A STUDY OF SCHOOL COSTS

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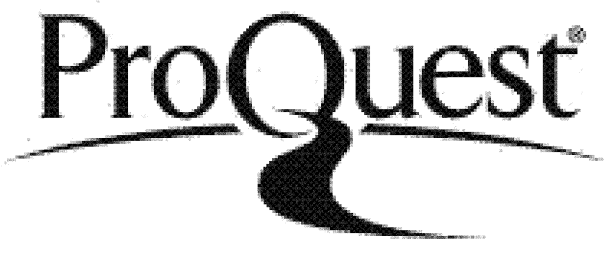

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PREFACE

It would not have been possible for me to complete this thesis without sustained assistance and encouragement from many sources, both individuals and organisations, and I wish to record my gratitude to all of them.

The Social Science Research Council generously awarded me a grant of £5,622, much of which was devoted to the task of collecting detailed cost data in the offices of four Local Education Authorities. The research could not have been pursued without the active co-operation of those four L.E.A.s and their officials who throughout showed me every courtesy. (I am unable to name them here since they wish to remain anonymous).

My particular thanks are due to my research supervisors at the University of Leicester, initially Professor L. Needleman (now at the University of Waterloo, Canada) and subsequently Professor P. Jackson, Head of the Public Sector Economics Research Centre. I am grateful to Loughborough University for granting me sabbatical leave for one term to pursue this research and to my Head of Department, Professor L.M. Cantor, for his constant advice and support.

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Lastly, and above all, my thanks are due to my wife and family for more than I could ever express on paper.

Final responsibility for the work, and for any errors and/or omissions, does of course lie with myself alone.

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by

J. R. HOUGH

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".... some of the particulars being of that impressive order of which the significance is entirely hidden, like a statistical amount without a standard comparison but with a note of exclamation at the end...."

(from George Eliot: "Middlemarch", Penguin edition, 1965, page 483).

CHAPTER 1. INTRODUCTION

The aim of this thesis is to examine certain aspects of costs of, or expenditure on, schools in the United Kingdom, including an analysis of data relating to individual schools. The impetus to do so has stemmed primarily from the following:

(i) it is apparent that far more work has been done in the field of educational costs and expenditures in other countries, especially the U.S.A., than in the United Kingdom[1];

(ii) some of the most prominent researchers in this field have stressed the need for further studies, including at the institutional level;

(iii) no other major study of school costs or expenditures in England or Wales has been able to include data relating to individual schools;

(iv) the one study of costs of, and within, individual schools in the United Kingdom (a) related solely to Scotland and (b) was completed some ten years ago and has never been followed-up[2];

(v) before commencing the research I sought advice from many leading authorities in this field and almost all of them warmly encouraged me to pursue research on these lines.

No previous published work has studied expenditure data on a school-by-school basis in England or has examined in detail the pattern of educational costs within an English local education authority: I understand that there have been previous attempts

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1. Points (i) to (iv) will be referred to in more detail in Chapter 2.

2. To Dr. Cumming's regret, as he commented to me in a conversation at Ibadan, May 1979: No other researcher has been able to follow the same path and he himself has worked overseas for long periods in recent years.

to do so but that the researchers in question were unable to persuade L.E.A.s to grant them access to their confidential records.[1]

I have been fortunate in that at the outset I was informed[2] that the recent climate of financial constraints has made local education authorities more cost conscious than previously and therefore perhaps more disposed to assist research in this field. It also appeared that L.E.A.s' record-keeping had returned to normal after a rather chaotic year in 1973-4 brought about by local government reorganisation in 1974 and that some at least of the reconstituted authorities might be predisposed to assist a researcher.

I was able to obtain advice as to which L.E.A.s might or might not be likely to co-operate: of various L.E.A.s approached some were already committed to assisting other research projects or had to decline for other reasons and there eventually emerged a "short-list" of five authorities willing to assist. Of these it subsequently transpired that one (a) did not have available in any useable form the data that would be needed and (b) gave the impression of being desperately short of resources of all kinds - e.g. the Assistant Director of Education, who discussed the matter with me, shared an office with his secretary. Thus there remained four L.E.A.s and as the work progressed it became clear that these four produced as much data as I could handle, indeed I had to decline data that became available for further years if this thesis was ever to be completed. It proved extremely convenient that three of these L.E.A.s lay close together and afforded easy access from Loughborough, whilst the fourth was some three hours' drive away. Whilst the main

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1. Comment made to me in conversation by Professor Mark Blaug.
2. By Dr. Eileen Byrne.

focus of interest was on secondary schools, certain data relating to primary schools also became available and this has been included where appropriate. From these remarks it will be apparent that the inclusion of these four L.E.A.s in the research was primarily a matter of expediency and not the result of any statistically valid random sample.

I had to undertake that each L.E.A., and the names of their schools, should remain confidential and the former will therefore be referred to simply as A, B, C and D, and the latter by code numbers. Brief details of the authorities are as follows:

L.E.A. "A": A large county authority with some 80 secondary schools. No large conurbations but a number of smaller towns; many schools in semi-rural locations. Overall the area probably above average in socio-economic mix and school attainments. Some additional locations and schools acquired on local government reorganisation and some reorganisation of selective-entry schools into comprehensives still taking place. Secondary school data available for the years 1974/5, 1975/6, and 1976/7.

L.E.A. "B": An urban metropolitan authority with some 21 secondary schools. Probably below average socio-economic catchment area. All schools comprehensive and only minimally affected by local government reorganisation. Secondary school data collected for the years 1974/5 and 1975/6.

L.E.A. "C": A large county authority with some 87 secondary schools. Mix of urban and more rural locations. Most secondary schools have been comprehensives for many years but also selective-entry schools acquired on local government reorganisation. Secondary

school data available for the years 1974/5, 1975/6 and 1976/7 and some primary school data also available.

