describing this relationship comprises a constant term and a proportional term or factor. It can be written as:

$$\text{Resources} = \text{Constant} + (\text{Factor} \times \text{Subsidy Students})$$

This relationship plays a fundamental role in the U A C Formula.¹⁾

The procedure used to fit linear equations of this form to the data entailed two steps, one for each of the parameters of the equation. The first of these was for estimating the constant term of the equation so as to reflect the fixed or set-up resource requirements of a university. The second was for estimating the proportional term so as to reflect the additional resources required as student numbers increase.

Set-Up Resource Requirements: It was decided that the most convenient method of incorporating set-up costs into a formula would be to make a global provision per university for these initial expenses, by differentiating only between the two subject groupings identified above.²⁾ In so doing the high level of aggregation of the data would counteract the relatively small number of observations in each separate category and lend stability and confidence to the statistical results.³⁾

-
- 1) SAPSE Report-110: Op.Cit., p. 39.
 - 2) The Human Sciences and the Natural Sciences.
 - 3) SAPSE Report-110: Op.Cit., p. 40.

This was achieved in the following manner. Consider the equation:

$$R = K + \frac{1}{a} WS$$

where R = resource requirements;

K = constant;

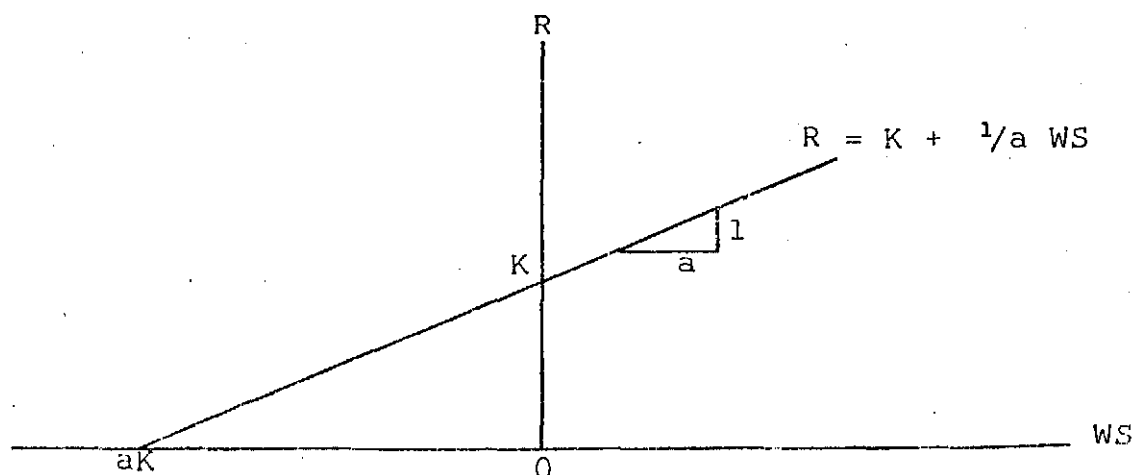
$1/a$ = proportional factor.

The value of K was estimated for each of the two science groups by using regression techniques. In addition, it was considered to be advantageous for the future administrative application of the formula to make a simple transformation by writing the equation in the form:

$$R = \frac{1}{a} (aK + WS)$$

which says that resources should be provided in proportion to weighted student numbers after being augmented with a number equal to aK .

The significance of this is best illustrated in graphical terms. Consider the accompanying graph, in which university resource use (R) is shown on the vertical axis and the number of weighted students (WS) is depicted on the horizontal axis.



As customary, K equals the distance from the origin of the axes to the intercept on the vertical axis and must be positive if it is to be interpreted in practical terms. This, together with the linearity of the graph described by the equation, implies that aK marks the intercept of the graph with the horizontal axis depicting weighted student numbers. Therefore aK can be interpreted as the distance from the origin to the intercept on the horizontal axis, which means that the average university's set-up costs equal the resource requirements of aK level one subsidy students.

To determine empirical values for aK , regression lines were fitted to the available data according to the two Science Groups identified above. The results showed that university set-up costs could be accounted for in a formula by increasing the level one subsidy student numbers by 600 for the Human Sciences and by 400 for the Natural Sciences when calculating the subsidies.¹⁾

Proportional Increase in Resource Use: The second step necessary for determining a formula was to estimate values for the proportional term ($1/a$). This was done by making the assumption that the average use of resources per student in the various university (sub)programmes equals the marginal use of those resources as student numbers increase. This assumption could be justified in the following way:

A well-known property of linear functions, such as that specified above, is that, as the value of the independent variable increases, the average and marginal values of the dependent variable tend towards equality with one another.

1) SAPSE Report-110: Op.Cit., pp. 38-41.

With respect to the equation,

$$R = K + \frac{1}{a} WS ,$$

$$\begin{aligned} R/WS &= (K + \frac{1}{a} WS)/WS = \text{the average use} \\ &\text{of resources per student, and as usual,} \\ \frac{1}{a} &= \text{the marginal use of resources.} \end{aligned}$$

Now, as the value of WS increases, the relative contribution of K to determining the magnitude of the average use of resources decreases, i.e.

$$(K + \frac{1}{a} WS)/WS \text{ tends towards the value of } \frac{1}{a}$$

as W/S tends towards infinity.

If the data for all the (residential) universities is aggregated according to university (sub)programme, it is clear that, in relative terms, the respective magnitudes become very large. Therefore, the discrepancies between average and marginal values will tend to be minimal, and the assumption made above justified. In addition, because the average values can be calculated with confidence, the results of this procedure are likely to be satisfactory.

Technically, if the marginal and average values do actually equal one another, the graph described by the linear equation should pass through the origin of the axes. Consequently, the procedure of making separate provision for university set-up costs could be viewed loosely as one transforming the graph to pass through the origin of the axes. In so doing, an intuitive justification for using average resource use figures is added to the more formal one advanced above.

8.2.5.2 The Basis for the Payment of Subsidies

The basis for the payment of subsidies in the U A C Formula can be divided into three components, depending upon which university programme is under consideration. The formula distinguishes between the academic and general programmes; the auxiliary enterprises programme; and the hospitals programme.¹⁾

In the case of the academic and general programmes, the basis for the payment of subsidies is primarily to be found in the concepts developed above in Section 8.2.5.1. Firstly, an allowance is made for the instructional levels by weighting the FTE student numbers in the four level groupings, identified in Section 8.2.4.1, with factors ranging from 1 to 4; secondly, allowance is made for subject category by distinguishing the two Science Groups, viz. Human Sciences and Natural Sciences, as also explained in Section 8.2.4.1; and thirdly, allowance is made for university set-up costs by increasing the actual number of FTE students, in the way mentioned above.²⁾

In addition, however, to encourage the efficient use of the resources provided by the government, subsidization is based upon (gross) university outputs, i.e. passed degree credits, plus a fraction of inputs, measured in terms of credits failed. The rationale for including a portion of failed credits was examined in general terms in Section 5.3.1.4 above. There it was concluded that such a basis for subsidization would encourage diligence amongst students, without placing undue financial pressure on universities to condone failures. It was also concluded that, after a minor manipulation, this subsidy basis could be reduced to one of enrolments plus passed degree credits.

1) Vide Chapter 6, Table 2 above.

2) Cf. SAPSE Report-110: Op.Cit., Section 3.4.1.

Accordingly, the U A C Formula defines two concepts of primary importance for subsidizing the universities' educational and general programmes. The first is the 'Effective Subsidy Students in the Human Sciences', which equals $600 + \frac{1}{2} E_H + \frac{1}{2} P_H$, where E_H and P_H denote FTE enrolments and FTE degree credits respectively in the Human Sciences, and are weighted with the appropriate level factors of 1 to 4, as already defined. The second is a similar definition with respect to the Natural Sciences, in which the effective number is, however, obtained by increasing the actual weighted number with 400 instead of 600.¹⁾

Although subsidies are to a great extent coupled to the 'effective subsidy student' concepts defined above for the educational and general programmes, an additional factor is introduced for the research programme. As argued in Section 5.3.1.4 above, an optimal basis for subsidizing research would include both research outputs and inputs. Accordingly, the U A C Formula bases subsidization partially on the fraction of instruction/research personnel inputs devoted to research activities and partially on a research output indicator, developed by the Department of National Education by using international citation indices as suggested above.²⁾

In the case of the universities' auxiliary programme, subsidization is based upon the distinction between those FTE students that make use of the university's hostel facilities (defined as 'institutional housing' in the SAPSE system) and those that do not.³⁾ In the case of the hospitals programme, the number of experiential students is used as subsidy basis, where the term 'experiential' refers, as before, to activities that allow previously acquired knowledge or

1) Ibid., p. 41.

2) Vide Section 5.3.1.4 and SAPSE Report-110: Op.Cit., p. 43.

3) Ibid., pp. 43-44.

skills to be applied. The number of effective subsidy experiential students is defined as the number of enrolled FTE experiential students, weighted with the same level weighting factors as used for the formal instruction programme.¹⁾

8.2.5.3 The Subsidization of Current Expenditure

General Approach: The U A C Formula specifies university resource requirements in physical terms before using cost units to convert those requirements into a sum of money for a specific year - a procedure that was pioneered in South Africa by the van Wyk de Vries Report.²⁾

With respect to current expenditure, cost units are defined in the U A C Formula for three categories of personnel, namely, instruction/research professional personnel; personnel excluding instruction/research professional personnel and service workers; and service workers.³⁾ These cost units comprise representative combinations of different academic and civil service posts. Their values are determined annually by using the salaries that correspond to each of their constituent posts. To provide for additional current expenditure, a cost unit was also defined for 'supplies, services, etc.', equal to R10 000 in June 1981.⁴⁾ Its value for subsequent years is calculated by escalating the initial amount with the aid of the Consumer Price Index.

The procedure used to determine the additional resources required as student numbers increase was based upon the assumption discussed in Section 5.3.1.5, namely that the universities' internal resource allocation procedures

1) Ibid., p.44.

2) Cf. Sections 5.3.1.6 and 8.3 above.

3) SAPSE Report 110: Op. Cit., p.52 and tables 4, 5 and 6.

4) Ibid., table 7.

achieve an optimal relative distribution of personnel. The actual technique employed was that of using averages, described above in Section 8.2.5.1. Furthermore the overall FTE student to FTE instruction/research staff ratio of 13:1 was assumed to be satisfactory for the residential university system as a whole.

A diagrammatically illustrated synopsis of a central portion of the U A C Formula is presented in Tables 4 and 5 to facilitate the reading of the descriptive sections, which follow below, and in which the various aspects of the formula are presented seriatim. Tables 4 and 5 refer exclusively to the Human Sciences Subject Group and to the treatment of the educational and general programmes in the formula in order to illustrate the principles involved. These principles, however, apply mutatis mutandis to the other sections of the formula.

Instruction/Research Professionals: In the way described above the provision of FTE instruction/research personnel in the educational and general programmes per effective subsidy student was determined for the different (sub)-programmes and subject groups. This is illustrated with respect to the Human Sciences Group in column 1 of Table 5, where it is, for example, shown that for each additional effective subsidy student in the Humanities a university is entitled to 0,037 additional instruction/research professionals in the formal instruction subprogramme.¹⁾

In order to express the physical ratios of FTE personnel to FTE students for the different (sub)programmes in terms of the cost unit, defined for the instruction/research

-
- 1) The university is of course not obliged to deploy its resources in the way the formula prescribes as reasonable, but is free to do as it wishes. The only exception to this rule is in respect of the renewal of buildings and other land improvements. The funds provided for these purposes are classified as restricted in order to safeguard the interests of future generations. SAPSE Report-110: Op.Cit., pp. 61-62.

ABLE 4. DIAGRAMMATICAL ILLUSTRATION OF THE PROCEDURE USED IN THE U A C FORMULA FOR CALCULATING SUBSIDIES FOR THE EDUCATIONAL AND GENERAL PROGRAMMES IN THE HUMAN SCIENCES GROUP.

1	2	3	4	5	6
PROVISION FOR CURRENT EXPENDITURES	Fraction of Relevant Cost Units	Rand Value of Cost Units in 1981	Rand per Article or S_H	Rand per Coefficient (K)	Subsidy Basis
1.1 Inst/Research Personnel Cost Units per Published Article	0,020	x 24 961	= 4 992	4 992(K_3)	x Published Articles (A_H)
1.2 Cost Units per Effective Subsidy Student (S_H) for:	<div>Provision for FTE Personnel per S_H x Remuneration of FTE Personnel Relative to Appropriate Cost Units</div> <div>1.2.1 Inst/Research x = ... 0,056 x 24 961 = 1 397,816</div> <div>1.2.2 Other Personnel..... x = ... 0,051 x 12 106 = 617,406</div> <div>1.2.3 Service Workers..... x = ... 0,052 x 2 822 = 146,744</div> <div>(See Table 3)</div>			<div>S_H in Human Sciences = 600 + $\frac{1}{2}$ FTE Enrolments + $\frac{1}{2}$ Passed Credits weighted for level.</div>	
1.2.4 Supplies, Services, Etc.	0,049	x 10 000	= 490,000	2.894 (K_1)	x Effective Subsidy Students (S_H)
PROVISION FOR RENEWAL/REPLACEMENT OF FIXED ASSETS					
Cost Units per S_H for:					
2.1 Land Improvements other than Buildings	0,021	x 732	= 15,372	1 793 (K_5)	x Increase in S_H from Previous Maximum (I_H)
2.2 Buildings	0,140	x 732	= 102,480		
2.3 Equipment	0,062	x 1 100	= 68,200		
2.4 Book Volumes in the Human Sciences	1,700	x 19	= 32,300		
2.5 Periodical Volumes in the Human Sciences	0,600	x 39	= 23,400		
PROVISION FOR INITIAL COSTS OF FIXED ASSETS RESULTING FROM AN INCREASE IN STUDENT NUMBERS (I_H)					
Cost Units per I_H for:					
3.1 Equipment	0,617	x 1 100	= 737,00	1 793 (K_5)	x Increase in S_H from Previous Maximum (I_H)
3.2 Book Volumes	34,000	x 19	= 646,00		
3.3 Periodical Volumes	12,000	x 39	= 468,00		
TOTAL PROVISION FOR HUMAN SCIENCE GROUP = $K_1 S_H + K_3 A_H + K_5 I_H$					

Source: SAPSE Report-110: Op.Cit., Chapter 6.

TABLE 5. PROVISION OF PERSONNEL COST UNITS PER EFFECTIVE SUBSIDY STUDENT (S_H) IN THE U A C FORMULA FOR THE EDUCATIONAL AND GENERAL PROGRAMMES IN THE HUMAN SCIENCES GROUP.

Programme/Subprogramme	Provision for FTE Personnel per S_H			Relative Remuneration of Personnel			Fraction of Relevant Cost Units per S_H		
	Inst/Res.	Other P.	Service W.	Inst/Res.	Other P.	Service W.	Inst/Res.	Other P.	Service W.
1.0 Instruction	1	2	3	4	5	6	7	8	9
1.1 Formal Instruction	0,037			1,00			0,037		
1.2 Community Instruction									
1.3 Preparatory/Remedial Instruction									
2.0 Research	0,012			1,00			0,012		
3.0 Public Service									
4.0 Academic Support									
4.1 Library Services		0,008	0,002		0,84	1,00		0,0067	0,002
4.2 Museum Services		0,000			0,67			0,0000	
4.3 Educational Media Services		0,002			0,10			0,0022	
4.4 Academic Computing Support		0,001			1,10			0,0011	
4.5 Ancillary Support	0,001	0,007	0,007	1,00	1,36	1,00	0,001	0,0095	0,007
4.6 Academic Administration	0,004	0,010	0,002	1,00	0,51	1,00	0,004	0,0051	0,002
4.7 Course and Curriculum Development	0,001	0,001		1,00	1,00		0,001	0,0010	
4.8 Academic Personnel Development	0,001	0,000		1,00	1,50		0,001	0,0000	
5.0 Student Services									
5.1 Student Services Administration		0,000			1,14			0,0000	
5.2 Social and Cultural Development		0,001	0,001		0,82	1,00		0,0008	0,001
5.3 Counselling and Career Guidance		0,001			1,33			0,0013	
5.4 Student Health Services									

(Continued)

TABLE 5. PROVISION OF PERSONNEL COST UNITS PER EFFECTIVE SUBSIDY STUDENT (S_H) IN THE U A C FORMULA FOR THE EDUCATIONAL AND GENERAL PROGRAMMES IN THE HUMAN SCIENCES GROUP. (Continued).