L.E.A. "D": A county authority with some 60 secondary schools (including middle schools). No large conurbations and many schools in small towns or semi-rural locations. Both local government reorganisation and further reorganisation of secondary schools into a comprehensive system have brought some changes in recent years. Secondary school data available for the years 1974/5, 1975/6 and 1976/7 and some primary school data also available.

L.E.A.s "A", "C", and "D" kept their school expenditure records on a computerised system which listed each month and for each school, cumulative expenditure to date under a variety of functional sub-headings (teachers' salaries, non-teachers' salaries, books and periodicals, equipment, etc.). For L.E.A. "B" no such record was available and similar details could only be collated via many hours of detailed clerical work, including working through individual invoices relating to purchasing orders for each school.

An original intention of the research was to proceed from an examination of school costs to an attempt to link costs to some measure(s) of "output" or achievement, possibly initially on the same lines as the study by Blaug and Woodhall, referred to below, but using disaggregated data. As the study progressed, however, it became clear that (i) to deal with all the available data on costs alone would be a major task, as already indicated above, (ii) some of the data required for measures of school "output" did not exist in any convenient form and would take much time and effort to collect, and (iii) where certain output data, e.g. schools' external examination results, was available, local authorities were likely to refuse to release same to any researcher, in that such material was regarded as

highly sensitive and even dangerous from a political point of view. This thesis therefore confines itself to school costs.

It has been suggested above that from certain points of view the time was propitious for this research. From two other points of view, however, particular problems arose. Firstly, the exceptionally high rates of inflation experienced during the years in question meant that any attempt to consider rates of expenditure increase over time or to assess, for example, whether expenditure per pupil under one or more headings was increasing or decreasing in real terms, would be fraught with difficulty. Secondly, the fact that some reorganisation of schools (usually along comprehensive lines) was still taking place within the authorities studied implied that the classification of schools into homogeneous sub-groups, for comparative purposes, would be rendered somewhat more difficult: just because the name-board outside the school has been changed from, for example, "grammar" to "comprehensive", there is little or no reason to expect the pattern of expenditure in that school immediately to change. Fortunately, only a small minority of the schools were in this position and they did not cause any undue problems. Some of these and other authorities have had reorganisation of one kind or another taking place for many years now and there must be a danger that a researcher worrying unduly about this aspect would find that the time was never right to proceed with such research.

Thus far the words "cost" or "expenditure" have been used interchangeably, as they will continue to be throughout this thesis, as a matter of convenience. In fact, of course, it should be emphasised that the pattern of expenditure at any one moment in time should be the product of both demand and supply[1] and that if we concentrate solely

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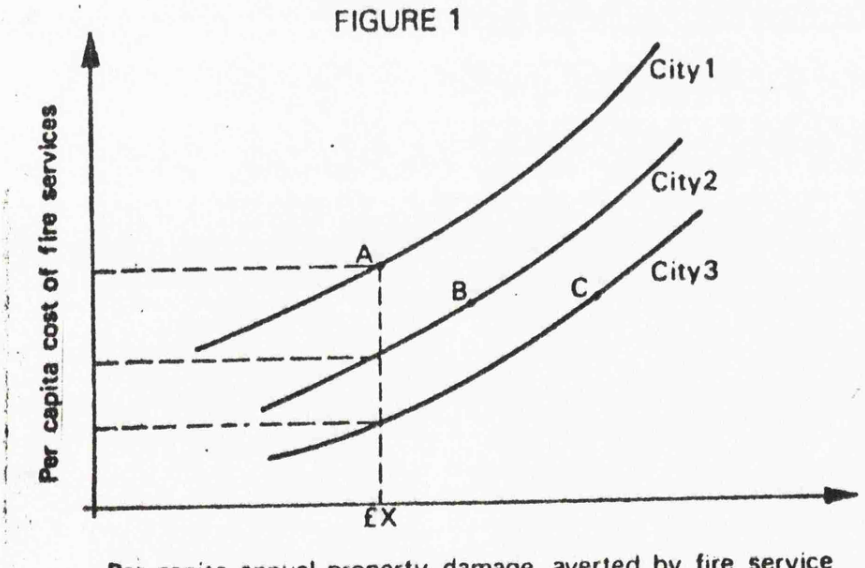
1. As does Diane Dawson in "Determinants of Local Authority Expenditure", published in Appendix 7 to the report of the Layfield Committee on Local Government Finance.

on costs we are neglecting altogether the demand aspects. To quote from Diane Dawson:

> "If a particular variable - urbanisation - is positively associated with per capita expenditure it is impossible to say whether people living in urban areas are willing to support better public services or that the same services cost more to provide in urban areas than elsewhere."

To believe, however, that demand has a significant influence on the level or pattern of spending in any one school or L.E.A. area implies considerable confidence in the efficacy of the democratic process or in the willingness of local education authorities to respond to demands from either pupils or parents. Diane Dawson illustrates this point by the following diagram relating to the provision of fire fighting services[1] where the information available relates only to points A, B, and C; she argues that a study might conclude that cities 2 and 3 had identical levels of cost whereas in fact city 2 has higher costs offset by a lower standard of service.

FIGURE 1



1. Op.cit., page 3.

That this question is quite problematical, however, can be shown by considering the horizontal axis in the diagram: London, for example, would have a far higher incidence of property at risk per head than, say, central Wales, and it could well have higher figures for "per capita annual property damage averted by fire service" but a worse fire service, in that a smaller proportion of fires might be extinguished or prevented. It is, in any event, far from clear how the general public could express their "demand" for a certain level of fire service in any one locality. To revert to education, we might perhaps postulate a form of Tiebout hypothesis[1] under which over time people would move to any one locality to match their own demand for the provision of education with those of the other inhabitants of that area and thus all the people in an area would have broadly similar tastes regarding the level of expenditure on education. In fact, however, it is clear that (i) people move to different localities for diverse reasons which may have little or nothing to do with the level of educational expenditure in that area, and (ii) people express their preferences, i.e. vote, for reasons which may include, but are certainly not confined to, education. Whilst, therefore, it is true that in theory expenditure comprises both demand and supply elements, in practice it is difficult to say anything very convincing about the expression of demand for education within any one L.E.A.: we certainly have no evidence that, within any one L.E.A., more per pupil is being spent at one school than another because the authority is responding to higher demand for education in the former locality (except as the result of, for example, variations in staying-on rates); indeed, an authority would probably not be allowed to provide such deliberate discrimination even if it so wished. It seems

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2. C.M. TIEBOUT: "A Pure Theory of Local Expenditures", Journal of Political Economy, 1956.

reasonable, therefore, to conclude that the expenditure variations within L.E.A.s with which we shall be concerned relate either primarily or solely to variations in costs. This appears to be the sense in which the Department of Education and Science[1] use, and writers such as Vaizey[2] used, the term "costs".

Rather different, however, are the variations in expenditure from one L.E.A. to another which are evident from a study of the published C.I.P.F.A. statistics. When we find that expenditure per pupil is consistently higher in the relatively affluent counties of Buckinghamshire and Surrey and consistently low in the much less affluent areas of Cleveland or Leeds, it seems clear that there is an implicit "demand" variable present. The children in the former counties do, it would seem, consistently enjoy a high quality education because the local ratepayers can well afford to provide same. Cleveland, on the other hand, apparently just cannot afford to spend more on its schools.

A prime focus in this thesis is on the study of the costs of individual schools and it is interesting to note what is apparently a marked difference of opinion regarding whether or not it is valid to make a study at this level of disaggregation. The view of the Department of Education and Science, as recorded in its "Statistics of Education" was expressed in the 1975 edition as:

> "Because of the variations in the levels of study, the number and mix of subjects studied and the balance of pupils/students in the institutions, it follows that costs of individual pupils/students will vary considerably about the costs and it would be dangerous to use average costs in relation to single schools, pupils, etc."

the latter part of which, by the time of the 1976 edition, had been changed to:

> ".... it is unsound, therefore, to apply an average unit cost to selected establishments or individuals."

(all the remainder of the section of six paragraphs having stayed unchanged).

1. D.E.S. : "Statistics of Education" Vol 5.
2. J. VAIZEY: "The Costs of Education" (Allen & Unwin, 1958).

Whilst no attempt will be made to explore the distinction between "dangerous" and "unsound", it is of interest to note that at first sight this view appears contrary to that held in many other countries: as will be shown, a very large number of studies have been carried out in the U.S.A. relating wholly or partly to the costs of individual schools and at the present time the International Institute of Educational Planning, Paris, a branch of UNESCO, has under way an active research programme on school costs which includes studies of the costs of individual schools in at least Cameroons, Indonesia, Nigeria, Pakistan, Peru and Venezuela. Arising out of the research discussed in the present thesis, the author was invited by I.I.E.P. to assist with the research study in Nigeria and subsequently to lecture in Nigeria and in Indonesia on educational costs to UNESCO training courses for educational planners, the participants in which came from Kenya, Tanzania, Uganda, Mali, Malaysia, Thailand, Philippines, and Papua New Guinea, in addition to countries already mentioned. The participants were urged by representatives of I.I.E.P. to pursue studies of the costs of individual schools in their own countries. When we take into consideration the further such courses that have already been planned by I.I.E.P. to take place in other parts of the world in 1980 and 1981 we have a long list of countries in which studies of the costs of individual schools are, or will be, taking place.

The motivation for such studies is quite clear: in all these countries an examination of two apparently similar schools, which are broadly doing the same job and achieving similar results, may indicate that the one costs twice (or three times) as much per pupil to run as the other. What are the determinants of such a wide differential? Does it persist over time? What could or should be done

about it, if anything? These are some of the obvious questions of interest which, in the absence of such detailed studies, cannot be answered. At the same time it is easy to recognise the concern which has led the Department of Education and Science to use such words as "dangerous" and "unsound" in the extracts quoted above, as can be seen from, for example, the recent experience in the United States of the use or misuse of school costs in lawsuits (as will be discussed in Chapter 2). And in fact the contrast in approach indicated thus far is more apparent than real: the D.E.S. is not opposed to cost studies in individual institutions as such but merely cautious about any unwarranted implication that national norms or averages can be applied to individual institutions, as has happened in some countries.

Perhaps there were similar doubts over the implications of Vaizey's initial research over twenty years ago but at its close Professor R.M. Titmuss commented:

> "Argument there may be about the validity of some of the assumptions which he has been forced to make in the absence of data on .... education but there can, I think, be no dispute that Mr. Vaizey has made a signal contribution to the analysis of the costs of education".[1]

The thesis will proceed as follows: Chapter 2 will review previous literature, both in this country and overseas, relating directly or indirectly to school costs; Chapter 3 will consider the standard presentation of costs in economic theory, for subsequent reference; Chapter 4 will examine trends at the national level in the field of school costs over the last twelve years or so, i.e. since the seminal work of Vaizey;[1] Chapter 5 will discuss

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1. J. VAIZEY, The Costs of Education (Allen & Unwin, 1958).

variations in the level and pattern of educational expenditure on the part of the eighty-eight local education authorities in England and Wales; Chapter 6 will examine some statistical problems which arose during the course of the research; Chapter 7 will turn to cost data collected for individual schools and discuss aspects of these statistics; Chapter 8 will consider previous attempts at assessing economies of scale in education and then examine whether the data collected provide evidence of economies of scale; Chapter 9 will examine data relating to Nigerian schools (collected by the writer in the course of his two visits to Nigeria in 1979); Chapter 10 will discuss the research findings and their implications and limitations and will present some suggestions for future work.

There is no suggestion that all, or even many, of the outstanding questions of interest relating to educational expenditure will have been answered in this thesis. It is hoped, however, to make a worthwhile contribution to the literature in this field and perhaps particularly to stimulate and encourage further detailed studies in the future.