Programme/Subprogramme	Provision for FTE Personnel per S_H			Relative Remuneration of Personnel			Fraction of Relevant Cost Units per S_H		
	Inst/Res.	Other P.	Service W.	Inst/Res.	Other P.	Service W.	Inst/Res.	Other P.	Service W.
	1	2	3	4	5	6	7	8	9
6.0 Institutional Support									
6.1 Executive Management		0,002			1,99			0,0040	
6.2 Financial Administration		0,003			1,54			0,0046	
6.3 Financial Aid Administration		0,000			1,17			0,0000	
6.4 General Administration and Logistical Services		0,006	0,007		0,67	1,00		0,0040	0,007
6.5 Student Admissions, Records and Examinations		0,002			0,68			0,0014	
6.6 Administrative Computing Support		0,002			0,81			0,0016	
6.7 Public Relations/ Fund Raising		0,001			1,10			0,0011	
6.8 Staff Social and Cultural Development									
7.0 Operation and Maintenance of Plant									
7.1 Administration of the Operation and Maintenance of Physical Plant		0,001			1,18			0,0012	
7.2 Building Maintenance		0,003	0,005		1,05	1,00		0,0032	0,005
7.3 Custodial Services		0,000	0,014		1,05	1,00		0,0000	0,014
7.4 Utilities		0,001	0,002		1,05	1,00		0,0011	0,002
7.5 Landscape and Grounds Maintenance		0,001	0,012		1,05	1,00		0,0011	0,012
7.6 Non-capitalizable Alterations and Renovations									
8.0 Bursaries									
8.1 First Qualification Bursaries									
8.2 Higher Qualification Bursaries									
TOTAL (Carried Over to Table 2).							0,056	0,0510	0,052

Source: SAPSE Report-119: Op. Cit., Tables 8.9 and 10.

professional group, an analysis of the relative remuneration per instruction/research professional in the (sub)programmes, in which these persons were deployed, was conducted. It was concluded that the remuneration of these persons in all (sub)programmes should not differ from the average for the instruction/research professional group as a whole, which was set to equal the relevant cost unit. Therefore the average remuneration factors of the FTE instruction/research personnel in these (sub)programmes, expressed as a fraction of the cost unit for this personnel category, all equal one. This is illustrated in column 4 of Table 5. The final provision of instruction/research professionals, expressed in terms of the appropriate cost unit, as shown in column 7 of Table 5, was thereafter obtained by multiplying the former two magnitudes (i.e. physical provision of personnel per effective subsidy student and the remuneration structure).

The total of the figures, derived in this way per (sub)programme, (i.e. 0,056 as found in Table 5, column 7), shows the number of instruction/research professional cost units provided as subsidy by the formula per additional effective subsidy student. Coefficients of this nature, accordingly, are the proportional terms of the resource use equations referred to above in Section 8.2.5.1. They appear again in Table 4, column 2. To convert these numbers into money, they must be multiplied by the value of the cost units, as determined for the particular year. This is shown in columns 3 and 4 of Table 4. Of course, to determine the total number of cost units, provided for a particular university, these figures must in turn be multiplied by the university's number of effective subsidy students, as illustrated in Table 4, column 6.

Research: In order to incorporate both output and input factors in the basis for subsidizing research,¹⁾ the U A C

1) Vide Sections 4.4.3 and 5.3.1.4 above.

Formula assumes that, for the Natural Science Group, 40 per cent of the total number of personnel that would have been generated by an entirely input orientated procedure, should be allocated on the basis of outputs. Furthermore, if it is assumed that all publications are attributable to researchers comprising this 40 per cent, average research output, measured in terms of articles published during 1981, equals five articles per man. Therefore, a provision of 0,2 cost units per published article was made in the formula.¹⁾ This is shown in column 2 of Table 4.

It was assumed that the same provision of cost units per published article should be made for the Human Sciences Group. The input based provision of instruction/research professionals for the research programme in this Science Group was accordingly set so that the total provision of personnel would not be less than it would have been, had the total provision been input based.

Other Personnel: On the basis of the assumptions, justified in the earlier chapters of this dissertation, concerning the optimality of the universities' internal distribution of resources, the U A C Formula established a ratio of 1:1 for 'other personnel' and instruction/research professionals in the residential university system. The procedure for distributing the number of personnel, derived by applying this ratio, between the various (sub)programmes was again based upon the existing patterns. The final distribution is illustrated for the Human Sciences in column 2 of Table 5.

In contrast to the case of the instruction/research personnel category, provision was made for salary differentials between subprogrammes in respect of these workers. Therefore, the average remuneration per FTE worker in the 'other personnel' category for the different (sub)programmes, expressed

1) SAPSE Report-110: Op.Cit., p. 54.

as fractions of the relevant cost unit, vary around the value of one, as shown in column 5 of Table 5. This was to be expected, because clearly differences exist between, say, the average remuneration of clerical workers and that of the universities' executive managers.¹⁾

Service Workers: The procedure adopted in the U A C Formula for determining subsidies under this heading is mutatis mutandis the same as that used for the previous personnel category. However, the ratio of service workers in subsidizable programmes to instruction/research professionals, derived from the data submitted by the universities and used for these purposes, was 0,8:1.²⁾

Supplies, Services, Etc.: It was established from the universities' submitted data that the ratio of 'supplies, services, etc.' cost units to 'instruction/research professionals' cost units was 0,9:1. This ratio was used as the basis for determining the extent of subsidization under this heading in a way analogous to that used for determining the subsidization of the 'other personnel' and 'service worker' categories.³⁾

Auxiliary Enterprises Programme: Because the universities' current expenditures for the auxiliary programme are not considered to be subsidizable,⁴⁾ no provision is made for subsidies under this heading in the U A C Formula.

Hospitals Programme: The U A C Formula makes the same provision for personnel and supplies, services, etc. per effective subsidy experiential student for the hospitals programme as it does per effective subsidy student in the

-
- 1) In fact, Table 5 (column 5) indicates that on average the remuneration of workers in the academic administration programme equals 0,51 cost units, whereas the average executive manager receives 1,99 cost units.
 - 2) SAPSE Report-110: Op.Cit., p. 56.
 - 3) Loc.Cit.
 - 4) Cf. Chapter 7 above.

academic and general programmes.¹⁾

8.2.5.4 The Subsidization of Fixed Asset Expenditure.

General Approach: As was suggested in Section 5.3.1.9 above, the U A C Formula differentiates between two major categories of costs in respect of fixed assets, namely, the initial costs of acquiring the asset and the costs of replacing or renewing the asset as it is used up over its effective life-span.²⁾ With respect to the second category two terms are used: 'replacement' refers to the situation where the whole of the asset is considered to have been used up, and 'renewal' to the situation where a portion of the asset is retained, as would, for example, normally occur with buildings.

The U A C Formula extends the distinction between acquiring and renewing (or replacing) assets to the basis of subsidizing these expenditures. Subsidies for establishing assets are based in principle upon the growth of (projected FTE) student enrolments, so as to provide new physical capacity within the university when an influx of students is expected.³⁾ Subsidies for renewing (or replacing) those assets already owned by the universities are based in principle on the (replacement) costs⁴⁾ of the fixed assets owned by a university. However, to facilitate the necessary calculations, the (projected) number of effective subsidy students is used as a surrogate for the replacement costs of a university's fixed assets, because their initial provision is directly coupled to student numbers.

1) Ibid., pp. 56-57.

2) Ibid., p. 58.

3) Cf. Section 5.3.1.9.

4) Vide Section 5.3.1.9 in which reservations about using replacement cost are mentioned.

In contrast to its predecessors,¹⁾ the U A C Formula provides subsidies for renewing (or replacing) all fixed assets. Because the factors of obsolescence and wear and tear, which necessitate such subsidies, can be foreseen, they can conveniently be included in the formula. With the exception of the provision of new buildings and other land improvements, made necessary because of increased student numbers or the application of new formula norms, for which a separate procedure²⁾ exists, the U A C Formula also provides for acquiring new assets.

The procedure used is analogous to that designed for the subsidization of the universities' current expenditures. Requirements are specified in physical terms, whereafter they are converted into sums of money with the aid of cost units. The U A C Formula, accordingly, defines cost units for the various categories of fixed assets identified in the SAPSE system.

Land: Because of the extent of regional variations, the provision of land to the universities is not made by means of the subsidy formula.³⁾

Land Improvements other than Buildings: This category includes expenditures for roads, landscaping, utility distribution systems, parking areas, etc.

The provision in the U A C Formula for renewing these assets rests on the assumption that two thirds of each of these assets requires renewal after a period of fifty years.

-
- 1) With the exception of low-cost assets, all applications by the universities for capital funds were formerly considered separately from the subsidy formula.
 - 2) SAPSE Report-110: Nation-wide Building Space Planning System Manual, Pretoria, Department of National Education, First Edition, 1982. Cf. Section 5.3.1.9.
 - 3) SAPSE Report-110: Op.Cit., p. 60.

Renewal could be necessitated either by deterioration through normal use, or by the need for remodelling because of changed occupancy or academic requirements.¹⁾ These assumptions mean that $\frac{4}{3}$ per cent (= 2 per cent of $\frac{2}{3}$) of the cost units for establishing an asset must be provided annually by the subsidy formula for these purposes.

Buildings: Provision is made for the renewal of buildings, housing subsidizable educational and general programmes, in a similar way to the procedure adopted for land improvements other than buildings. This means that an annual sum equal to $\frac{4}{3}$ per cent of the cost units initially needed for acquiring a particular building should be provided for these purposes.²⁾

As noted above, the basis used for determining these subsidies is the projected number of effective subsidy students for the year for which the subsidy is being calculated.

Equipment, Etc.: Under this heading the U A C Formula provides subsidies for all movable property, (with the exception of library collections), having an acquisition value in excess of R20 in June 1980 for each item, an expected useful life longer than one year, and an identity that is not altered materially through use. Provision is also made, within this category, for museums and art collections, and livestock.³⁾

Subsidies are provided for both acquiring and replacing these assets. The procedure for determining the extent of the subsidization necessary under the different (sub)programmes was that developed and used throughout this dissertation,

1) Loc.Cit.

2) Ibid., p. 61.

3) Ibid., p. 62.

namely that of identifying the patterns established by the universities' internal resource allocation procedures. In addition, it was assumed that all equipment requires total replacement after a period of ten years, and accordingly, provision for replacing these assets was made at an annual rate of ten per cent of the cost units necessary for acquiring them.

Library Collections: The U A C Formula provides subsidies under this heading for all library books, periodicals, microforms and other library items.

The procedure used in the case of library collections for determining the required subsidies was analogous to that used for the other fixed asset categories. The annual numbers of book and periodical volumes acquired per FTE instruction/research professional in the Human and Natural Science Groups were determined and used as basis for the provision of library collections in the formula. On the assumption that all library material requires replacement after twenty years, the provision for the library material, needed on account of an increase in effective subsidy students, was made at a rate twenty times greater than that for renewal.¹⁾

Auxiliary Enterprises Programme: The U A C Formula makes provision for subsidizing the buildings and other land improvements used for this programme. The basis for subsidization is the same as that proposed for the educational and general programmes, namely $\frac{4}{3}$ per cent of the relevant cost units per annum. However, the percentage state contribution to these costs of the auxiliary enterprises programme is lower than that contemplated for the educational and general programmes.²⁾

1) Ibid., p. 63.

2) Ibid., p. 64 and p. 48. Cf. also Section 5.3.1.7 above where arguments are given in justification of such a procedure.

Hospitals Programme: The U A C Formula makes the same provision for the hospitals programme per effective experiential subsidy student as it does per effective subsidy student in the educational and general programmes.

8.2.5.5 The Percentage Government Contribution

The U A C Formula, using arguments similar to those discussed in Section 5.3.1.7, proposes that the percentage government contribution to the costs estimated to be reasonable by the formula, should be set so as to enable the residential universities to ask broadly similar tuition fees. Because of the economies of scale inherent in university operations, this means that the smaller universities should receive a larger percentage contribution from the government than the larger universities.¹⁾ This inverse relationship between the government contribution and university size is determined by applying the following formula:²⁾

Percentage government contribution

$$= 100 \left[1 - \frac{\gamma(\text{Total Effective Subsidy Students} - 1000)}{\text{Total Effective Subsidy Students}} \right]$$

The value for γ to be used in this formula was left to be determined by the Universities Advisory Council. The opinion was expressed in the U A C Report that, because of the University of South Africa's different student body, a different percentage contribution to its costs by the government could be expected.

8.2.5.6 The Extrapolation of the Factors upon which the Subsidy Formula is Based

To overcome the problem caused by the delay in compiling the

1) Cf. Section 5.3.1.7.

2) SAPSE Report-110: Op.Cit., p. 48.

data for the year, for which the subsidy is being calculated,¹⁾ the U A C Formula uses extrapolation techniques.

Because the definition of an effective subsidy student contains both (FTE) enrolments and passed degree credits, the numbers of which are not finally known until after the supplementary examinations, a delay of two years is entailed. The extrapolation technique suggested in the U A C Report, accordingly, projects the latest available data ahead for two years.²⁾

To avoid the extrapolation technique overemphasizing the (positive or negative) growth rate of any particular year, a damping factor equal to one half is also included. This implies that the growth rate measured over the latest two years, for which data are available, is included once only in the formula. The projection technique employed in the formula is thus:

$$\bar{f}_i = f_{i-2} + (f_{i-2} - f_{i-3})$$

where \bar{f}_i is the projected value of the factors upon which subsidization is based for year i , and f_{i-2} and f_{i-3} are the actual values for those factors for the years $i-2$ and $i-3$, respectively.³⁾

8.2.5.7 Summary of the U A C Formula⁴⁾

For the educational and general programmes the U A C Formula depends upon the (projected) numbers of effective subsidy students in the Human and Natural Science Groups, the (projected) increase in those numbers from the previous maximum (if positive), and the number of articles published in the

1) Vide Section 5.3.1.8 above.

2) SAPSE Report-110: Op.Cit., pp. 49-50.

3) Ibid., p. 50.

4) Ibid., Chapter 6.

two Science Groups, as measured by a centrally compiled index. These factors are shown schematically in Table 4, column 6, for the Human Sciences Group.

Cost units are specified for each of the universities' expenditure categories, e.g. instruction/research professionals; supplies, services, etc.; book volumes in the different Science Groups; etc.

Coefficients¹⁾ for these cost units are specified for every subsidizable (sub)programme and can be aggregated for all (sub)programmes in each expenditure category, as shown in Table 4, column 2 and Table 5. Because the values of the different cost units are constant for the period of any year,²⁾ these coefficients, multiplied by the relevant cost unit values, as determined for a particular year, (i.e. column 2 multiplied by column 3), can be summed and expressed as amounts of money for that year. These amounts do not vary according to residential university. If these amounts of money are referred to as $K_1 \dots K_6$, as is done in Table 5, column 5, the final subsidy provision for the educational and general programmes (F_g) becomes:³⁾

$$\begin{aligned} F_g &= K_1 S_H + K_2 S_N \\ &+ K_3 A_H + K_4 A_N \\ &+ K_5 I_H + K_6 I_N \end{aligned}$$

where S refers to the projected number of effective subsidy students; A to the projected number of published articles; I to increases in the projected number of effective subsidy

-
- 1) These coefficients correspond to the proportional terms in the equations specifying university resource use, as discussed above in Section 8.2.5.1.
 - 2) The values for 1981 are shown in Table 4, column 3.
 - 3) Ibid., p. 68.

students, (if positive), and H and N respectively to the Human and Natural Science Groups.

Similarly, the provision in the subsidy formula for the auxiliary enterprises programme can be expressed in terms of summarized coefficients and the four relevant university variables, namely, the projected FTE students using institutional housing; those not using institutional housing; and the projected increases in those two groups.

Likewise for the hospitals programme, the U A C Formula expresses the provision made for this programme's expenditures in terms of the effective subsidy experiential students in the two Science Groups.

8.2.5.8 An Evaluation of the U A C Formula

The U A C Formula bases the subsidization of universities upon acknowledged economic principles without ignoring higher education's fundamental pedagogic requirements. The formula's philosophical preamble, which extends over three chapters in the Report,¹⁾ reviews the possible techniques for planning education from the perspective of university autonomy. The conclusion is reached that, under South African conditions, the most satisfactory planning procedure would be to require students to make their own cost-benefit calculations on whether their university attendance would be beneficial or not.²⁾ However, for private decisions to generate a socially optimal level of education, the public benefits derived from the students' decisions to go to university must be reflected in the payment of public subsidies.³⁾ The U A C Formula, accordingly allocates

1) SAPSE Report-110: Op.Cit., Chapters 1-3.

2) Cf. Chapter 2 above.

3) Cf. Chapter 4 above.

subsidies to those university programmes that are considered to generate public benefits.¹⁾

The basis for the payment of subsidies was chosen so as to reward the productive use of scarce resources without placing universities in the position where they could be influenced to sacrifice academic standards for financial gain. Subsidies for both instruction and research were, therefore, in the first instance coupled to outputs, but with provision made for input based subsidies as well. The combination of outputs and inputs used also presented a pragmatic solution to the theoretical problems of measuring educational outcomes.