CHAPTER 2 REVIEW OF PREVIOUS LITERATURE IN THE FIELD OF EDUCATIONAL COSTS

In this thesis the aim is to focus attention on aspects of the costs of schools in the United Kingdom, with particular reference to a detailed analysis of the costs of schools in the areas of four English Local Education Authorities. Initially, however, it seems necessary to attempt to review previous work that has a bearing, wholly or partly, on the field of educational costs, with a view to seeing, in particular, whether any conclusions emerge which will be relevant to the remainder of this study. As will be seen, on at least some of the points of interest, the evidence is unsatisfactory and/or incomplete. Since the literature tends to be so scattered and fragmentary and since much time has had to be spent culling references from a wide variety of sources, this review of previous work will be more extensive and more diverse than might otherwise be expected. Broadly speaking, the chapter proceeds as follows: the first (and major) part is devoted to United Kingdom material, followed by work from other countries with particular emphasis on the U.S.A. Within each the general approach is to proceed from the macro to the micro level. Works which refer only indirectly to school costs have been cited only where they appear to be of reasonably direct relevance to this thesis. The literature on economies of scale in education is dealt with elsewhere (in chapter 8) and will receive only passing mention here, whilst references of a quite specific or particular nature are included in a number of other chapters.

The education service in the United Kingdom has grown steadily, if unevenly, throughout the twentieth century and has now reached such dimensions that it is sometimes viewed as an "industry", using a variety of "inputs" to produce its "outputs". Any normal

industry over such a period would have accumulated detailed and complex information relating to all aspects of the costs of its operations, including the costs of producing each type of output. In the case of education, however, we find a quite remarkable ignorance of, and lack of interest in, the subject of costs; if, further, we attempt to search for information relating costs to specific outputs, we find almost a complete void. If these statements are true of education in general, they are even more true of education in state primary and secondary schools in particular: the few detailed studies of educational costs, or the relationships between costs and outputs, that have been published mostly relate to aspects of further or higher education, or to private fee-paying schools.

Not until Vaizey's pioneering study[1] in 1958 was there a major enquiry into educational costs at the national level and he had to report a dearth of adequate statistical information relating to many aspects of costs, especially relating to schools. By the time of his follow-up work[2] in 1968, he was able to report considerable expansion and improvement of relevant official statistics but significant gaps remained. By 1972 Maureen Woodhall[3] could write in terms which are still valid today:

> "The most obvious area for research by the economist is the whole question of educational costs....." but "... even after more than a decade of research activity ... cost analysis ... remains one of the most fruitful areas of research ... it is hoped that the sophistication of information on costs will again be increased, particularly by means of detailed studies of institutional costs."

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1. J. VAIZEY: The Costs of Education (Allen & Unwin, 1958)
2. J. VAIZEY and J. SHEAHAN: Resources for Education (Allen & Unwin, 1968)
3. M. WOODHALL: Economic Aspects of Education (N.F.E.R., 1972).

On the relationships between costs and outputs we find an even more critical comment, by Professor Mark Blaug:[1]

> "..... we face a pervasive ignorance about the production function of education, that is, the relationship between school inputs, on the one hand, and school outputs as conventionally measured by achievement scores, on the other."

The Department of Education and Science's "Statistics of Education" (H.M.S.O.)[2] now runs to six volumes annually yet it still contains remarkably little information about financial or cost aspects of education other than at the national (or sometimes regional) level. Thus practically no figures are given for variations from one local education authority to another, let alone any further breakdown. Apparently rather more helpful are the detailed cost statistics for education published annually by C.I.P.F.A.[3] (The Chartered Institute of Public Finance and Accountancy), which give, for each local education authority in England and Wales, a detailed breakdown of total costs for each sector (Primary, Secondary, etc.) into functional headings (teachers' salaries, repairs and maintenance, etc.). Unfortunately, however, it is widely agreed that the potential usefulness of the C.I.P.F.A statistics is greatly diminished by the fact that the basis on which they are prepared is not standardised from one L.E.A. to another, quite apart from the fact that some L.E.A.s are unable to provide all the information requested.[4] (More standardised information is in fact supplied to the D.E.S., on Form 7 and Form RO1 but this is not published.) Further, even with the figures that are published

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1. M. BLAUG: An Introduction to the Economics of Education (Pelican, 1970).
2. Department of Education and Science: Statistics of Education (6 vols. annually) (H.M.S.O.)
3. Education Statistics (Actuals) and Education Estimates Statistics (annually) (C.I.P.F.A.)
4. A recent issue referred to "comments and criticisms on the publication from a number of sources" and reported the setting up of an Education Statistics Working Party, "to review the adequacy of statistics relating to the Education Service": Education Estimates Statistics 1978/79 (C.I.P.F.A.)

considerable care in interpretation is needed and the reader needs to be aware of the sometimes intricate conceptual and measurement problems involved and of the adjustments that may be necessary before meaningful conclusions can be drawn.[1] Particularly is this true regarding inter-authority comparisons: the heterogeneity of L.E.A.s' accounting practices in fact bedevils almost any attempt to do serious research in the field of school costs: the accounting systems in use by L.E.A.s appear to vary widely but they have the common characteristic that they were not designed to facilitate the extraction of data by a research worker. Many L.E.A.s just do not know how much one of their schools costs to run: this is, apparently, not something that interests them. Their accounts have, of course, primarily to serve the needs of the elected councillors.

In the absence of any information at all relating to the costs of individual schools, many questions remain unanswered: Do large schools cost less to run than small schools (whether costs are measured per pupil, or per class or per lesson or whatever)? Do "comprehensive" schools cost less than grammar schools (or more than secondary modern schools)? Does one pattern of comprehensive schooling (e.g. large units on split sites) cost less to run than another? Do school costs vary, e.g. from North to South? Are History lessons more expensive than, say, Science? Which schools spend most on clerical staff, or books, or sports equipment? How does the size of tutor groups affect costs (if at all)? The list of such questions is endless. It must be a matter of some surprise that, for England and Wales, no one has ever been able to answer any of them: no study of the costs of individual schools has ever been published.