The U A C Formula is built upon production functions estimated from cross-sectional university data.²⁾ Because of the small number of universities from which the data could be drawn, a relatively high degree of aggregation was found to be necessary to achieve results with the required degree of statistical significance.

To convert the production function estimates into cost functions, use was made of the cost unit concept pioneered in South African university subsidy formulae by the van Wyk de Vries Commission.

The U A C Formula is broader in scope than any of its predecessors and also specifies subsidies by university (sub)-programme, thereby enabling a functional analysis of university resource requirements. Nevertheless, the formula is administratively simple to apply, because the various subsidy coefficients can be aggregated and, in conjunction with the value of the cost units determined for any year,

1) Cf. Chapter 7 above.

2) Cf. Chapter 4 above.

expressed as constants, irrespective of university.¹⁾

Once these constants have been calculated and published by the responsible government department, the calculation of any university's subsidy requires minimal effort. All that is required is the calculation of the university's projected effective subsidy students, (increases in effective subsidy students, etc.) and multiplication by those constants.

8.3 Correspondence Universities

8.3.1 Model F.

If, as was done with the preceding models, it is assumed that universities' internal resource allocation processes reveal optimal resource use patterns, regression techniques could be used in principle to discern these patterns for correspondence universities. However, the application of this technique is problematical, if the number of correspondence universities is small, as is the case where only one such institution, the University of South Africa (Unisa), exists. Under such circumstances insufficient statistical observations are available for the satisfactory application of normal regression techniques, unless several adaptations are made.

The first possibility would be to apply regression techniques to time series data. However, because the SAPSE Information System has not been in operation for sufficiently long, such data are not available. Nevertheless, if this technique were applied later, the data from the different years would require adjusting to be mutually comparable. This would need to be done by deflating the later figures with a suitable index, preferably one designed for university costs.

1) Cf. Table 4, column 5 above.

Alternatively, the use of cross-sectional regression analyses could be considered, if the regression equations were fitted for highly aggregated science groups, in which case the data provided by each academic department within the science group could be considered to correspond to a statistical observation.¹⁾

A third possibility would be to apply a method similar to that employed for Model E above, which implies estimating university constant and recurrent costs separately. In Model E the procedure for estimating marginal costs was based on the assumption that average and marginal costs had become (approximately) equal on account of the great size of the combined residential universities. Unfortunately, however, because only one correspondence university exists in South Africa, a similar assumption would be less convincing in its case.

This would particularly be the case if the ratio of fixed costs to marginal costs for correspondence universities proved to be greater than that ratio for residential universities. That could occur because the physical restriction of class size in residential universities requires the duplication of lecture meetings. In correspondence universities the same does not apply: once a lecture course has been prepared and printed in textbook or note form, the number of students taking the course only plays an important role in determining costs in as far as the marking of essays, set problems, etc., is concerned. Therefore, these recurrent costs (the marking of essays) could be relatively less in relation to the fixed costs of establishing the particular course in correspondence universities. And the larger fixed costs are in relation to marginal costs, the more unsatisfactory it becomes to assume that marginal and average costs are equal.

1) This insight is attributable to Dr. R.H. Venter.

8.3.2 Model G.

Provision could be made for correspondence universities by introducing a scaling factor into the formula for residential universities so as to reduce the level of subsidization in relation to Unisa's lower costs per student. This was suggested by Model D above and applied by the van Wyk de Vries Formula, which considered three Unisa students to equal one residential student for subsidy purposes.

This procedure was also adopted by the U A C Formula, which proposes "... that the number of (Unisa's) subsidy students should be calculated in such a way that the ratio of Unisa's subsidy students to its successful students ... equal(s) the ratio of the aggregates of those same magnitudes for the residential universities"¹⁾ The U A C Formula achieved this by defining Unisa's subsidy students, Y' , to be

$$Y' = \beta (P + \frac{1}{2}U)$$

where P equals passed credits, U equals unsuccessful or failed credits, and β as derived from the empirical evidence equals $\frac{2}{3}$.

Because the residential universities' number of subsidy students can be written as $Y = \frac{1}{2}E + \frac{1}{2}P$, where E equals FTE enrolments,²⁾ the corresponding expression for Unisa becomes:

$$Y' = \frac{1}{3}E + \frac{1}{3}P.$$

1) SAPSE Report-110: Op.Cit., p. 36.

2) Cf. Section 8.2 above. It should be remembered that Unisa's FTE enrolments are significantly lower than its student head-count.

In addition to this reduction, the U A C Formula makes separate provision in the case of Unisa for the renewal of buildings and land improvements other than buildings in all programmes; for equipment in the auxiliary enterprises programme; and for the percentage government contribution.¹⁾

8.4 Conclusions

In this chapter several models for estimating the parameters of a subsidy formula were analysed. The underlying assumption of each of these was that an application of regression techniques to university expenditure data would reveal suitable parameter values for inclusion in a subsidy formula. Although it was found that the choice of technique used depends upon the nature of the available data and in particular upon the number of statistical observations, the results of the analyses, culminating in the development of the U A C Formula, confirm the hypothesis that regression analyses of the universities' historical expenditure patterns can be used to good effect for the stated purposes.

1) SAPSE Report-110: Op.Cit., p. 38. Cf. Section 5.3.1.7 above.

CHAPTER 9

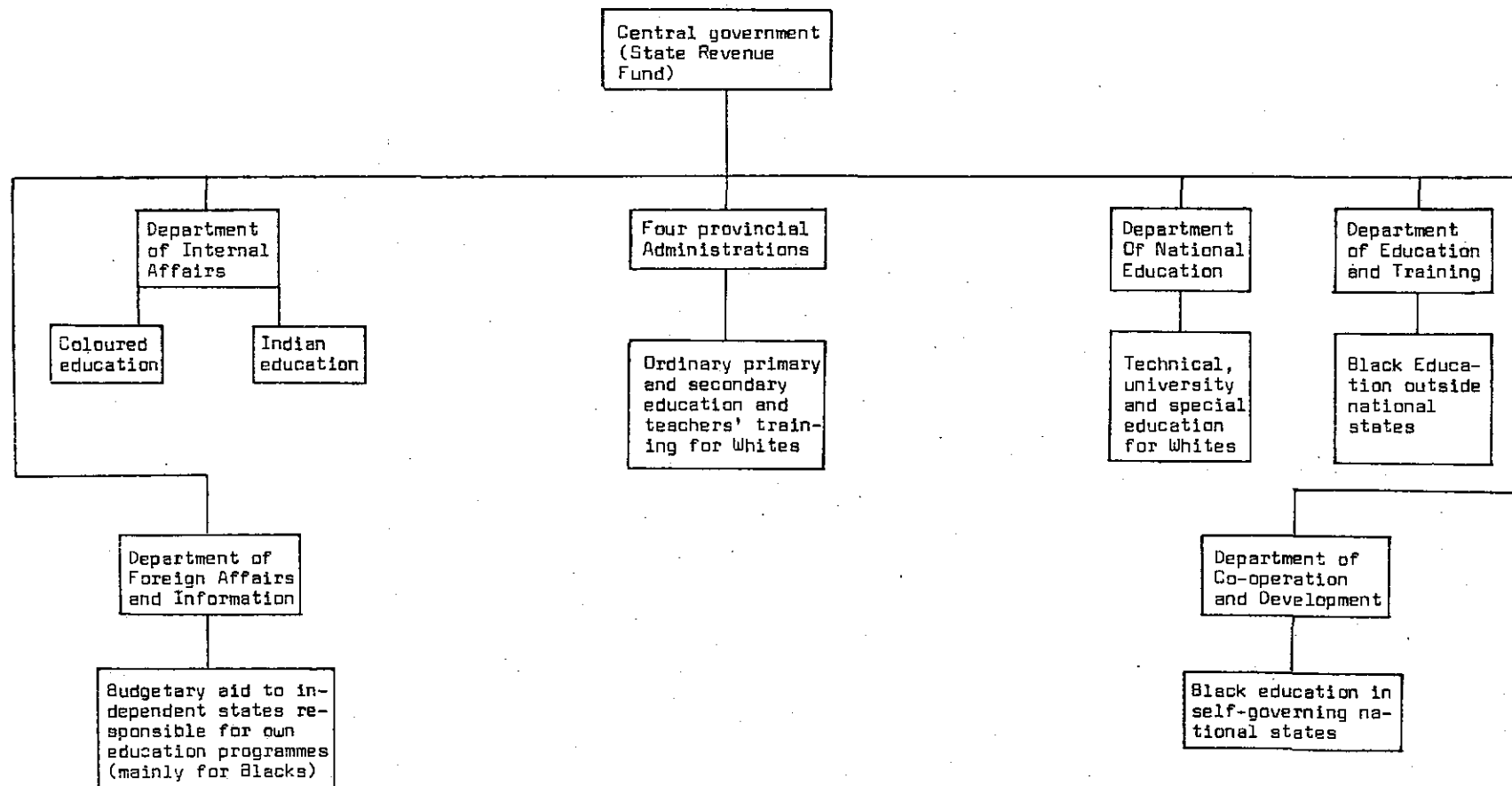
SOME PUBLIC FINANCE CONSEQUENCES OF
UNIVERSITY SUBSIDIZATION9.1 The State Structure for Financing Education

As was pointed out in Section 1.4 above, the administrative control over the South African universities is spread over several government departments. However, ultimately the funds of each derive from one source, namely, the State Revenue Fund. Table 6 illustrates diagrammatically the flow of funds from the central state coffers to the different authorities responsible for providing education.¹⁾

Three government departments are primarily responsible for channeling funds to the universities. The Department of Internal Affairs is responsible for the provision of education to Coloureds and Indians, including the provision of higher education by means of the Universities of the Western Cape and Durban-Westville.²⁾ In fulfilling this function the Department of Internal Affairs is assisted by the Department of Community Development, which provides the capital facilities for these two universities. The Department of National Education administers the funds destined for the ten 'white' residential universities and the University of South Africa. It also caters for technical and special education for Whites. Finally, the Department of Education and Training controls all state provided education for Blacks outside the national states, including the black universities.

-
- 1) HSRC Work Committee Report : Education Financing, (Chairman: Brand, S.S.), Pretoria, Human Sciences Research Council, July 1981, p. 28 et seq.
 - 2) Coloured and Indian Affairs were formerly handled by two separate departments.

TABLE 6

STRUCTURE OF STATE EDUCATIONAL FINANCING IN SOUTH AFRICA, 1981¹⁾

Besides these departments, funds also flow from the State Revenue Fund through the Department of Foreign Affairs and Information to the independent states, where they are partially used for educational purposes; funds flow to the provincial administrations for the provision of primary and secondary education as also teachers' training for Whites; and funds are channeled through the Department of Co-operation and Development to be used for (black) education in the self-governing national states.

9.2 The Need for Comparable Data

Despite the fact that the funds that flow through these various channels all originate from one source, the diversity of institutions responsible for administering them complicates the calculation of the total sum involved. Yet clearly, knowledge of the absolute and relative amounts going to the different departments is essential, both for assessing the costs of (higher) education and for determining a suitable percentage state contribution to total costs.

In Section 5.3.1.7 it was suggested that the magnitude of the percentage state contribution to the universities' costs should be determined by a group of men, chosen for their experience in public affairs, according to their conception of the public benefits that derive from university education. However, the fixing of norms in this regard cannot be done in isolation for any single group of students or universities, nor without knowing the financial implications for the public exchequer.

This does not necessarily imply that all student groups should receive the same measure of public support, because different tuition fees for different groups could be required to elicit optimal private decisions to invest in university education.¹⁾

1) Cf. Sections 4.4.2 and 5.3.1.7.

What is implied, however, is that decisions concerning the relative positions of different student groups cannot be taken without knowing the particulars of each, including the costs caused by each.

Equally, unless the total financial implications for the state of its spending upon (university) education are known, it is not possible to begin considering the alternative possible uses for the state's (limited) financial resources. This applies to both the potential areas for state expenditure outside of the educational sphere, (say on hospitals, roads or defence), and within the educational sphere itself. For example, decisions on the amount of money to be spent on the universities cannot be taken rationally without knowing the sum to be spent on the technikons, or for that matter on secondary and primary education.

The trade-offs, which lie at the heart of all economic problems, cannot be judged unless the costs of the alternatives are calculated. And the magnitude of public funds devoted to education makes calculations of this kind imperative. However, the lack of a central co-ordinating body with respect to (university) education in South Africa results in these costs not being known, with the result that calls for the founding of such a body have been made.¹⁾ and can be considered to be well substantiated.

The task of unravelling the intricate web of education finances in South Africa was partially tackled in the de Lange Report.²⁾ However, that Report addresses itself almost exclusively to primary and secondary education, the

-
- 1) For example by the de Lange Report. Human Sciences Research Council: The Provision of Education in the RSA, Pretoria, HSRC, 1981, Main Report p. 197.
 - 2) Human Sciences Research Council: Op. Cit.

other educational sectors having been largely excluded. This chapter is not the vehicle for completing the task, which is, in a sense, incidental to the main theme of the dissertation. All that is done here is to broach the subject by listing the costs of the universities under the jurisdiction of the three main responsible government departments, i.e. the Department of National Education, Internal Affairs and Education and Training. This means that the funds that flow to the universities in the independent and self-governing states are not revealed by the data presented below. Neither are the other institutions of the post-secondary education sector considered.

The data presented below require careful interpretation, because in many respects they are not strictly comparable. This is the result of the systems, through which the data are collected, differing between the government departments which administer the universities. In addition, with the exception of the data provided since 1981 by the Department of National Education and based upon the SAPSE system,¹⁾ even the particulars of the universities administered by the same government department are not strictly comparable. This follows because unambiguous definitions of the various magnitudes measured generally do not exist. Consider, for example, the number of enrolled students as given in the tables below. Unless these are given in full-time equivalents, which in the past was not done for any of the universities, it is not possible to distinguish between students taking all the subjects of a particular prescribed course and those taking less.

1) Vide Chapter 6 above.

9.3 Student Enrolments

Table 7 presents data on student enrolments in the universities administered by the Department of National Education. As was noted in the previous paragraph, because these data do not measure FTE enrolments, the information they convey is limited. This criticism has particular force in the case of the data from universities having large part-time enrolments and, therefore, a fortiori to the University of South Africa's figures. Because of this defect, the figures in the total column of Table 7 are deceptive, especially those for non-white enrolments. This is because the majority of non-white students at the Department of National Education universities is enrolled at the University of South Africa (Unisa), and therefore, predominately comprises part-time students. Accordingly, the percentage of non-white students appears to be relatively higher than it is in reality.

The deficiency mentioned in the previous paragraph has been rectified by the introduction of the SAPSE system for the collection of data from the universities administered by the Department of National Education. However, insufficient time has elapsed for time-series data to have been established. A comparison of Table 7 with Table 8, which contains FTE enrolled student numbers for these universities for 1981, reveals the order of magnitudes involved for the different universities in converting their head-count enrolment data to FTE enrolments. Although accurate comparisons between the two measures would only be possible if the data for both were available with respect to the same year, it appears from Tables 7 and 8 that in the case of Unisa, the enrolment figure is reduced by approximately a half, when expressed in terms of full-time equivalents. For the other universities, the conversion has, as is to be expected, far less significant effects.

TABLE 7

NUMBER OF ENROLLED STUDENTS AT THE UNIVERSITIES ADMINISTERED BY
THE DEPARTMENT OF NATIONAL EDUCATION, 1971 - 1980

Year	OFS		POTCHEFSTROOM		PRETORIA		STELLENBOSCH		RAU		CAPE TOWN	
	White	Non-White	White	Non-White	White	Non-White	White	Non-White	White	Non-White	White	Non-White
1971	4 490	0	4 682	0	12 232	0	8 082	0	1 444	0	7 390	400
1972	5 251	0	5 377	0	13 150	0	8 451	0	1 738	0	7 605	492
1973	5 841	0	5 892	0	13 752	0	8 850	0	1 897	0	8 057	505
1974	6 682	0	6 421	0	14 313	0	9 284	0	2 143	0	8 450	523
1975	7 073	0	6 611	0	15 389	0	9 742	0	2 493	0	8 536	537
1976	7 189	0	6 474	0	15 368	0	10 238	0	2 945	0	8 424	556
1977	7 830	0	6 560	0	16 192	0	10 623	0	3 251	0	8 603	678
1978	8 195	4	6 639	10	16 726	0	11 170	37	3 787	5	8 931	847
1979	8 312	8	6 521	13	16 584	0	11 539	65	4 220	7	8 935	932
1980	8 324	8	6 688	9	16 658	2	11 878	91	4 797	7	9 297	929
Year	NATAL		RHODES		WITWATERSRAND		PORT ELIZABETH		UNISA		TOTAL	
	White	Non-White	White	Non-White	White	Non-White	White	Non-White	White	Non-White	White	Non-White
1971	6 030	621	1 988	40	9 168	377	1 358	0	20 239	5 205	77 103	6 643
1972	6 587	591	2 106	40	9 400	381	1 602	0	23 339	5 950	84 606	7 454
1973	6 828	678	2 163	40	9 803	432	1 735	0	25 387	6 717	90 205	8 372
1974	7 197	705	2 299	43	9 855	444	1 980	0	27 252	7 221	95 876	8 936
1975	7 186	683	2 325	45	10 188	475	2 179	0	30 936	9 273	102 658	11 013
1976	7 216	746	2 425	55	10 346	483	2 418	0	33 102	10 691	106 145	12 531
1977	7 501	854	2 568	86	10 697	644	2 700	0	34 818	11 896	111 343	14 158
1978	7 490	986	2 671	105	10 952	797	2 897	23	38 257	14 143	117 715	16 957
1979	7 346	1 135	2 649	160	11 175	974	2 919	67	38 006	16 214	118 206	19 575
1980	7 285	1 199	2 728	186	12 272	1 071	2 952	72	37 519	18 653	120 398	22 227

Source: Department of National Education: Annual Reports, Pretoria, Government Printer, RP 21/1972, RP 78/1972, RP 57/1974, RP 30/1975, RP 117/1975, RP 107/1976, RP 118/1977, RP 38/1979, RP 18/1980, RP 34/1981, RP 28/1982.

TABLE 8

NUMBERS OF FTE ENROLLED STUDENTS AT THE
UNIVERSITIES ADMINISTERED BY THE DEPARTMENT
OF NATIONAL EDUCATION 1981

UNIVERSITY	1981 FTE ENROLMENTS
OFS	7 402,80
Potchefstroom	6 068,02
Pretoria	14 061,01
Stellenbosch	10 663,19
RAU	4 323,31
Cape Town	9 655,46
Natal	7 848,24
Rhodes	2 750,28
Witwatersrand	12 079,00
Port Elizabeth	2 722,36
Unisa	29 993,36
Total	107 567,03

Source: Department of National Education, Pretoria

Unfortunately, as mentioned above, enrolment numbers are not available for the Coloured, Indian and Black universities in full-time equivalents. Table 9 contains data on headcount enrolments between 1971 and 1981 for the two universities currently administered by the Department of Internal Affairs, namely the University of the Western Cape for Coloureds and the University of Durban-Westville for Indians.

TABLE 9

NUMBERS OF ENROLLED STUDENTS AT THE UNIVERSITIES
ADMINISTERED BY THE DEPARTMENT OF INTERNAL AFFAIRS
1971 - 1981

YEAR	WESTERN CAPE	DURBAN-WESTVILLE
1971	975	2 303
1972	1 241	2 003
1973	1 572	2 192
1974	1 535	2 342
1975	2 073	2 674
1976	2 531	3 124
1977	2 744	3 522
1978	3 270	4 201
1979	3 591	4 652
1980	4 153	4 875 2)
1981	3 921 ¹⁾	4 961 2)

Source: Department of Coloured, Rehoboth and Nama Affairs: Annual Reports, RP 111/1977 and RP 58/1981; Department of Indian Affairs: Annual Reports, RP 38/1972, RP 36/1973, RP 48/1974, RP 48/1975, RP 31/1976, RP 38/1977, RP 19/1978, RP 120/1978, RP 113/1979, Pretoria, Government Printer.

1) Supplied by the University of the Western Cape.

2) Supplied by the University of Durban-Westville.

Table 10 contains data on headcount enrolments between 1971 and 1981 for the four black universities administered by the Department of Education and Training. Although once again the comparability of the data is subject to doubt, these universities are clearly on average considerably smaller than the white universities, the enrolment numbers of which are depicted in Table 7. It is also clear that, with the inclusion of Unisa, the 'white' university system

TABLE 10

NUMBERS OF ENROLLED STUDENTS AT THE UNIVERSITIES ADMINISTERED BY THE DEPARTMENT
OF EDUCATION AND TRAINING 1971 - 1981

Year	Fort Hare	The North	Zululand	Medunsa	Total
1970	613	810	599	1)	2 022
1971	777	901	701	1)	2 379
1972	942	1 246	837	1)	3 025
1973	1 053	1 274	979	1)	3 306
1974	1 029	1 512	1 004	1)	3 545
1975	1 320	1 695	1 118	1)	4 133
1976	1 651	1 902	1 651	1)	5 204
1977	1 628	1 816	1 084	1)	4 528
1978	1 844	1 474	1 287	166	4 771
1979	2 585	2 174	1 405	200	6 364
1980	3 058	2 752	1 691	324	7 825
1981	2 410	2 859	2 196	510	7 975

1) Medunsa began enrolling students in 1978.

Source: Department of Education and Training, Pretoria.

plays a significant role in providing university education for non-whites.

9.4 Expenditure by Government Departments on Universities

9.4.1 Department of National Education

The procedure used by the Department of National Education to subsidize the universities under its administrative control is based upon the use of a subsidy formula. In the past a number of ad hoc amounts were also added to that calculated by the formula,¹⁾ for instance, for pension schemes, housing schemes, medical insurance and annual bonuses. In addition, subsidies are paid on the interest and redemption payments of the universities' private loans, floated with government approval to obtain capital for constructing physical assets. Although some of the subsidies provided by the government are restricted, in the sense that their use is limited to financing the specific activities for which they were provided by the government, these universities are in principle free to expend their funds as they consider best.

The actual total amounts spent by the Department of National Education on the universities for which it is responsible, that is including all ad hoc subsidies and subsidies on interest and redemption of loans, are displayed in Table 11.

On combining the total direct costs incurred by the Department of National Education in financing these universities in 1981 with the total FTE enrolment for that year (as shown in Table 8) one finds an average cost of R2 577 per student

1) The U A C Formula proposes to incorporate all these ad hoc amounts in the Formula by defining the relevant cost units so as to make provision for them. Cf. Section 8.2.5.

TABLE 11

TOTAL ACTUAL EXPENDITURE BY THE DEPARTMENT OF NATIONAL EDUCATION ON
UNIVERSITIES 1970/71-1980/81

University	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
OFS	2 985 165	4 057 093	4 594 118	6 142 942	8 066 597	10 652 214
Potchefstroom	2 978 258	3 841 028	4 203 905	5 524 674	7 152 497	9 676 619
Pretoria	7 980 624	9 673 642	10 415 137	12 880 411	15 704 488	20 264 474
Stellenbosch	6 000 351	7 660 448	8 771 581	10 677 230	13 607 858	16 573 355
RAU	2 415 455	3 211 128	3 740 539	5 250 661	7 548 142	9 740 908
Cape Town	6 139 459	7 656 035	8 252 094	10 327 012	12 632 452	15 475 657
Natal	5 244 674	6 643 083	7 226 527	9 360 887	11 408 129	13 794 534
Rhodes	1 851 952	2 151 874	2 489 734	3 283 541	4 017 694	4 522 845
Witwatersrand	6 644 943	8 367 098	8 957 726	10 896 441	13 233 635	15 543 860
Port Elizabeth	2 075 036	2 778 082	3 096 274	4 608 537	5 879 039	7 391 222
Unisa	4 249 414	5 824 348	6 128 817	8 336 737	10 377 364	13 683 968
Total	48 565 331	61 863 859	67 876 452	87 289 073	109 527 895	137 319 656

(continued)

TABLE 11

TOTAL ACTUAL EXPENDITURE BY THE DEPARTMENT OF NATIONAL EDUCATION ON
UNIVERSITIES 1970/71 - 1980/81 (Continued)

University	1976/77	1977/78	1978/79	1979/80	1980/81
OFS	13 787 344	15 225 131	17 190 411	19 869 643	23 726 956
Potchefstroom	11 141 937	11 050 613	12 514 281	14 531 945	16 765 001
Pretoria	24 619 164	25 912 921	28 631 612	33 360 873	39 643 200
Stellenbosch	20 206 658	22 351 169	24 968 704	28 737 705	35 091 436
RAU	11 279 093	12 338 476	13 270 517	15 101 310	17 353 043
Cape Town	16 208 830	18 073 004	20 307 849	23 576 994	27 886 175
Natal	16 151 861	15 416 040	18 949 192	22 072 988	27 670 468
Rhodes	5 409 759	5 845 200	6 525 340	7 818 183	9 378 224
Witwatersrand	17 510 963	18 568 153	20 866 903	25 173 156	30 807 909
Port Elizabeth	8 533 303	10 179 923	11 373 483	13 295 571	15 352 810
Unisa	17 528 179	19 346 096	21 522 524	25 701 045	33 493 303
Total	162 377 091	174 306 726	196 120 816	229 239 413	277 168 525

Source: Department of National Education.

for that year.¹⁾ However, besides these direct costs, indirect costs are incurred by the government in financing the universities. These arise because tax revenue is forgone by the government as a result of income tax credits allowed to families supporting students and from tax concessions made to university donors. On the basis of several assumptions, it was estimated in Chapter 5 that the total amounts forgone by the government in 1981 on account of these two concessions could possibly have approximated R8 million²⁾ and R5,25 million.³⁾

Table 12 shows the expenditure by the Department of National Education on its universities over the past decade expressed in real terms.⁴⁾ As can be seen, inflationary effects contributed to a large extent to the very marked increase in nominal expenditure over the decade. Nevertheless, when the real expenditures are written in index form and compared to a similar index for student enrolments (as is done in Table 12), it is apparent that real university costs per student were higher at the end than at the beginning of the past decade. However, when the real expenditure per year is expressed per enrolled student, it is evident that costs rose sharply from R580 per student in 1970/71 to R743 in 1976/77, but then fell again to R671 in 1979/80. This cut-back in government spending on the universities was necessitated by the recessionary phase, through which the economy

-
- 1) Although it is customary to express university costs in this way, i.e. per student, it must not be forgotten that not all expenditure is to the direct benefit of students. A considerable portion is, for example, spent on research.
 - 2) Vide Section 5.2.4.
 - 3) Vide Section 5.3.2.
 - 4) The nominal expenditures have been deflated with the Consumer Price Index. Unfortunately, no truly suitable index exists for university expenditures.

TABLE 12

INDEX OF TOTAL REAL EXPENDITURE BY THE DEPARTMENT OF NATIONAL EDUCATION
ON UNIVERSITIES COMPARED TO INDEX OF ENROLLED STUDENTS 1970/71 - 1980/81

Year	Expenditure in nominal terms (R)	Expenditure in real terms (R) ¹⁾	Index of real expenditure	Index of Enrolled Students	Real Expenditure per enrolled student
1970/71	48 565 331	48 565 331	100,0	100,0	580
1971/72	61 863 859	58 088 131	119,6	109,9	631
1972/73	67 876 452	60 495 947	124,6	117,7	614
1973/74	87 289 073	70 736 688	145,7	125,2	675
1974/75	109 627 895	79 903 714	164,5	135,7	703
1975/76	137 319 656	87 632 199	180,4	141,7	738
1976/77	162 377 091	93 266 566	192,0	149,9	743
1977/78	174 306 726	90 174 199	185,7	160,8	670
1978/79	196 120 816	92 948 254	191,4	164,5	675
1979/80	229 239 413	95 669 693	197,0	170,3	671
1980/81	277 168 525	100 964 740	207,9	2) ²⁾	2) ²⁾

1) Deflated with the Consumer Price Index. 1970=100.

2) Available in FTEs and not therefore comparable.

Source: Tables 7 and 11.

was passing at the end of the seventies.

9.4.2 Departments of Internal Affairs and Community Development

As mentioned above, capital expenditures on fixed assets for the Universities of the Western Cape and Durban-Westville are made by the Department of Community Development. All other governmental funds, going directly to these universities, at present flow through the Department of Internal Affairs.

Table 13 depicts the actual expenditures by the Department of Internal Affairs (and those formerly made by the Department of Coloured Affairs) on the University of the Western Cape. These are expressed in both nominal and real terms. The real expenditures are also shown in index form together with an index of enrolled student numbers.

Table 14 provides similar data in respect of the expenditures by the Department of Internal Affairs (and formerly by the Department of Indian Affairs) for the University of Durban-Westville.

Table 14 shows that real expenditure by the Department of Internal Affairs on the University of Durban-Westville (other than on capital assets) increased more slowly than did student enrolments. Over the period 1972/73 - 1981/82 the index of real expenditure increased by 70,2 percentage points, whereas the index of enrolled students increased by 147,7 percentage points. This considerable discrepancy between the increases in students and funds could have been caused either by an insufficient provision of resources over that period or by a relatively generous provision during the preceding period. If the university had, for example, been well endowed during the preceding period with many small teaching departments, each with few students, the increasing numbers of students could have been

TABLE 13

EXPENDITURE BY THE DEPARTMENT OF INTERNAL
AFFAIRS ON THE UNIVERSITY OF THE WESTERN
CAPE EXPRESSED IN NOMINAL AND REAL TERMS
AND IN INDEX FORM TOGETHER WITH ENROLLED
STUDENT NUMBERS

Year	Expenditure in nominal terms (R)	Expenditure in real terms (R) ¹⁾	Index of real expenditure	Index of enrolled students
1972/73	1 296 153	1 155 216	100,0	100,0
1973/74	1 839 833	1 490 950	129,1	126,7
1974/75	2 787 999	2 032 069	175,9	123,7
1975/76	4 005 999	2 556 476	221,3	167,0
1976/77	4 794 988	2 754 157	238,4	203,9
1977/78	5 570 992	2 882 044	249,5	221,1
1978/79	6 384 998	3 026 065	261,9	263,5
1979/80	8 034 991	3 353 285	290,3	289,4
1980/81	10 796 993	3 933 042	340,5	334,6
1981/82	13 644 999	4 339 239	375,6	316,0

1) Deflated with the Consumer Price Index. 1970=100

Source: Department of Internal Affairs and Table 9.
 1981/82 figures preliminary.

absorbed by 'filling up' classes.

Table 13, which provides comparable data for the University of the Western Cape, does not disclose a similar trend. For that university the index of real expenditure, (excluding capital expenditure, which was provided by the Department of Community Development), rose more quickly than did the index for enrolled students. In this respect the provision made for the University of the Western Cape is comparable to that made for the universities administered by the Department of National Education.

Although, as was emphasized in Section 9.2 above, no sound basis for comparing the data of the different universities exists, the magnitude of the difference between the indices, developed for the University of Durban-Westville, and the other universities discussed so far, would appear to suggest that different approaches to the funding of the various universities exist. This could only be eliminated by establishing some form of centralized policy making body with respect to all university affairs and by developing comparable data bases to be used by all the universities alike.

Besides the fact that a separate government department is involved in providing capital to the Universities of the Western Cape and Durban-Westville, the procedure used for financing their capital projects differs from that used for the 'white' universities. The white universities raise private loans to finance their capital projects, after which the interest and redemption payments on these loans are subsidized by the government through the Department of National Education. In contrast, the Department of Community Development provides funds on a budgetary basis for capital projects for the Universities of the Western Cape and Durban-Westville; it also supervises the actual building work.¹⁾ Because the university buildings are not owned by the universities, rental must be paid for their use.

1) This task used to be that of the former Department of Public Works.

TABLE 14

EXPENDITURE BY THE DEPARTMENT OF INTERNAL
AFFAIRS ON THE UNIVERSITY OF DURBAN-WEST-
VILLE EXPRESSED IN NOMINAL AND REAL TERMS
AND IN INDEX FORM TOGETHER WITH ENROLLED
STUDENT NUMBERS

Year	Expenditure in nominal terms (R)	Expenditure in real terms (R) ¹⁾	Index of real expenditure	Index of enrolled students
1972/73	3 369 364	3 002 998	100,0	100,0
1973/74	4 041 702	3 275 285	109,1	109,4
1974/75	4 920 637	3 586 470	119,4	116,9
1975/76	5 922 804	3 779 708	125,9	133,5
1976/77	6 733 712	3 867 726	128,8	156,0
1977/78	6 893 079	3 566 000	118,7	175,8
1978/79	8 146 902	3 861 090	128,6	209,7
1979/80	10 492 182	4 378 757	145,8	232,3
1980/81	12 713 675	4 631 236	154,2	243,4
1981/82	16 071 682	5 110 947	170,2	247,7

1) Deflated with the Consumer Price Index. 1970=100.

Source: Department of Internal Affairs and Table 9.
 1981/82 figures preliminary.

This procedural difference makes accurate comparisons between the funds going to these universities and those going to the white universities impossible. This is particularly the case when it is remembered that the unit for measuring student enrolments also differs between the two university groups. Although it would be possible to impute sums for interest and redemption on the capital amounts spent on these universities and to subtract the amounts paid as rental on buildings,¹⁾ the inaccuracies involved would make the results precarious.