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1. See A. Peacock, H. Glennerster and R. Lavers : "Educational Finance, its Sources and Uses in the U.K. (Oliver and Boyd, 1968).

To revert to the work of Vaizey[1], he had to report a dearth of previous interest in this field: as he wrote later[2], "The state of official statistics at that time was scandalous." He proceeded to analyse the main trends in national expenditure on education by the state, up to the financial year 1955. After making a number of adjustments to the available statistics, Vaizey expressed expenditure as a percentage of net national income at factor cost and found, to use his own words, the "melancholy conclusion" that the figure for 1955 was less than that for 1932 and that over 1945-1950 the percentage was lower than that for most pre-war years. When viewed against the background of the 1944 Education Act, the claim of "secondary education for all" for the first time and the intensive post-war school building programme, these conclusions must be seen as quite astonishing even in spite of all the economic and social problems the country faced before and after the outbreak of war in 1939. To quote monetary values is problematic: these can only be compared over time if they are corrected to real values via a suitable (educational) price index and for earlier years the latter did not exist and had to be computed. Nevertheless, it could be shown that total expenditure per child year in England and Wales for 1955 amounted to £45.4. At current prices total outlay on public expenditure had grown from £84.6m. in 1921 to £410.6m. in 1955, with the largest increase occurring in the years after 1946; at constant (1948) prices, the growth from £128.1m. for 1921 to £300m. for 1955 represented a real growth of 134%, or 3.9% per year. Expenditure rose fastest in those years when the numbers of children rose fastest and the peaks of expansion coincided with years of high economic activity.

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1. Op. cit. (1958)

2. J. VAIZEY and J. SHEAHAN, op. cit.

Three highly critical conclusions were:

(i) that in secondary schools expenditure per school child year had risen little since 1938 (but the school life of the average child had lengthened by one-third),

(ii) 70% more was spent on the education of a grammar school pupil than on that of his or her secondary modern counter-part, and

(iii) there were probably grave differences in levels of expenditure per child in different geographical areas but the extent of these was unknown.

It seemed that year-to-year fluctuations of the economy had little effect on the level of educational expenditure in real terms but they did affect its rate of growth over time; this operated as a gloss on the secular trend of rising real expenditure - in real terms total spending on education for 1955 was twice that for 1938 and showed an increase of 66% over 1946. Capital expenditure in real terms did not exceed the 1932 total for the next twenty years.

A breakdown of the total figures into functional headings showed a striking fall in the percentage devoted to reachers' salaries (69% in 1921, 52% in 1955) whereas the largest percentage increases related to the School Health Service, to meals and milk, and to heating and lighting. Transfer payments grew from some 8% of the total in 1921 to around 14% in 1938, but then fell to around 10% in 1955, the fluctuations relating primarily to loan charges and to teachers' superannuation payments and not to grants to pupils. A number of separate calculations were also made for each of primary, secondary and further education, and secondary education was shown to be taking an increasing share of the total education budget over time; here also emphasis was laid on the lack of some of the requisite statistics.

Finally, Vaizey forecast that the trends most likely to affect the level of expenditure in future years would be:

(i) rising prices

(ii) relative changes in teachers' salaries

(iii) change in population and rise in % of children in state schools

(iv) rising educational standards

(v) raising of school leaving age

(vi) increased demand for higher education

and these have all been verified by the events of the ensuing twenty years, although inevitably new problems also arose, especially in the 1970s.

In their follow-up study,[1] Vaizey and Sheahan were able to report that the rapid expansion of education after 1955 had been accompanied by a long overdue expansion of the official education statistics. By the mid-1960s, the education service was taking some 5.0% of Gross National Product and 18.9% of total public expenditure. From 1955 to 1965, whilst the number of secondary pupils rose by 50% total real expenditure on them more than doubled, the greater part of the increase going to non-academic secondary pupils. The proportion of total educational expenditure devoted to the secondary sector also rose, to 28.0% by 1965 (it had been 17.7% in 1920). Expenditure on secondary teachers' salaries as a proportion of the total continued to fall, from 67% in 1955 to 60% in 1965, whilst the proportions devoted to salaries paid to non-teachers, and to "things", both rose. Total real expenditure on public education rose by 50% over 1955 to 1965 and as a percentage of Gross National Product rose from 2.8% to 4.1%; over the same period capital expenditure rose by 180% in real terms. A savage commentary on the inequality of educational

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1. J. VAIZEY and J. SHEAHAN, op. cit.

finance was provided by a reference to the heavy weighting given to older pupils in the Rate Support Grant calculations, the effect being that the most prosperous localities received the largest grants; Tower Hamlets and Hounslow, for example, had very similar population grants for children under 15 (respectively £47,380 and £43,775) but their supplementary grants were respectively £493,699 and £806,139 - despite the fact that Hounslow would have many more children in private schools and hence being educated at no cost to the rates, and fewer children with educational disadvantages. In theory, of course, the L.E.A.s have discretion to allocate the R.S.G. funds as they wish but in practice they tend to see the use as being predetermined.

Whilst, as mentioned above, no detailed study of the costs of individual schools, let alone of any breakdown of costs within schools, in England and Wales has ever been published, one such does exist for Scotland. It will be necessary to deal fairly fully with this work, by Cumming[1], since cross-references to it will be made elsewhere in this thesis. It set out to explore a tabula rasa: in the complete absence of any previous studies, whatever it produced would be new and potentially interesting and at the very least was liable to encourage the development of further studies of various aspects of costs. (It was also partially responsible for inspiring the present study). Cumming had to report that the Scottish local education authorities he investigated kept no records of the costs of individual schools, costs of different ways of organising schools, or costs of individual subjects within schools nor even details of the division of the education budget

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1. C.E. CUMMING: Studies in Educational Costs (Scottish Academic Press, 1971)

between educational expenditure as such and social and welfare items, the prime motive for the pattern of their educational accounts being fiscal accountability. After discussing the movements over time of total outlays on the major cost items (teachers' salaries, school maintenance, books, apparatus, etc.), Cumming again had to note:

> "What we cannot tell from these figures is by how much, if at all, unit outlays in real terms exceeded (in 1966/7) those in our base year 1959/60".