Because of these problems, no attempt is made to combine the expenditures of the Departments of Internal Affairs and Community Development to derive estimates for total per student costs in these universities. Likewise no comparisons are drawn with the white (or black) universities.

Nevertheless, in Tables 15 and 16 the capital amounts spent by the Department of Community Development on the Universities of the Western Cape and Durban-Westville over the period 1971/72 - 1981/82 are shown respectively. Interest and redemption charges are imputed from the actual amounts spent in each year. The rates of interest used for this purpose were derived from those payable on Public Corporation Loans for the respective years. Because in the long-run the combined annual sums, payable for interest and redemption, tend to equal the amount payable for interest alone, no additional provision was made for loan redemption in the calculations.

The amounts calculated in Tables 15 and 16 for imputed interest and loan redemption charges can be viewed as the annual equivalent capital charges of the actual expenditures. Because payments of these equivalent capital charges

1) Rental on buildings amounts to a capital change.

TABLE 15

IMPUTED INTEREST AND REDEMPTION CHARGES ON CAPITAL AMOUNTS SPENT BY
THE DEPARTMENT OF COMMUNITY DEVELOPMENT ON THE UNIVERSITY OF THE
WESTERN CAPE 1971/72 - 1981/82

Year	Actual Capital Expenditure ¹⁾	Assumed Rate of Interest ²⁾	Imputed Interest and Redemption Charges	Cumulative Total ³⁾	Cumulative Total in Real Terms ⁴⁾
1971/72	123 800	9,0	11 142	11 142	8 971
1972/73	488 965	9,0	44 006	55 148	44 154
1973/74	464 530	8,5	39 485	94 633	67 643
1974/75	91 915	9,75	8 961	103 594	63 052
1975/76	1 522 326	10,75	163 650	267 244	144 613
1976/77	2 706 995	11,75	318 071	585 315	291 637
1977/78	1 113 875	12,5	139 234	724 549	352 579
1978/79	887 532	10,75	95 409	819 958	385 863
1979/80	1 799 550	9,5	170 957	990 915	396 049
1980/81	1 926 223	10,5	202 253	1 193 168	376 394
1981/82	5 050 008	13,0	656 501	1 849 669	443 672

1) Source: Department of Community Development. 1981/82 figures preliminary.

2) Interest rates based on those for Public Corporation loans.

3) Redemption over a 20 year period is assumed.

4) Deflated with the Bureau for Economic Research Building Cost Index, 1970=100, because the major portion of the universities' capital investment is in buildings.

TABLE 16

IMPUTED INTEREST AND REDEMPTION CHARGES ON CAPITAL AMOUNTS SPENT BY
THE DEPARTMENT OF COMMUNITY DEVELOPMENT ON THE UNIVERSITY OF DURBAN-
WESTVILLE 1971/72 - 1981/82

Year	Actual Capital Expenditure ¹⁾	Assumed Rate of Interest ²⁾	Imputed Interest and Redemption Charges	Cumulative Total 3)	Cumulative Total in ⁴⁾ Real Terms
1971/72	2 768 683	9,0	249 181	249 181	200 629
1972/73	2 079 482	9,0	187 153	436 334	349 347
1973/74	1 699 190	8,5	144 431	580 765	415 129
1974/75	587 701	9,75	57 300	638 065	388 354
1975/76	299 390	10,75	32 184	670 249	362 689
1976/77	117 923	11,75	13 856	684 105	340 859
1977/78	140 672	12,5	17 584	701 689	341 455
1978/79	517 427	10,75	55 623	757 312	356 382
1979/80	2 413 410	9,5	229 274	986 586	394 319
1980/81	3 826 095	10,5	401 740	1 388 326	437 958
1981/82	248 442	13,0	32 297	1 420 623	340 759

1) Source: Department of Community Development. 1981/82 figures preliminary.

2) Interest rates based on those for Public Corporation loans.

3) Redemption over a 20 year period is assumed.

4) Deflated with the Bureau for Economic Research Building Cost Index, 1970=100, because the major portion of the universities' capital investment is in buildings.

must be made yearly over a period of, say twenty years, the total imputed costs of capital, payable in each year, must be obtained by cumulating the amounts calculated for each year separately. Finally, these amounts are converted into real terms by deflating the nominal amounts with the aid of the Bureau for Economic Research Building Cost Index.

9.4.3 The Department of Education and Training and the South African Development Trust¹⁾

The financing of the Universities of Fort Hare, Zululand, the North and Medunsa, is done primarily through the Department of Education and Training. The procedure used is in many ways analagous to that used for the two universities discussed in the previous section. This is because a budgetary process is also used, with the difference, however, that the Department of Education and Training supplies funds for both the current and capital expenditures of these universities. This was not, however, always the case. Prior to 1977/78 the major portion of the capital expenditures was financed by the South African Development Trust.

In the case of the universities falling in this group, the construction of buildings is undertaken by building teams employed by the universities themselves. The buildings are owned by the different universities and, consequently, no rental is paid for their use.

Since 1974/75 an additional source of capital funds has been opened to these black universities by their having been granted limited permission to float loans, in a way similar

1) The South African Development Trust was formerly known as the South African Bantu Trust.

TABLE 17

EXPENDITURE BY THE DEPARTMENT OF EDUCATION AND TRAINING ON BLACK UNIVERSITIES 1970/71 - 1981/82

Year	UNIVERSITY OF FORT HARE			UNIVERSITY OF ZULULAND			UNIVERSITY OF THE NORTH			MEDUNSA		
	Current	Capital	Interest and redemption	Current	Capital	Interest and redemption	Current	Capital	Interest and redemption	Current	Capital	Interest and redemption
1970/71	1 470 538	0	0	980 908	0	0	1 090 402	0	0	0	0	0
1971/72	1 953 672	0	0	1 450 769	0	0	1 560 721	0	0	0	0	0
1972/73	2 007 024	0	0	1 436 158	0	0	1 733 838	0	0	0	0	0
1973/74	2 561 375	0	0	1 949 961	0	0	2 547 159	0	0	0	0	0
1974/75	3 144 197	0	8 316	2 393 616	0	0	3 197 784	0	0	0	0	0
1975/76	3 646 735	0	42 628	2 768 267	0	0	3 779 054	0	0	0	0	0
1976/77	4 274 402	0	73 881	3 443 881	0	0	4 190 166	0	0	129 992	0	0
1977/78	4 696 358	n.a.	1)	3 798 888	n.a.	1)	4 579 467	n.a.	1)	825 712	n.a.	0
1978/79	6 027 387	2 049 894	308 234	4 720 359	1 878 081	337 364	5 269 487	2 077 776	259 589	2 273 414	6 369 312	0
1979/80	7 537 970	2 599 948	308 234	5 840 385	2 298 181	343 392	6 853 583	2 587 293	259 589	3 015 621	10 243 422	0
1980/81	9 817 277	4 899 985	308 234	8 033 412	5 199 355	337 828	8 955 849	5 198 288	259 589	4 901 702	12 541 200	6 000 000
1981/82	11 193 162	6 697 441	308 234	8 981 419	8 997 425	341 163	9 845 854	8 182 504	259 589	6 306 678	5 343 071	7 000 000

Source: Department of Education and Training. 1981/82 figures preliminary.

1) Total amount for the universities together - R763 593

to that used by the white universities. The interest and redemption payments on these loans are also subsidized by the Department of Education and Training.

Table 17 shows the current expenditures by the Department of Education and Training on the four relevant universities between 1970/71 and 1981/82. The capital amounts expended between 1978/79 and 1981/82 as also the sums for interest and redemption paid on loans floated by the universities since 1974/75 are also shown.

In Table 18 an index of current real expenditure by the Department of Education and Training on the Universities of Fort Hare, Zululand and the North, is compared to an index of enrolled students for the period 1970/71 - 1981/82.

The medical university, Medunsa, was not included in these calculations on account of its being sui generis and thus not comparable. As can be seen from the data contained in the table, with the exception of 1974/75, the index of enrolled students increased more rapidly than the index of real current expenditure by the Department of Education and Training. By the end of the period under review the index of enrolments had increased by 269,2 percentage points, whereas the index for real current expenditure had increased by 169,5 percentage points. It will be recalled that a similar situation was observed in the case of the University of Durban-Westville.

The capital amounts spent by the South African Development Trust on the respective black universities are shown in Table 19. As was mentioned above, capital expenditures on those universities became the responsibility of the Department of Education and Training as from April, 1977. The relevant amounts expended after that date are shown in Table 17.

TABLE 18

INDEX OF CURRENT REAL EXPENDITURE BY THE DEPARTMENT OF EDUCATION
AND TRAINING ON THE UNIVERSITIES OF FORT HARE, ZULULAND AND THE
NORTH COMPARED TO INDEX OF ENROLLED STUDENT NUMBERS

1970/71 - 1981/82

Year	Nominal Current Expenditure	Real Current Expenditure ¹⁾	Index of Real Current Expenditure	Index of Student Enrolments
1970/71	3 541 848	3 541 848	100,0	100,0
1971/72	4 965 162	4 662 124	131,6	117,7
1972/73	5 177 020	4 614 100	130,3	149,6
1973/74	7 058 495	5 720 012	161,5	163,5
1974/75	8 735 597	6 367 053	179,8	175,3
1975/76	10 194 056	6 505 460	183,7	204,4
1976/77	11 908 449	6 840 005	193,1	257,4
1977/78	13 074 713	6 763 949	191,0	223,9
1978/79	16 017 233	7 591 106	214,3	227,7
1979/80	20 231 938	8 443 501	238,4	304,8
1980/81	26 806 538	9 764 871	275,7	371,0
1981/82	30 020 435	9 546 782	269,5	369,2

Source: Tables 10 and 17.

1) Deflated with the Consumer Price Index, 1970=100.

TABLE 19

CAPITAL AMOUNTS SPENT BY THE SOUTH AFRICAN DEVELOPMENT TRUST ON BLACK UNIVERSITIES, 1970/71 - 1976/77

Year	Fort Hare	Zululand	The North	Medunsa	Total
1970/71	366 218	334 638	360 307	0	1 061 163
1971/72	430 155	536 201	501 358	0	1 467 714
1972/73	474 560	458 778	387 680	0	1 321 018
1973/74	450 425	506 061	489 793	0	1 446 279
1974/75	850 615	927 501	803 142	0	2 581 258
1975/76	1 244 869	1 060 387	1 142 541	0	3 447 797
1976/77	1 191 066	1 074 706	1 230 063	2 338 955	5 834 790

Note: As from 1977/78 capital expenditures on these universities were made by the Department of Education and Training. Cf. Table 17 above.

Source: Department of Co-operation and Development.

9.5 Conclusions

Although, as has been repeatedly stressed in the course of this chapter, the nature of the data, resulting from the financial procedures used, makes balanced comparisons impossible, the tentative results obtained point to an absence of co-ordination between the departments dispensing university subsidies. This conclusion is supported by the differing ways in which enrolments and (current) expenditures are correlated for the different university groups.

In order to obtain the maximum possible benefit from society's scarce resources going to the university sector, a measure of overall planning, based on comparable data,¹⁾ is a necessity. It follows from the arguments raised above that comprehensive planning ought eventually to be extended to the whole educational system in South Africa.

1) The SAPSE system could, for example, be extended to all the South African universities.

CHAPTER 10

SUMMARY AND CONCLUSIONS

The aim of this dissertation was to investigate possible ways of financing universities. As such the primary hypothesis, formulated in Chapter 1, was that a system of subsidy formulas could be devised that would be economically efficient in dispensing the government's available resources and yet would not interfere with university autonomy. In the various chapters of the dissertation arguments were developed in support of this hypothesis.

Chapter 2 was devoted to an analysis of the economic properties of education and to the consequences thereof for planning the provision of education. The standard conclusion in this regard, namely that, because education generates public benefits, it should receive public financial support, was confirmed. The complexities of measuring these public benefits, as also the effects of education upon economic growth and development were discussed. Consideration was given to both centralized manpower planning techniques and 'rate of return' techniques. However, it was argued that a decentralized procedure of allowing each student to conduct his own cost-benefit analysis could be successfully applied if prices were set so as to reflect private marginal costs. A detailed analysis of the effects of pricing university services was, however, postponed to Chapter 4.

In Chapter 3 the internal functioning of universities (as economic units) was analysed with the view to developing ways of calculating the marginal costs required for efficient pricing. Despite the problems encountered with measuring university inputs and outputs as also with defining university goals, it was concluded that satisfactory estimates of university costs could be made by fitting regression lines to university resource use data. In addition to cost functions, it was argued that university production functions could be estimated by applying similar techniques to university resource use

data measured in physical terms. These procedures were justified by arguing that on average universities optimize the use of their scarce resources in the long run.

Chapter 4 returned to a detailed analysis of the problems, encountered in the beginning of the dissertation, of whether education should be centrally planned and provided, and if not, how educational services should be priced so as to elicit optimal responses from the private investors in education. With respect to the first of these aspects - that of whether education should be centrally planned and provided - it was argued that that should not be done in the case of the universities. Although the debate on private versus public university provision can not be won either way on theoretical economic arguments alone, the concepts of university freedom and autonomy were considered sufficient to warrant a minimum of state interference in university affairs.

A minimum of state interference does not, however, imply no state responsibility towards the university sector. On the contrary, it was argued that the public purse should be held responsible for the public benefits ensuing from the consumption of education. The fact that the public benefits of education are difficult to quantify does not detract from this fundamental principle of university subsidization. Indeed, this principle was used in Chapter 7 to determine which university activities should be supported financially by the state.

Chapter 5 was devoted to an analysis of alternative ways of applying the principle for university subsidization, spoken of in the previous paragraph. The basic alternatives for adjusting total university costs (so as to reflect only the individual student's private costs in university tuition fees) are the payment of subsidies to students and the payment of subsidies to institutions. The payment of subsidies to students can be achieved with grants, loans, vouchers or

tax concessions, whereas the most important way of aiding institutions, it was argued, is by using subsidy formulas.

An extended analysis of subsidy formulas followed, in which it was stated that the use of formulas could lead to an equitable distribution of the resources destined for the university sector, without impinging upon either university autonomy or economic efficiency. It was also argued that most of the advantages of alternative methods, vouchers for example, were found in formula financing without encountering many of their disadvantages.

The remaining chapters of the dissertation were used to apply the principles developed in the earlier sections and to test them against existing university subsidy formulas. The format of the applied sections was defined in Chapter 6, which contains a description of the South African Post-Secondary Education (SAPSE) system, from which the empirical data used, was drawn. Because the SAPSE system contains a logical set of mutually consistent definitions applicable to universities, the data generated by the universities using the SAPSE system lends itself readily to analysis.

The SAPSE programme structure, in which eleven programmes, covering the compendium of a university's activities, are defined, formed the basis for determining which university activities warrant subsidization. The principle for identifying subsidizable programmes, namely the presence of public benefits, was applied to each of the SAPSE (sub)-programmes in turn. It was concluded that the results proved to be both satisfactory and fair, and could be incorporated in a system of formula financing with ease.

In Chapter 8 alternative models for determining parameter values for subsidy formulas were discussed. The first of these models were those advocated by the various South African university commissions. The other models were those

that eventually led to the development of the U A C Formula, proposed in 1982 for subsidizing the universities administered by the Department of National Education. It was concluded from the results obtained from the U A C Formula that the various hypotheses outlined at the beginning of the dissertation could be upheld, and that indeed, subsidy formulas can be developed that are economically efficient, that respect university autonomy, that rely on a minimum of centralized authority and that are a fair reflection of university costs.

The dissertation was concluded in Chapter 9, which was devoted to an analysis of some of the public finance consequences of university subsidization in South Africa. After the diversified system of administrative control over the various parts of the university sector had been described briefly, the importance of being able to compare costs across all the subsystems of the post-secondary education system was emphasized. It was concluded that, on account of the fragmented system currently in operation in South Africa, this was not possible. Nevertheless, some attempt was made to quantify the costs to the public exchequer of the different South African universities. It was also concluded that the SAPSE system could profitably be extended to encompass the whole South African post-secondary education sector, which would also benefit from a system of comprehensive planning by a unitary education body.

The SAPSE system has been developed along the lines of programme budgeting, whereby costs are brought into relation with an organization's aims and the different activities necessary to achieve those aims. This facilitates decision making by the organization and generates data usable for planning on a national level. This dissertation, therefore, ends with the recommendation that the use of the SAPSE system be extended as far as possible, so as to enable the provision of education to be planned in an optimal manner in South Africa.

BIBLIOGRAPHY

- ADAMS, D. (Ed.) : Education in National Development, London, Routledge & Kegan Paul, 1971.
- AHAMAD, B. and BLAUG, M. : The Practice of Manpower Forecasting; a Collection of Case Studies, Amsterdam, Elsevier, 1973.
- ARCHIBALD, G.C. : 'On the Measurement of Inputs and Outputs in Higher Education', in Lumsden K.G. (Ed.): Efficiency in Universities, Amsterdam, Elsevier, 1974.
- ARONS, S. : 'The Peaceful Use of Education Vouchers', in La Noue, G.R. (Ed.): Educational Vouchers: Concepts and Controversies, New York, Columbia University Teacher College Press, 1972.
- ARROW, K.J. : 'Classificatory Notes on the Production and Transmission of Technical Knowledge', American Economic Review, LIX, 2 May 1969, pp.29-35.
- : 'Higher Education as a Filter', in Lumsden, K.G. (Ed.): Efficiency in Universities : The La Paz Papers, Amsterdam, Elsevier, 1974.
- ATTIYEH, R.E., BACH, G.L. and LUMSDEN, K.G. : 'The Efficiency of Programmed Learning in Teaching Economics : The Results of a Nation-wide Experiment', American Economic Review, LIX, 2 May 1969, pp. 217-223.
- ATTIYEH, R. and LUMSDEN, K.G. : 'University Students' Initial Understanding of Economics : The Contribution of the A Level Economics Course and of other Factors', Economica, XXXVIII, February 1971, pp. 81-97.
- : 'Educational Production and Human Capital Formation', in Lumsden, K.G. (Ed.): Efficiency in Universities : The La Paz Papers, Amsterdam, Elsevier, 1974.
- AZAD, J.L. : 'Financing Institutions in India : The Need for a Realistic Fee Policy', Higher Education, Vol. 5, no. 1, February 1976, pp. 1-7.
- BALDERSTON, F.E. : Managing Today's University, San Francisco, Jossey-Bass Publishers, 1975.
- BALL, R. : 'Allocation of Academic Staff in Universities', Higher Education, Vol. 9, no. 4, July 1980, pp. 419-428.

- BARTHOLOMEW, D.J. (Ed.): Manpower Planning Selected Readings, Middlesex, Penguin Books, 1976.
- BARZEL, Y. : 'Private Schools & Public School Finance', Journal of Political Economy, January/February 1973, Vol. 81(1), pp. 174-186.
- BAXTER, C.,
O'LEARY, P.J. and
WESTOBY, A. (Eds.) : Economics and Education Policy : A Reader, London, Longman (in association with The Open University Press), 1977.
- BEAR, D.V.T. : 'The University as a Multi-Product Firm', in Lumsden, K.G. (Ed.): Efficiency in Universities : The La Paz Papers, Amsterdam, Elsevier, 1974.
- BECKER, G.S. : Human Capital . A Theoretical and Empirical Analysis, with Special Reference to Education, New York, Columbia University Press, 1964.
- BEHR, A.L. and
MacMILLAN, R.G. : Education in South Africa, Pretoria, J.L. van Schaik Ltd., 1971.
- BENNET, W.S. : 'Educational Change and Economic Development', in Eckstein, M.A. and Noah, H.J.: Scientific Investigations in Comparative Education, London, MacMillan, 1969.
- BENSON, C.S. : The Economics of Public Education, Boston, Houghton Mifflin Co., (3rd Edition) 1978.
- BERGSON, A. : 'Sources of Soviet Economic Inefficiency', in Feiwel, G.R. (Ed.) : New Currents in Soviet-Type Economies, Pennsylvania, International Textbook Co., 1968.
- BERLS, R.H. : 'An Exploration of the Determinants of Effectiveness in Higher Education', in Joint Economic Committee, Congress of the United States : The Economics and Financing of Higher Education in the United States, Washington DC , U.S. Government Printing Office, 1969.
- BHADURI, A. : 'Education and the Distribution of Personal Income : an Analysis of Issues and Policies', Industry and Development, No. 2, 1978.
- BILLING, D. : Indicators of Performance, (Papers Presented at the Fifteenth Annual Conference of the Society for Research into Higher Education, 1979.), Dorset England, Direct Printers, 1980.
- BIRCH, D.W.,
CALVERT, J.R. and
SIZER, J. : 'A Note on Costing the Teaching Activity in Higher Education', Higher Education, Vol. 6, no. 1, February 1977, pp. 67-74.

- BLADEN REPORT : Vide Commission to the Association of Universities and Colleges of Canada.
- BLAUG, M. : The Economics of Education : A Selected Annotated Bibliography, Oxford, Pergamon Press, 1970.
- : 'The Correlation between Education and Earnings : What Does it Signify?', Higher Education, Vol. 1, no. 1, February 1972, pp. 53-78.
- : An Introduction to the Economics of Education. Middlesex, Penguin, 1970.
- BLAUG, M. (Ed.) : The Economics of the Arts, London, Martin Robertson, 1976.
- BLAUG, M. and WOODHALL, M. : 'Patterns of Subsidies to Higher Education in Europe', Higher Education, Vol. 7, no. 3, August 1978, pp. 331-362.
- BLOT, D. and DEBEAUVAIS, M. : 'Educational Expenditure in Developing Areas', in OECD: Financing Education for Economic Growth, Paris, 1966.
- BLUM, V.C. : 'Freedom of Choice in Education', in La Noue, G.R. : Educational Vouchers : Concepts and Controversies, New York, Columbia University Teacher College Press, 1972.
- BOLTON, R.E. : 'The Economics and Public Financing of Higher Education', in Joint Economic Committee, Congress of the United States : The Economics and Financing of Higher Education in the USA, Washington DC, US Government Printing Office, 1969.
- BOTTOMLEY, J.A. et al : Costs and Potential Economies, Paris, OECD, Centre for Educational Research and Innovation, 1972.
- BOWEN, W.G. : 'British University Salaries : Subject Differentials', Economica, Vol. 30, November 1963, pp. 341-359.
- BOWEN, H.R. : 'Finance and the Aims of American Higher Education', in Orwig, M.D. (Ed.) : Financing Higher Education : Alternatives for the Federal Government, Iowa City, Monograph 5, The American College Testing Program, 1971, pp. 155-170.
- : 'Who Pays the Education Bill?' in Orwig, M.D.: The Financing of Higher Education : Alternatives for the Federal Government, Iowa, Monograph 5, The American College Testing Program, 1971, pp. 281-298.

- BOWLES, S. : 'Towards an Educational Production Function', in Hansen, W.L., (Ed.), Education, Income and Human Capital, New York, Columbia University Press, 1970.
- : 'Schooling and Inequality from Generation to Generation', Journal of Political Economy, Vol. 80, no. 3, Part II, May/June 1972, pp. S219-S251.
- BOWMAN, M.J. : 'Schultz, Denison, and the Contribution of "Eds" to National Income Growth', Journal of Political Economy, Vol. 72, October 1964, pp. 450-464.
- BRENEMAN, D.W. and FINN, C.E. (Eds.) : Public Policy and Private Higher Education, Washington, DC , The Brookings Institution, 1978.
- BRENEMAN, D.W. and NELSON, S.C. : Financing Community Colleges. An Economic Perspective, Washington, DC , The Brookings Institution, 1981.
- BRIDGE, R.G., JUDD, C.M. and MOOCK, R.R. : The Determinants of Educational Outcomes, (The Impact of Families, Peers, Teachers and Schools), Massachusetts, Ballinger Publishing Co., 1979.
- BROVENDER, S. : 'On the Economics of a University : Toward the Determination of Marginal Cost of Teaching Services', Journal of Political Economy, May/June, 1974, Vol. 82(3), pp. 657-664.
- BUTCHER, H.J. and RUDD, E. (Eds.) : Contemporary Problems in Higher Education London, McGraw-Hill, 1972.
- CALIFORNIA CO-ORDINATING COUNCIL FOR HIGHER EDUCATION : A Comparison of the Trimester and Four Quarter Calenders for Year-Round Operation of Public Higher Education in California, Sacramento, 1964.
- CAMPBELL, R. and SIEGEL, B. : 'The Demand for Higher Education in the United States, 1919 - 1964', American Economic Review, Vol. 57, 1967, pp.482-94.
- CARNEGIE COMMISSION ON HIGHER EDUCATION : New Students and New Places, New York, McGraw-Hill, 1971.
- : Papers on Efficiency in Higher Education, New York, McGraw-Hill, 1971.
- : The More Effective Use of Resources, New York, McGraw-Hill, 1972.
- : Institutional Aid. Federal Support to Colleges and Universities, New York, McGraw-Hill, 1972.

CARNEGIE COMMISSION
ON HIGHER EDUCATION

- : Priorities for Action : Final Report of the Carnegie Commission on Higher Education, New York, McGraw-Hill, 1973.
- : Higher Education : Who Pays? Who Benefits? Who Should Pay?, New York, McGraw-Hill, 1973.
- : College Graduates and Jobs. Adjusting to a New Labour Market Situation, New York, McGraw-Hill, 1973.
- : The Purposes and the Performance of Higher Education in the United States, New York, McGraw-Hill, 1973.

CARNEGIE COUNCIL ON
POLICY STUDIES IN
HIGHER EDUCATION

- : Low or No Tuition. The Feasibility of a National Policy for the First Two Years of College, San Francisco, Jossey-Bass, 1975.

CARNEGIE FOUNDATION
FOR THE ADVANCEMENT
OF TEACHING

- : The States and Higher Education, San Francisco, Jossey-Bass Publishers, 1976.

CARTER, C.F.

- : 'The Economics of Higher Education', The Manchester School of Economic and Social Studies, Vol. 33, no. 1, January 1965, pp. 1-16.
- : 'The Efficiency of Universities', Higher Education, Vol. 1, no. 1, February 1972, pp. 77-89.
- : 'The Economics of the Open University: A Comment', Higher Education, Vol. 2, No. 1, February 1973, pp. 69-70.
- : Higher Education for the Future, Oxford, Basil Blackwell, 1980.

CARTER, C.F. and
WILLIAMS, B.R.

- : 'Proposals for Reform in University Finance', The Manchester School of Economic and Social Studies, Vol. 31, no. 3, September 1963, pp. 255-61.

CHAMBERLAIN, N.W. (Ed.): Contemporary Economic Issues, Homewood Illinois, Richard D. Irwin, Inc., Revised Edition, 1973.

CHAMBERS, M.M.

- : Higher Education and State Governments, 1970-1975, Illinois, The Interstate Printers & Publishers, Inc., 1974.
- : Appropriations . State Tax Funds for Operating Expenses of Higher Education. 1977-78, Office of Research and Information, National Association of State Universities and Land-Grant Colleges, (No Date).

- CILLIERS REPORT : Vide Committee of Enquiry into the Universities.
- CLURMAN, M. : 'Does Higher Education Need More Money?' in Joint Economic Committee, Congress of the United States : The Economics and Financing of Higher Education in the USA, Washington DC , US Government Printing Office, 1969.
- COLE, S. and
COLE, J.R. : 'Scientific Output and Recognition : A Study in the Operation of the Reward System in Science', American Sociological Review, June 1967, Vol. 32, no. 3, pp. 377-90.
- COLLIER, D.J. : Higher Education Finance Manual, Washington DC., National Centre for Educational Statistics, Department of Health, Education and Welfare, Field Review Edition, July 1974.
- COMMISSION OF ENQUIRY INTO THE UNIVERSITIES : Verslag van die Kommissie van Onderzoek na Universiteitsfinansies en -Salarisse, 1951, (The Holloway Report), Pretoria, The Government Printer, 1951.
- COMMISSION OF ENQUIRY INTO THE UNIVERSITIES : Main Report of the Commission of Enquiry into the Universities, (van Wyk de Vries Report), Pretoria, Government Printer, RP25/1974.
- COMMISSION TO THE ASSOCIATION OF UNIVERSITIES AND COLLEGES OF CANADA : Financing Higher Education in Canada, (Chairman: Bladen, V.W.), Toronto, University of Toronto Press, 1965.
- COMMITTEE OF ENQUIRY INTO THE UNIVERSITIES : Report of the Committee of Enquiry into Quinquennial Revision of University Subsidy Formulae (1964-1969), (The A.C. Cilliers Report), Pretoria, The Government Printer, 1963.
- COMMITTEE ON HIGHER EDUCATION : Report, (Chairman : Lord Robbins), London, H M Stationery Office, Cmd.2154, October 1963.
- : Administrative, Financial and Economic Aspects of Education, Appendix Four of Report, (Chairman : Lord Robbins), London, H M Stationery Office, Cmd. 2154, October 1963.
- COON, J.E.,
SUGERMAN, S.D. and
CLUNE, W.H. : 'Reslicing the School Pie', in La Noue, G.R.: Educational Vouchers : Concepts and Controversies, New York, Columbia University Teacher College Press, 1972.

- COOTNER, P.H. : 'Economic Organization and Inefficiency in the Modern University', in Lumsden, K.G.: Efficiency in Universities : The La Paz Papers, Amsterdam, Elsevier, 1974.
- CORREA, H. : The Economics of Human Resources, Amsterdam, North-Holland Publishing Co., 1963.
- : Quantitative Methods of Educational Planning, Pennsylvania, International Text-book Co., 1969.
- COUNCIL OF EUROPE : Changing Tertiary Education in Modern European Society, Strasbourg, Report of the Working Party, Council for Cultural Co-operation, 1978.
- CUA/COU JOINT SUB-COMMITTEE ON FINANCE/OPERATING GRANTS : Financing University Programs in Education, Ontario, Report on the Special Study of Requirements for the Formula Financing of Education Programs in Ontario Universities, 1971.
- CULYER, A.J. : The Political Economy of Social Policy, Oxford, Martin Robertson, 1980.
- DANIÈRE, A. : Higher Education in the American Economy, New York, Random House, Inc., 1964.
- DA SILVA FREIRE, M.E. and FRAÚSTO DA SILVA, J.J.R. : 'The Application of Production Functions to the Higher Education System - Some Examples from Portuguese Universities', Higher Education, Vol. 4, no. 4, November 1975, pp. 447-460.
- DE LANGE REPORT : Vide Human Sciences Research Council.
- DENISON, E.F. : The Sources of Economic Growth in the United States and the Alternatives before Us, New York, Committee for Economic Development, 1962.
- : Why Growth Rates Differ . Postwar Experience in Nine Western Countries, Washington DC, The Brookings Institution, 1967.
- DENT, H.C. : Education in England and Wales, London, Hodder and Stoughton, 1977.
- DEPARTMENT OF COLOURED, REHOBOOTH AND NAMA AFFAIRS : Annual Reports, Pretoria, Government Printer, RP 111/1977, RP58/1981.

- DEPARTMENT OF INDIAN AFFAIRS : Annual Reports, Pretoria, Government Printer, RP38/1972, RP36/1973, RP48/1974, RP48/1975, RP31/1976, RP38/1977, RP19/1978, RP120/1978, RP113/1979.
- DEPARTMENT OF NATIONAL EDUCATION : Annual Reports, Pretoria, Government Printer, RP21/1972, RP78/1972, RP57/1974, RP30/1975, RP117/1975, RP107/1976, RP118/1977, RP38/1979, RP18/1980, RP34/1981, RP28/1982.
- DE WET, G.L. : 'The State of Cost-Benefit Analysis in Economic Theory', South African Journal of Economics, Vol. 44, March 1976, pp. 50-64.
- DICKINSON, F.G. : The Changing Position of Philanthropy in the American Economy, New York, National Bureau of Economic Research, distributed by Columbia University Press, 1970.
- DRESSEL, P.L. : Handbook of Academic Evaluation : Assessing Institutional Effectiveness, Student Progress, and Professional Performance for Decision Making in Higher Education, San Francisco, Jossey-Bass, 1976.
- DUNWORTH, J. and BOTTOMLEY, A. : 'Potential Economies of Scale at the University of Bradford', Higher Education, Vol. 2, no. 2, May 1973, pp. 225-228.
- DUNWORTH, J. and COOK, R. : 'Budgetary Devolution as an Aid to University Efficiency', Higher Education, Vol. 5, no. 2, May 1976, pp. 153-168.
- DYER, J.S. : 'The Use of PPBS in a Public System of Higher Education : Is it Cost-Effective?' in Lyden, F.J. and Miller, E.G. (Eds.) : Planning, Programming, Budgeting. A Systems Approach to Management, Chicago, Markham Publishing Co., 2nd Edition 1972.
- ECKSTEIN, M.A. and NOAH, H.J. : Scientific Investigations in Comparative Education, London, MacMillan Co., 1969.
- ECKSTEIN, O. : 'The Problem of Higher College Tuition', The Review of Economics and Statistics, Vol. XLII, no. 3, part II, Supplement, August 1960, pp. 61-72.
- EDDING, F. : 'Student Aid', in OECD Study Group in the Economics of Education (Ed. Lucille Reifman): Financing of Education for Economic Growth, Paris, 1966.
- EURICH, A.C. : 'Increasing Productivity in Higher Education', The Review of Economics and Statistics, Supplement, August 1960, pp. C 185-188.