From the point of view of an authority, the essential distinction appeared to be "constrained expenditure" (such as teachers' salary scales) over which it had little or no control) and "unconstrained (or policy-controlled) expenditure" (such as capitation allowances for schools) where it could exercise considerable discretion, but even these two major categories of expenditure frequently could not be distinguished from each other in the educational accounts.

Attempts to compare expenditure per pupil in different L.E.A.s were bedevilled by the extreme variations in density of pupil populations per square mile (from 1 per square mile in Sutherland to 2,830 per square mile in Glasgow) and by the chronic shortage of teachers in some areas (e.g. in Glasgow). As would be expected, the former evidenced a strong negative rank order correlation ($r = -0.73$) between density and unit cost whilst the latter resulted in artificial "savings". An attempt to relate unit costs to the total size of the L.E.A.'s school population via ordinary least squares regression analysis was described as less clear cut since it resulted in the estimated equation:

$$\log Y = -0.0991 \log X + 2.6035 \quad (r = -0.6375)$$

where X = school population in pupils, Y = unit cost in £. Both the coefficient of determination (40.64) and the regression coefficient (0.0991) had quite low values; in any event the validity and usefulness

of such an inter-authority comparison are at least open to dbout in view of the wide dissimilarities in both the L.E.A.s themselves and in their accounting practices. Probably more valid is the finding that Loan Charges per pupil vary from one L.E.A. to another by as much as a factor of five but here again we need to know more about the existing building stock and variations in costs of land and other resources before any useful conclusions can be drawn. Cumming was able to identify maintenance costs as relatively lower per pupil in older buildings but as relatively lower per square foot in newer buildings where more generous space/pupil ratios applied; stress was, however, laid on the problematic nature of such findings since the available statistics did not adequately cover such points.

More detailed studies were then undertaken within two L.E.A. areas and, after a very great deal of tedious clerical work in L.E.A. offices, the following results were identified:

(i) clear evidence for economies of scale for primary schools

(ii) no clear evidence for economies of scale for secondary schools "because of the paucity and variety of secondary schools"

(iii) teachers' salaries per pupil in secondary schools were approximately double those in primary schools, due both to their better qualifications and to smaller class sizes

(iv) "no obvious connection exists between unit outlays on salaries/wages and size and type of secondary school"

(v) expenditure per head on educational equipment in secondary schools was nearly 3½ times that in primary schools

(vi) calculations to allocate teaching costs over various school subjects resulted in the finding that average teaching costs per pupil period varied from the high of

Classics (£6.40) to the low of Modern Studies (£1.54) whilst on a per pupil basis the range was from £36.70 (Classics) to £3.83 (Music)

(vii) A number of problems implicit in such calculations were admitted: for example,

(a) no data was collected on how the age or experience of teachers might affect the results and this "could affect the figures by 100%", and

(b) "it would be easy to dispute the allocation of the responsibility allowance element of a Teacher's Salary to the head School Administration" (as opposed to teaching costs).

(c) statistics for some schools were distorted by cyclical items occurring in the period studied - e.g. the painting of schools on a 5-year cycle.

An earlier and briefer study[1] in Scotland had discussed trends in educational costs over time and, whilst it did not attempt to investigate costs at the level of individual schools, it was able to show very wide variations in average expenditure per pupil, the range having a factor of about $2\frac{1}{2}$, with costs apparently particularly high in localities with sparse and scattered populations; variation would have been even greater but for the fact that such items as fuel, light, cleaning, rents, and rates, tended to be lower in rural areas. More recently, a detailed breakdown of educational expenditure for the city of Glasgow was given by Jackson[2] but he had to report a dearth of suitable data for analytical purposes.

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1. J. SLEEMAN: Educational Costs and Local Government Structure in Scotland, Scottish Journal of Political Economy, Vol. 12, 1965.

2. P.M. JACKSON: Local Authority Public Expenditure, A Case Study of Glasgow 1948/70 (Ph.D. thesis, University of Stirling, 1975)

Perhaps the first major attempt at a disaggregated study of educational expenditure in England was that by Bleddyn Davies[1] who compiled, for each local authority and for each of a number of social services, including education, indices of both needs and of standards of provision of the service. After stressing the problems involved in doing so and the imperfections in the I.M.T.A. (now C.I.P.F.A.) expenditure statistics from which he was working, Davies found considerable variations in both indices. Primary school expenditure per pupil was shown to have a low degree of correlation positively with the proportion of households in shared dwellings and negatively with the proportion of the population of primary school age whilst pupil-teacher ratios, teachers' salaries per pupil, the proportion of pupils receiving school dinners, and most other constituents of cost per pupil were positively correlated with indices of social class. Secondary school expenditure per pupil was correlated negatively with the proportion of manual jobs in an area, with an index of family size and with the proportion of the population of secondary school age and positively with the percentage of the population who were immigrants from the newer Commonwealth countries. However, nearly all of these correlations were quite weak and in any event since they were at the L.E.A. level and in view of the problems involved in making such inter-authority comparisons the value of such calculations must be open to doubt. Perhaps some comfort can be drawn from the finding that at the local authority level standards of provision of education services varied much less than those of other services.

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1. BLEDDYN DAVIES: Social Needs and Resources in Local Services (Michael Joseph, London, 1968).