- FARRELL, R.L. and ANDERSEN, C.J. : 'General Federal Support for Higher Education: An Analysis of Five Formulas', in Orwig, M.D. (Ed.): Financing Higher Education : Alternatives for the Federal Government, Iowa, The American College Testing Program, Monograph Five, 1971.
- FEINSTEIN, C.H. (Ed.) : Socialism, Capitalism and Economic Growth, Cambridge, Cambridge University Press, 1967.
- FEIWEL, G.R. (Ed.) : New Currents in Soviet-Type Economies, Pennsylvania, International Textbook Co., 1968.
- FIELDS, G.S. : 'The Allocation of Resources to Education in Less Developed Countries', Journal of Public Economics, May 1974, Vol. 3 (2), pp. 133-43.
- : 'The Private Demand for Education in Relation to Labour Market Conditions in Less Developed Countries', Economic Journal, December 1974, Vol. 84, pp. 906-25.
- FOLGER, J.K. (Ed.) : Increasing the Public Accountability of Higher Education, San Francisco, Association of Institutional Research, No. 16, Jossey-Bass, 1977.
- FREEMAN, R.A. : 'Last Chance to Save Private Colleges', in Orwig, M.D. (Ed.): Financing Higher Education : Alternatives for the Federal Government, Iowa, The American College Testing Program, Monograph 5, 1971.
- FRIEDMAN, M. : 'The Role of Government in Education', in Solo, R.A. (Ed.): Economics and the Public Interest, New Brunswick, N J, Rutgers University Press, 1955; also in Friedman, M.: Capitalism and Freedom, Chicago, Chicago University Press, 1963, pp. 85-108.
- FROOMKIN, J. : Trends in the Sources of Student Support for Postsecondary Education, Iowa, American College Testing Program, Special Report 16, 1975.
- FULKERSON, W.M. : Planning for Financial Exigency in State Colleges and Universities, Washington DC, American Association of State Colleges and Universities, (no date).
- GARMS, W.T. : 'The Correlates of Educational Effort', in Eckstein, M.A. and Noah, H.J.: Scientific Investigations in Comparative Education, London, MacMillan, 1969.
- GARVIN, D.A. : The Economics of University Behaviour, New York, Academic Press, 1980.

- GEZI, K.I. (Ed.) : Education in Comparative and International Perspectives, New York, Holt, Rinehart and Winston Inc., 1971.
- GHALI, M., MIKLIUS, W and WADA, R. : 'The Demand for Higher Education Facing an Individual Institution', Higher Education, Vol. 6, no. 4, November 1977, pp.477-486.
- GINZBERG, E. : 'The Economics of the Voucher System', in Ia Noue, G.R. (Ed.): Educational Vouchers : Concepts and Controversies, New York, Columbia University Teacher College Press, 1972.
- GODDARD, F.O. and GOFFMAN, I.J. : 'The Public Financing of Non-Public Education', Review of Social Economy, Vol. 1 (2), October 1973, pp. 152-66.
- GRAAFF, J. de V. : Theoretical Welfare Economics, Cambridge, Cambridge University Press, 1957.
- GRAHAM, D.H. : 'The Growth, Change, and Reform of Higher Education in Brazil : A Review and Commentary on Selected Problems and Issues', in Roett, R. (Ed.): Brazil in the Sixties, Nashville, Vanderbilt University Press, 1972.
- GRAMLICH, E.M. and KOSHEL, P.P. : 'Is Real-World Experimentation Possible? The Case of Educational Performance Contracting', in Haveman, R.H. and Margolis, J.: Public Expenditure and Policy Analysis, Chicago, Rand McNally College Publishing Company, 2nd Edition, 1977.
- HALSTEAD, D.K. : Statewide Planning in Higher Education, Washington DC, Government Printing Office, 1974.
- HANDA, M.L. and SKOLNIK, M.L. : 'Unemployment, Expected Returns, and the Demand for University Education in Ontario: Some Empirical Results', Higher Education, Vol. 4, no. 1, February 1975. pp.27-43.
- HANSEN, W.L. (Ed.) : Education, Income, and Human Capital, New York, National Bureau of Economic Research, Columbia University Press, 1970.
- HANSEN W.L. : 'Income Distribution Effects of Higher Education', American Economic Review, May 1970, Vol. 60 (2), pp. 335-340.
- : 'Equity and the Finance of Higher Education', Journal of Political Economy, Vol. 80, no. 3, part II, May/June 1972, pp. S260-S273.

- HAVEMAN, R.H. and MARGOLIS, J. : Public Expenditure and Policy Analysis, Chicago, Rand McNally College Publishing Company, 2nd Edition, 1977.
- HEALY, M.T. and BROWN, D.J. : 'Forecasting University Enrollments by Ratio Smoothing', Higher Education, Vol. 7, No. 4, November 1978, pp. 417-430.
- HILLER, J. and TOLLISON, R.D. : 'An Economic Model of Performance Contracting in Education', Public Finance, Vol. 29 (1), 1974, pp. 36-48.
- HINSON, J.P. : 'Higher Education - How to Pay', New England Economic Review, March/April 1971, pp.3-22.
- HOENACK, S.A. : 'The Efficient Allocation of Subsidies to College Students', American Economic Review, June 1971, Vol. 61 (3), pp. 302-311.
- HOENACK, S.A. and NORMAN, A.L. : 'Incentives and Resource Allocation in Universities', Journal of Higher Education, Vol. XLV, No. 1, January 1974, pp. 21-37.
- HOENACK, S.A. and WEILER, W.C. : 'Cost-Related Tuition Policies and University Enrollments', Journal of Human Resources, Summer 1973, Vol. 10(3), pp. 332-60.
- HOLLOWAY REPORT : Vide Commission of Enquiry into the Universities.
- HOOPER, R. : 'Some New Approaches to Research and Development Funding', Higher Education, Vol. 7, No.1, February 1978, pp. 13-26.
- HOROBIN, G.W. and SMYTH, R.L. : 'The Economics of Education : A Comment', and 'Reply' by Wiseman, J., Scottish Journal of Political Economy, February 1960, pp.69-74.
- HU, T.W., KAUFMAN, J.J., LEE, M.L., and STROMSDORFER, E.W. : 'Theory of Public Expenditures for Education', in Wykstra, R.A. (Ed.): Education and the Economics of Human Capital, London, Collier-MacMillan, 1971.
- HUGHES, J.F. (Ed.) : Education and the State, Washington DC, American Council on Education, 1975.
- HUMAN SCIENCES RESEARCH COUNCIL : The Provision of Education in the RSA, Main Report, (The de Lange Report), Pretoria, Human Sciences Research Council, 1981.
- HUMAN SCIENCES RESEARCH COUNCIL WORK COMMITTEE REPORT : Education Financing, (Chairman: Brand, S.S.), Pretoria, Human Sciences Research Council, July 1981.
- HUNTER, G. : Education for a Developing Region, London, George Allen and Unwin Ltd., 1963.
- INTERNATIONAL ASSOCIATION FOR THE EVALUATION OF EDUCATIONAL ACHIEVEMENT (IEA) : The National Case Study : An Empirical Comparative Study of Twenty-One Educational Systems, New York, John Wiley and Sons, 1976.

- JACKSON, G.A. : 'Financial Aid and Student Enrollment', Journal of Higher Education, Vol. XLIX, No. 6, November/December 1978, p. 548.
- JACKSON, G.A. and WEATHERSBY, G.B. : 'Individual Demand for Higher Education. A Review and Analysis of Recent Empirical Studies', Journal of Higher Education, Vol. XLVI, No. 6, November/December 1975, pp. 623-652.
- JAKUBAUSKAS, E.B. and PALOMBA, N.A. : Manpower Economics, Reading Mass., Addison-Wesley Publishing Co., 1973.
- JANNE, H. : 'The University and the Needs of Contemporary Society', (Papers of the International Association of Universities, No. 10), Paris, 1970.
- JENCKS, C. : 'Social Stratification and Higher Education', in Orwig, M.D. (Ed.): Financing Higher Education : Alternatives for the Federal Government, Iowa City, The American College Testing Program, Monograph 5, 1971.
- JENNY, H.H. : 'Pricing and Optimum Size in a Non-Profit Institution : The University', American Economic Review, Vol. LVIII, No. 2, May 1968, pp. 270-283.
- JOHNSON, H.G. : 'The Alternatives before Us', Journal of Political Economy, Vol. 80, No. 3, Part II, May/June 1972, pp. S280-S289.
- JOHNSON, J.L. : 'Setting Tuition Levels at Public Institutions : The Case of the University of Washington', Journal of Higher Education, Vol. XLVII, No. 2, March/April 1976, pp. 125-139.
- JOINT ECONOMIC COMMITTEE, CONGRESS OF THE UNITED STATES : 'The Economics and Financing of Higher Education in the United States', Washington, DC, US Government Printing Office, 1969.
- JONSEN, R.W. : 'State Policy and Independent Higher Education', Toledo, Centre for the Study of Higher Education, 1975.
- JUSTER, F.T. (Ed.) : 'Education, Income and Human Behaviour', New York, Carnegie Commission on Higher Education, McGraw-Hill, 1975.
- XJOUBERT, R.J.O. : 'Enkele Ekonomiese Aspekte van Suid-Afrikaanse Onderwysinvestering : 'n Verdienstefunksie-benadering', Johannesburg, Unpublished Thesis, Rand Afrikaans University, 1976.
- : 'Verdienstefunksies en die Onderwys', South African Journal of Economics, Vol. 46, No. 4, December 1978, p. 371.

- LAYARD, R.R.G. and VERREY, D.W. : 'Cost Functions for University Teaching and Research', Economic Journal, Vol. 85, March 1975, pp. 55-74.
- LEE, M.L., STEVENS, D.W. and WALLACE, R.L. : 'A Conspicuous Production Theory of Resource Allocation in Higher Education', Higher Education, Vol. 4, No. 1, February 1975, pp. 77-86.
- LE GRAND, J. and ROBINSON, R. : The Economics of Social Problems, London, MacMillan, 1976.
- LESLIE, L.L. : 'Higher Education Tax Allowances : An Analysis', Journal of Higher Education, Vol. XLVII, No. 5, September/October 1976, pp. 497-522.
- LESLIE, L.L. and FIFE, J.D. : 'The College Student Grant Study : The Enrollment and Attendance Impacts of Student Grant and Scholarship Programs', Journal of Higher Education, Vol. XLV, No. 9, December 1974, p. 651.
- LESLIE, L.L. and JOHNSON, G.P. : 'The Market Model and Higher Education', Journal of Higher Education, Vol. XLV, No.1, January 1974, p. 1.
- LEVY, F.K. : 'Sources of Economies of Scale in Universities', in Joint Economic Committee, Congress of the United States : The Economics and Financing of Higher Education in the United States, Washington, DC, US Government Printing Office, 1969.
- LINDELOW, J. : Educational Vouchers, Virginia, National Association of Secondary School Principals, Research Analysis Series No. 45, no date.
- LIPSEY, R.G. and LANCASTER, K. : 'The General Theory of the Second Best', in Farrell, M.J. (Ed.): Readings in Welfare Economics, London, MacMillan, 1973.
- LITTLE, I.M.D. : A Critique of Welfare Economics, London, Oxford University Press, Second Edition, 1957.
- LOUW, L.B.Z. : Owerheidsbeleid en -Administrasie van Universiteite in Suid-Afrika, Pretoria, D.Phil Thesis, University of Pretoria, 1978.
- LOVEL, M.C. : 'The Production of Economic Literature : An Interpretation', Journal of Economic Literature, Vol. XI, No. 1, March 1973, pp.27-55.
- LUMSDEN, K.G.(Ed.) : Efficiency in Universities : the la Paz Papers, Amsterdam, Elsevier Scientific Publishing Co., 1974.

- MACE, J. : 'Mythodology in the Making: Is the Open University Really Cost-Effective', Higher Education, Vol. 7, No. 3, August 1978, pp. 295-310.
- MACHLUP, F. : Education and Economic Growth, Lincoln, USA, University of Nebraska Press, 1970.
- MACRAE, D.J. : 'Growth and Decay Curves in Scientific Citation', American Sociological Review, October 1969, Vol. 34(5), pp. 631-35.
- MAGNUSSEN, O. : 'The Cost and Finance of Post-Secondary Education', in OECD Report: Towards Mass Higher Education, Paris, Organisation for Economic Cooperation and Development, 1974.
- MALHERBE, E.G. : Education in South Africa, Vol. I (1652-1922), Cape Town, Juta and Co. Ltd., 1925; Vol. II (1923-1975), Cape Town, Juta and Co. Ltd., 1977.
- MARTIN, W.B. : 'The Problems of Size', Journal of Higher Education, March 1967, Vol. 38, pp.144-152.
- McKENZIE, R.B. : 'The Economics of Reducing Faculty Teaching Loads', Journal of Political Economy, Vol. 80, No. 3, Part 1, May/June 1972, pp. 617-619.
- McMAHON, W.W. : 'An Economic Analysis of Major Determinants of Expenditures on Public Education', Review of Economics and Statistics, August 1970, Vol. 52(3). pp. 242-52.
- McPHERSON, M. : 'The Demand for Higher Education', in Breneman, D.W. and Finn, C.E. (Eds.): Public Policy and Private Higher Education, Washington DC, Brookings Institution, 1978.
- MEETH, L.R. : Quality Education for Less Money. A Sourcebook for Improving Cost Effectiveness, San Francisco, Jossey-Bass Publishers, 1975.
- MEISINGER, R.J. : State Budgeting for Higher Education : The Use of Formulas, Berkely, Centre for Research and Development in Higher Education, University of California Berkely, 1976.
- METCALF, D. and BIBBY, J. : 'Salaries of Recruits to University Teaching in Britain', Higher Education, Vol. 1, No. 3, August 1972, pp. 287-298.
- MICHELSON, S. : 'What in a 'Just' System for Financing Schools? An Evaluation of Alternative Reforms', Law and Contemporary Problems, Winter/Spring, 1974, Vol. 38(3), pp.436-58.
- MIKLIUS, W. : 'The Distributional Effects of Public Higher Education : A Comment', Higher Education, Vol. 4, No. 3, August 1975, pp.351-356.

- MILLER, J.L. : State Budgeting for Higher Education, The Use of Formulas and Cost Analysis, Monograph, University of Michigan, 1964.
- MILLET, J.D. : Allocation Decisions in Higher Education, New York, Academy of Educational Development, (no date).
- X : 'Who Should Pay?', Journal of Higher Education, Vol. XLIII, No. 7, October 1972, p.p. 509-516.
- : The Budget Formula as the Basis for State Appropriation in Support of Higher Education, Indiana, Commission for Higher Education, 1974.
- MILLWARD, R. : Public Expenditure Economics, London, McGraw-Hill, 1971.
- MINAHAN, J.P. : 'Administrative Cost Accounting : Whose Cost and Whose Accounting?' Journal of Higher Education, Vol. XLV, No. 1, January 1974, pp. 38-47.
- MISHAN, E.J. : Cost-Benefit Analysis, London, George, Allen & Unwin Ltd., 1971.
- MOOD, A.M. : The Future of Higher Education, New York, Carnegie Commission on Higher Education, McGraw-Hill, 1973.
- MOOR, R.C. : 'The Economic Efficiency of Mixed Financing of Education in Economic Space', Public Finance Quarterly, October 1973, Vol. 1(4), pp. 399-408.
- MOSS, C.E. and : 'Formula Budgeting : Requiem or Renaissance?', Journal of Higher Education, Vol. XLVII, GAITHER, G.H. No. 5, September/October 1976, pp.543-563.
- MUSGRAVE, R.A. : The Theory of Public Finance, New York, McGraw-Hill, 1959.
- MUSHKIN, S.J. (Ed.) : Economics of Higher Education, Washington DC, United States Department of Health, Education and Welfare, 1962.
- NAVIA, L. and : 'A Price Index for University Budgetary MAGURA, M. Decisions', Journal of Higher Education, Vol. XLVIII, No. 2, March/April 1977, p.216.
- NERLOVE, M. : 'On Tuition and the Costs of Higher Education: Prolegomena to a Conceptual Framework', Journal of Political Economy, Part II, May/June 1972, Vol. 80(3), pp. S178-S218.

- NERLOVE, M. : 'Some Problems in the use of Income-Contingent Loans for the Finance of Higher Education', Journal of Political Economy, February 1975, Vol. 83(1), pp. 157-83.
- NETZER, D. : The Subsidized Muse : Public Support for the Arts in the United States, Cambridge, Cambridge University Press, 1978.
- NIELSEN, O. (Ed.) : University Administration in Practice, Stanford, Stanford University, 1959.
- O'DONOGHUE, M. : Economic Dimensions in Education, Dublin, Gill and MacMillan Ltd., 1971.
- O'NEILL, J.A. : Resource Use in Higher Education - Trends in Outputs and Inputs, 1930-1967, New York, Carnegie Commission on Higher Education Report, 1971.
- : Sources of Funds to Colleges and Universities, New York, Carnegie Commission on Higher Education, 1973.
- OPEN UNIVERSITY : The Finance of Education, Milton Keynes, The Open University Press, 1977.
- OPEN UNIVERSITY : The Internal Efficiency of Education Institutions, Milton Keynes, The Open University Press, 1977.
- ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD) : Policy Conference on Economic Growth and Investment in Education, (Washington, DC, October 1961), Paris, OECD, 1962.
- : The Residual Factor and Economic Growth, Paris, OECD, 1964.
- : Organisational Problems in Planning Educational Development, Paris, OECD, 1966.
- : Financing of Education for Economic Growth, (Editor: Lucille Reifman), Paris, OECD Study Group in the Economics of Education, 1966.
- : Organisational Problems in Planning Educational Development, Paris, OECD, 1966.
- : Methods and Statistical Needs for Educational Planning, Paris, OECD, 1967.

ORGANISATION FOR
ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

- : Efficiency in Resource Utilization in Education, Paris, OECD, 1969.
- : Institutional Management in Higher Education, Paris, OECD, 1972.
- : Planning University Development, Studies in Institutional Management in Higher Education, University of Lancaster, (Project Leader : Simpson, M.G.), Paris, OECD, 1972.
- : Costs and Potential Economies, Studies in Institutional Management in Higher Education, University of Bradford, (Project leader: Bottomley, J.A.), Paris, OECD, 1972.
- : University Planning and Management Techniques, (Author: Lockwood, G.), Paris, OECD, 1972.
- : Long-range Policy Planning in Education, Paris, OECD, 1973.
- : Towards Mass Higher Education, Conference on Future Structures of Post-Secondary Education, June 1973, Paris, OECD, 1974.
- : Policies for Higher Education (General Report), Conference on Future Structures of Post-Secondary Education, Paris, 26th-29th June 1973, Paris, OECD, 1974.
- : Programme Budgets for Graduate Training, (Project Leader : Appelquist, C.G.), Paris, OECD Centre for Educational Research and Innovations, 1974.
- : Institutional Resource Allocation Models in Higher Education, (Author : Hussain, K.M.), Paris, OECD, 1976.
- : Review of Student Support Schemes in Selected OECD Countries, (Author : Woodhall, M.), Paris, OECD, 1978.
- : Financing Higher Education : Alternatives for the Federal Government, Iowa City: The American College Testing Program, Monograph Five, 1971.

ORWIG, M.D.

- PANDIT, H.N. (Ed.) : Measurement of Cost, Productivity and Efficiency of Education, New Delhi, National Council of Educational Research and Training, 1969.
- PARISH, R.M. : 'The Economics of State Aid to Education', Economic Record, September 1963, pp.292-305.
- PASSOW, A.H. et al. : The National Case Study : An Empirical Comparative Study of Twenty-One Educational Systems, New York, International Association for the Evaluation of Educational Achievement, John Wiley & Sons, 1976.
- PAULY, M.V. : 'Mixed Public and Private Financing of Education : Efficiency and Feasibility' American Economic Review, March 1967, pp. 120-130.
- PECHMAN, J.A. : 'Note on the Intergenerational Transfer of Public Higher-Education Benefits', Vol. 80, No. 3, Part II, May/June 1972, pp. S256-S259.
- PECHMAN, J.A. : Federal Tax Policy, Washington DC., The Brookings Institution, Third Edition, 1977.
- PELLEGRIN, J.P. : 'Admission Policies in Post-Secondary Education', in OECD : Towards Mass Higher Education, (Issues and Dilemmas), Paris, 1974.
- PELTZMAN, S. : 'The Effect of Government Subsidies-in-Kind on Private Expenditures : The Case of Higher Education', Journal of Political Economy, Vol. 81, No. 1, January/February 1973, pp. 1-27.
- PESTON, M.H. & CORRY, B.A. (Eds.) : Essays in Honour of Lionel Robbins, London, Weidenfeld and Nicolson, 1972.
- PETERSON, M.W. : 'The Potential Impact of PPBS on Colleges and Universities', Journal of Higher Education, Vol. XLII, No. 1, January 1971, p. 1.
- PIGOU, A.C. : The Economics of Welfare, London, MacMillan, 4th Edition, 1978.
- POSNER, M. (Ed.) : Public Expenditure. Allocation between Competing Ends, Cambridge, Cambridge University Press, 1977.
- PSACHAROPOULOS, G. : 'The Economic Returns to Higher Education in Twenty-Five Countries', Higher Education, Vol. 1, No. 2, May 1972, pp. 141-158.
- PSACHAROPOULOS, G. : Returns to Education, An International Comparison, Amsterdam, Elsevier Scientific Publishing Co., 1973.

- PSACHAROPOULOS, G. : 'A Note on the Demand for Enrollment in Higher Education,' De Economist, September/October 1973, Vol. 121(5), pp. 521-25.
- PSACHAROPOULOS, G. and SOUMELIS, C. : 'A Quantitative Analysis of the Demand for Higher Education', Higher Education, Vol. 8, No. 2, 1979, pp. 159-177.
- REDER, M.W. : 'A Suggestion for Increasing the Efficiency of Universities', in Lumsden, K.G. : Efficiency in Universities : The La Paz Papers, Amsterdam, Elsevier, 1974.
- REYNHARDT, E.C. : Citation Analysis as a Tool of Research Evaluation, Pretoria, Department of National Education, 1982.
- RILEY, J.G. : 'Testing the Educational Screening Hypothesis', Journal of Political Economy, Vol. 37, No. 5, Part II, Supplement, pp. S227-S252.
- RITZEN, J.M.M. : Education, Economic Growth and Income Distribution, Amsterdam, North Holland Publishing Co., 1977.
- ROBBINS REPORT : Vide Committee on Higher Education.
- ROBINSON, A.J. : 'Government Subsidy to Higher Education : Benefits, Costs and Non-Economic Value of the Policy', American Journal of Economics and Sociology, July 1971, Vol. 30(3), pp. 259-274.
- ROBINSON, E.A.G. and VAIZEY, J.E. : The Economics of Education, London, MacMillan, 1964.
- RUDD, E. : 'The Foresight Saga : Predicting Future Numbers of Students', Higher Education, Vol. 8, No. 1, January 1979, pp. 89-98.
- RUSK, J.J. and LESLIE, L.L. : 'The Setting of Tuition in Public Higher Education', Journal of Higher Education, Vol. XLIX, No. 6, November/December 1978, pp. 531-547.
- SADLAK, J. : 'Efficiency in Higher Education - Concepts and Problems', Higher Education, Vol. 7, No. 2, May 1978, pp. 213-220.
- SAMUELSON, P. : 'The Pure Theory of Public Expenditure', Review of Economics and Statistics, Vol. XXXVI, No. 4, November 1954, pp. 387-389.
- SAPSE REPORT-001 : Information System Introductory Manual, Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-002 : Programme Classification Structure Manual, Pretoria, Department of National Education, First Edition, 1982.

- SAPSE REPORT-003 : Classification of Educational Subject Matter, Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-004 : Formal Degree/Diploma/Certificate Programme Classification Structure Manual, Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-005 : Student Statistics Manual, Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-006 : Finance Manual, Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-007 : Personpower Resources Budgeting and Accounting Manual, Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-008 : Fixed Assets Manual, Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-009 : Building and Space Inventory and Classification Manual, Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-010(U) : Information Survey Manual (Universities), Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-011(U) : Notes to Information Survey Manual (Universities), Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-110 : An Investigation of Government Financing of Universities, Pretoria, Department of National Education, First Edition, 1982.
- SAPSE REPORT-115 : Die Kwalifikasie- en Studieprogramme van Universiteite in Suid-Afrika, Pretoria, Department of National Education, 1982.
- SCHULTZ, T.W. : 'Resources for Higher Education': An Economist's View', Journal of Political Economy, May/June 1968, pp. 327-347.
- Y : 'Optimal Investment in College Instruction : Equity and Efficiency', Journal of Political Economy, Vol. 80, No. 3, Part II, May/June 1972, pp. S2 - S30.
- SCHUMPETER, J. : Capitalism, Socialism and Democracy, London, Unwin University Books, Eleventh Impression, 1966.
- SELF, P. : Econocrats and the Policy Process, London, MacMillan, 1975.

- SEWELL, W.H. and HANSER, R.M. : Education, Occupation and Earnings. Achievement in the Early Career, New York, Academic Press, 1975.
- SHEENAN, J. : The Economics of Education, London, George Allen & Unwin, (no date).
- SINGER, N. and FELDMAN, P. : 'Criteria for Public Investment in Higher Education', in Joint Economic Committee, Congress of the United States : The Economics and Financing of Higher Education in the United States, Washington DC, US Government Printing Office, 1969.
- SOLO, R.A. (Ed.) : Economics and the Public Interest, New Brunswick N.J., Rutgers University Press, 1955.
- SOUTH AFRICAN POST-SECONDARY EDUCATION : Vide SAPSE Reports.
- STARK, J.S. (et al) : The Many Faces of Educational Consumerism, Massachusetts, Lexington Books, 1977.
- STERN, S. : 'Effects of Alternative State Aid Formulas on the Distribution of Public School Expenditures in Massachusetts', Review of Economics and Statistics, February 1973, Vol. 55(1), pp. 91-97.
- STIGLITZ, J.E. : 'The Demand for Education in Public and Private School Systems', Journal of Public Economics, November 1974, Vol. 3 (4), pp. 349-385.
- STUBBLEBINE, W.C. : 'Institutional Elements in the Financing of Education', Southern Economic Journal, Vol. 32, July 1965, pp. 15-35.
- TAUBMAN, P.J. and WALES, T.J. : 'Higher Education, Mental Ability and Screening', Journal of Political Economy, Vol. 81, January/February 1975, p.28-55.
- : Higher Education and Earnings, College as an Investment and Screening Device, New York, McGraw-Hill Book Co., 1974.
- TIERNEY, M.L. : 'An Estimate of Departmental Cost Functions', Higher Education, Vol. 9, No. 4, July 1980, pp. 453-468.
- TOLLISON, R.D. and WILLET, T.D. : 'A Proposal for Marginal Cost Financing of Higher Education', Public Finance, 1972, Vol. 27(3), pp. 375-380.
- TROW, M. : 'The Implications of Low Growth Rates for Higher Education', Higher Education, Vol.5, No. 4, November 1976, pp. 377-396.

- TUCKMAN, H.P. : 'The Economics of Education', in Hailstones, T.J. and Mastrianna, F.V.: Readings in Economics, Cincinnati, South-Western Publishing Co., 1976.
- TURVEY, R. : Optimal Pricing and Investment in Electricity Supply, London, Allen and Unwin, 1968.
- VAIZEY, J. : The Economics of Education, London, Faber and Faber, (2nd Edition), 1962.
- VAIZEY, J. : The Economics of Education, London, MacMillan Studies in Economics, 1973.
- VAIZEY, J. and CHESSWAS, J.D. : The Costing of Educational Plans, Paris, UNESCO : International Institute for Educational Planning, (no date).
- VAN DIJK, P.M.H. : Hoger-Onderwijsbeleid. Economische Toetsing aan Enkele Doelstellingen, Amsterdam, Ph.D. Thesis, University of Amsterdam, 1980.
- VAN WYK DE VRIES REPORT : Vide Commission of Enquiry into the Universities.
- VERRY, D.W. : 'Economies of Scale', Higher Education, Vol. 2, No. 2, May 1973, pp. 214-217.
- VERRY, D. : 'Some Distributional and Equity Aspects of the Student Loans Debate', in The Open University : Education, Equity and Income Distribution, Milton Keynes, The Open University Press, 1977.
- VERRY, D. : 'Cost Studies and Efficiency', in The Open University : The Internal Efficiency of Education Institutions, Milton Keynes, The Open University Press, 1977.
- VERRY, D. : 'Planning Higher Education at the Sectoral Level: With Special Reference to Higher Education Costs in Britain', in Baxter, C., O'Leary, P.J. and Westoby, A. (Eds.): Economics and Education Policy : A Reader, London, Longman (in association with The Open University Press), 1977.
- VERRY, D. and DAVIES, B. : University Costs and Outputs, Amsterdam, Elsevier, 1976.
- VICKREY, W. : 'A Proposal for Student Loans', in Mushkin, S.J. (Ed.): Economics of Higher Education, Washington DC, US Department of Health, Education and Welfare, 1962.

- VREDEVELD, G.M. : 'Distributional Impacts of Alternative Methods of Financing Higher Education', Journal of Higher Education, Vol. XLIX, No. 1, 1978, p. 47.
- WAGNER, L. : 'The Economics of the Open University', Higher Education, Vol. 1, No. 2, May 1972, pp. 159-183.
- WAGNER, L. : 'The Measurement of Output', in The Open University : The Internal Efficiency of Education Institutions, Milton Keynes, The Open University Press, 1977.
- WATTENBARGER, J.L. : 'Student Fees and Public Responsibility', in Orwig, M.D. (Ed.): Financing Higher Education : Alternatives for the Federal Government, Iowa City, The American College Testing Program, Monograph Five, 1971.
- WEATHERSBY, G.B. and BALDERSTON, F.E. : 'PPBS in Higher Education Planning and Management : Part I an Overview', Higher Education, Vol. 1, No. 2, May 1972, pp. 191-206.
- WEATHERSBY, G.B. and BALDERSTON, F.E. : 'PPBS in Higher Education Planning and Management : Part II, The University of California', Higher Education, Vol. 1, No. 3, August 1972, pp. 299-320.
- WEATHERSBY, G.B. and BALDERSTON, F.E. : 'PPBS in Higher Education Planning and Management : Part III, Perspectives and Applications of Policy Analysis', Higher Education, Vol. 2, No. 1, February 1973, pp. 33-68.
- WEBER, G.O. and HORSEY, W.H. : Formula Budgeting for Physical Plants of Universities and Colleges, Maryland, University of Maryland, Mimeograph, (no date).
- WEST, E.G. : 'Private versus Public Education : A Classical Economic Dispute', Journal of Political Economy, October 1964, pp. 465-76.
- WEST, E.G. : 'Differential versus Equal Student Subsidies in Post-Secondary Education : A Current Canadian Dispute', Higher Education, Vol. 3, No. 1, February 1974, pp. 25-42.
- WEST, E.G. : 'The Yale Tuition Postponement Plan in the Mid-Seventies', Higher Education, Vol. 5, No. 2, May 1976, pp. 169-175.
- WILCZYNSKI, J. : The Economics of Socialism, London, George Allen and Unwin Ltd., (2nd Edition), 1972.
- WILCZYNSKI, J. : Socialist Economic Development and Reform, London, MacMillan Press Ltd, 1972.

- WILES, P. : 'The Correlation Between Education and Earnings : The External-Test-Not-Hypothesis (ETNC)', Higher Education, Vol. 3, No. 1, February 1974, pp. 43-57.
- WILLIAMS, B.R. : 'Capacity and Output of Universities', The Manchester School of Economic and Social Studies, Vol. XXXI, No. 2, May 1963, pp. 185-202.
- WILLIAMS, H. : Planning for Effective Resource Allocation in Universities, Washington DC, American Council on Education, 1966.
- WINDHAM, D.M. : 'Social Benefits and the Subsidization of Higher Education : A Critique', Higher Education, Vol. 5, No. 3, pp. 237-252.
- WISEMAN, J. : 'The Economics of Education', Scottish Journal of Political Economy, February 1959, pp. 48-58.
- WITKOWSKI, E.H. : 'The Economy and the University : Economic Aspects of Declining Enrollments', Journal of Higher Education, Vol. XLV, No. 1, January 1974, p. 48.
- WOODHALL, M. : Cost-Benefit Analysis in Educational Planning, Paris, UNESCO, Fundamentals of Educational Planning, No. 13, 1970.
- WOODHALL, M. and BLAUG, M. : 'Methods of Financing Higher Education', in Butcher, H.J. and Rudd, E. (Eds.) : Contemporary Problems in Higher Education, London, McGraw-Hill, 1972.
- WYKSTRA, R.A. (Ed.) : Review of Student Support Schemes in Selected OECD Countries, Paris, OECD, 1978.
- WYKSTRA, R.A. (Ed.) : 'Productivity Trends in British University Education, 1938-1962', Minerva, Vol. II(4), Summer 1965, pp. 483-498.
- WYKSTRA, R.A. (Ed.) : Education and the Economics of Human Capital, London, Collier-MacMillan Ltd., 1971.
- WYKSTRA, R.A. (Ed.) : Human Capital Formation and Manpower Development, London, Collier-MacMillan Ltd., 1971.
- ZABALZA, A., TURNBULL, P. and WILLIAMS, G. : The Economics of Teacher Supply, Cambridge, Cambridge University Press, 1979.