More direct evidence was used, and rather firmer conclusions were produced, by Eileen Byrne in her detailed study[1] of the allocation of educational resources within three L.E.A.s, the cities of Lincoln and Nottingham, and the county of Northumberland, over the twenty-year period to 1965. All three authorities had differential schemes for school allowances, to provide additional money for older and more intelligent secondary pupils, yet three-quarters of all heads were shown to disapprove of such differentials for pupils under or over 16. The study found "inherent inequality" throughout the school system in connection with patterns of expenditure and the allocation of resources: that grammar schools should have higher expenditure per pupil for such items as teachers' salaries and capitation was only to be expected yet, more surprisingly, a similar differential was also found for the maintenance of buildings. Within a school, G.C.E. and C.S.E. groups tended to be "subsidised" by other classes; smaller schools, rural schools, and secondary modern schools, typically could offer only a limited range of subjects and less adequate facilities. Over time it seemed doubtful whether nominal monetary expenditure had risen quickly enough to maintain the same real expenditure per pupil and at times of, for example, large salary increases for teachers, the L.E.A.s pruned other areas of expenditure to compensate. There was clear evidence of considerable problems and inconsistencies arising out of centralised directions from the Ministry of Education, later the Department of Education and Science. The Ministry issued a steady stream of recommendations, urging desirable educational developments of various kinds whilst not allowing L.E.A.s any extra grants or even sometimes approvals for building work to go ahead; even in 1974 the Department insisted on a level of overcrowding of 15% in all secondary schools before

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1. EILEEN M. BYRNE: "Planning and Educational Inequality" (N.F.E.R., 1974).

permitting new building. Frequently optimistic public statements relating to expansion of, and improvements in, the educational service, were accompanied by cuts in expenditure and grants in real terms. The Ministry constantly overrode the wishes of L.E.A.s on a variety of matters, so that from the point of view of the L.E.A. it seemed that rather little real local autonomy remained, and control by the Ministry seemed to have increased over time.[1]

Regarding the three L.E.A.s studied, Lincoln for many years seemed preoccupied by its grammar schools, for instance in the way it concentrated capital expenditure on them, to the detriment of secondary modern schools (in which pupils were banned from taking external examinations right up to 1962); Nottingham on the other hand had developed bilateral schools by the late 1950s, spent relatively more than other authorities on secondary modern pupils and was so concerned to raise standards that over time its rate of increase of secondary school expenditure was greater than the rate of growth of pupil numbers (as would, of course, be the case with many other L.E.A.s).[2] Northumberland was shown to be a poorer authority than either Lincoln or Nottingham, with only 15% of pupils in grammar schools, G.C.E. performance rates well below the national average and many pupils leaving school underachieving by national standards; yet the authority appeared to favour prestige innovatory projects at the expense of basic standards and often refused to co-operate with central government suggestions, as when the country instructed its planning committee to refuse planning consent to prefabricated huts designed by the Ministry of

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1. Inevitably, the D.E.S. takes a contra view of this and in correspondence with me they have disagreed with the above comments (letter dated 8.5.1979).

2. The D.E.S. view is that the biggest single determinant of increasing expenditure per head is the improving pupil-teacher ratio (comment in same letter quoted above).

Works to cope with the raising of the school leaving age. There was again substantial imbalance in spending in favour of grammar school pupils, also in favour of schools in new buildings or with new head teachers, both of which fared much better than average for additional resources. Overall Eileen Byrne reported that, whilst no single identifiable pattern of resource allocation could be deduced, it seemed clear that inequalities between areas had widened, not narrowed, over time, including since the 1974 reorganisation. A "cycle of deprivation" arose from the fact that additional resources each year were allocated on a percentage basis, so that those areas poorly equipped in the 1940s were effectively discriminated against; building programmes never matched the increases in numbers of pupils and most schools remained severely overcrowded. Even rating revaluations were shown to favour the richest areas most, because of their higher incidence of industrial property, and as a consequence their future financial problems were eased. A major conclusion was a call for much more information and research relating to expenditure and resource allocation patterns on the part of local education authorities.

The latter point was reiterated strongly by the only other study to investigate in depth the provision of educational resources by individual L.E.A.s, that by D. Byrne, Williamson and Fletcher[1]. Their objective was to:

> "Measure the precise contribution which system inputs make to variations in rates of educational attainment"

and they proceeded to identify 69 separate variables, to represent "total material environment", "L.E.A.'s policy", and "educational attainment", which were then applied to a number of L.E.A.s.

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1. D. BYRNE, B. WILLIAMSON & B. FLETCHER: "The Poverty of Education" (Martin Robertson, 1975)

The latter evidenced wide disparities: Merthyr Tydfil and Wigan were both relatively poor areas with low rateable values but whereas levels of educational expenditure and achievement were high in the former they were low in the latter, Wigan being an example of a predominantly working-class authority taking an elitist view of its grammar schools and spending heavily on them. Solihull, a prosperous and mainly middle-class suburb of Birmingham had more than twice as many children in private schools as the national average but even so the L.E.A. schools had exceptionally high involvement by the parent-teacher associations in the life of and the provision of additional resources (for example, swimming pools) for the schools, and the schools recorded high levels of educational attainment. This was in contrast to Blackpool whose above-average social-class composition was not reflected in high success rates in education due to the local authority's policy of keeping down the local rate, and therefore the level of educational expenditure. Evident disparities within the area of one L.E.A. were also noted, a particular example being Bristol. The study found, inter alia, that poor provision in primary schools was strongly associated with poor provision in secondary schools, and that various indicators of educational attainment were much more positively correlated with measures of "social class plus provision plus environmental factors" (R^2 = c.0.70) than with measures of social class alone (R^2 = c.0.35). The authors therefore comment that their work tends to contradict the view that levels of expenditure and standard of provision in schools have little or no effect on the educational attainment of pupils, a view expressed in the Coleman[1] report and subsequently summarised by

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1. J.S. COLEMAN: "The Concept of Equality of Educational Opportunity", Harvard Educational Review, 38 (Winter 1968), p.8.

Hodgson[1] as follows:

> "factors such as the amount of money spent per pupil, or the number of books in the library, or physical facilities such as gymnasiums or cafeterias or laboratories, or even differences in the curriculum, seemed to make no appreciable differences to the children's level of achievement".[2]

Some thirty years after the 1944 Education Act, conclude D. Byrne, Williamson and Fletcher, far from providing equality of opportunity, our schooling system evidences a considerable degree of territorial injustice and sustained political pressure will be needed to effect any substantial improvement[3].

Practially no other studies of education expenditure wholly or partially at the local authority level appear to exist.

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1. G. HODGSON: "Inequality: Do Schools Make a Difference?" reprinted in H. SILVER, ed.: "Equal Opportunity in Education" (Methuen, 1973).

2. A recent U.K. Report published after this chapter was written, found, on the contrary, that schools do make a difference although it was more concerned with school "ethos" than with resources as such: M. RUTTER & Others:"Fifteen Thousand Hours" (Open Books, 1979).

3. D.S. BYRNE and W. WILLIAMSON: "The Effect of L.E.A. Resources and Policies on Educational Attainment" (Final Report to S.S.R.C., 1974, available from British Library Lending Division, Boston Spa) gives further particulars of this research, including a detailed study of Sunderland L.E.A. and an indication of the difficulty involved in attempting to compare resources for different schools - for example when the authors wished to compare capitation expenditures for each of Sunderland's twenty-three secondary schools the information required was unobtainable.

   See also: D.S. BYRNE and W. WILLIAMSON: "Some Intraregional Variations in Educational Provision and their Bearing upon Educational Attainment: The Case of the North-East", Sociology, Vol. 6, No. 1 (January 1971).

   The authors also had to write: "Our results do not allow us to ask the important question of just how far levels of provision make a difference". In a related paper the same authors found a stronger relationship between variations in educational provision and levels of attainment than between the latter and socio-economic background, but their findings have been challenged elsewhere. See D.S. Byrne and W. Williamson: "The Myth of the Restricted Code" (University of Durham, Department of Sociology and Social Administration, Working Papers in Sociology No. 1, 1972) and D.J. Pyle: "Intraregional variations in educational provision - some comments on Byrne and Williamson", Sociology, Vol. 9, 1975.

One comparison of education services of a relatively deprived London borough (West Ham) and a rather more affluent Berkshire town (Reading) contained much descriptive material but little or no information regarding expenditure or resource allocation save for a reference to the:

> "need for more sophisticated and rigorous studies of ..... costs and effectiveness".[1]

In each case the system was shown to be well if rather autocratically administered by powerful Education Department officials, with little or no active local participation. Boaden[2] examined the needs, dispositions and resources, of county boroughs, for a number of their services, including education, and found wide variations. The amount spent on education in the county boroughs per 1,000 population, for example, varied from £17,263 to £28,093, but not in the way that might be imagined: some "poor" authorities spent highly on education and vice-versa and there were no clear patterns of correlation between expenditure on education and expenditure on related social services such as the Welfare and Children's Departments. Expenditure, as shown by simple correlation calculations, tended to be higher where the borough had a lower social-class composition, was relatively poorer or was Labour-controlled, but the correlations are only of the order of 0.5 or less. Since these three independent variables (and others quoted) are obviously strongly inter-correlated, partial correlations were calculated to control for the effect of each in turn but the only clear conclusion that was not intuitively obvious appeared to be that social class composition exerted no independent

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1. D. PESCHEK and J. BRAND: "Policies and Politics in Secondary Education, Case Studies in West Ham and Reading" (Greater London Papers No. 11, London School of Economics, 1966).
2. NOEL BOADEN: "Urban Policy-Making (Influences on County Boroughs in England and Wales" (Cambridge University Press, 1971).

effect. All the previously stated reservations regarding calculations based on published I.M.T.A. statistics also apply.

There have been only two previous attempts to identify and analyse the costs of individual secondary schools in England and Wales, neither of which was ever published in the normal way, perhaps because of the evident difficulties involved in doing such studies. Norris[1] compiled the unit costs under a number of operational headings, for eight secondary schools in a Midlands L.E.A. for 1967/8. With such a small sample and in view of the heterogeneity of the schools (2 secondary modern, 1 grammar school with some boarders, 2 "11-16 comprehensives" and 3 "11-18 comprehensives"), inter-school comparisons are liable to be misleading but average costs per pupil did tend to be higher in smaller schools and lower in the larger ones (the range being very large, from 146 to 1943 pupils). "Average Costs" included both current and capital since for the latter Norris used a method of calculating the annual replacement cost of a school by calculating the current cost of building a new school of that size and amortizing the total over 60 years at a discount rate of 8%. As the author comments:

> "Thus difficulties associated with buildings of various ages are abstracted from"

Whilst this concept may move us closer towards the economist's ideal of a view of total resource costs (although it still does not include such items as value of pupils' time), it clearly departs from the notion of actual expenditure on a school in a particular year and therefore differs from almost all other writings. Using Norris's

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1. KEITH NORRIS (assisted by John Vaizey): "A Report on Unit Costs in Secondary Schools" (Mimeographed report for Acton Society Trust, January 1969).

method, capital costs are shown to be a major item in that they amount to some 20% to 25% of a school's current costs. The only other study, a brief paper by Barber[1], identified current cost figures for individual secondary schools in Oxford and found wide variations both between grammar schools and between secondary modern schools. For 1965/66 the average for each group was £170 and £117 respectively. The paper suggested that G.C.E. 'A' level courses at the College of Technology cost less to run than those at grammar schools but admitted that for the former it had not been possible to include all current cost items. An attempt[2] to link expenditure differences with educational attainment was not able to come to any firm conclusions. Research by Congdon[3] looked at individual independent colleges of further education, found wide differences (up to a factor of six) in the level of costs per student hour but emphasised the problematical nature of the statistics and the difficulties involved in making such comparisons on a valid basis.

A more recent work by Pearson worked with national statistics and did not attempt any micro-analysis at the level of individual L.E.A.s or individual schools but nevertheless felt able to produce fairly precise figures for the costs of class teacing for various school subjects.[4] Some indication of the statistical problems arising

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1. C. RENATE BARBER: "Cost Effectiveness of Education", Oxford College of Technology, Social Science Research Unit, Occasional Paper No. 1 (mimeographed).

2. Pursued in a second paper by the same author: C. RENATE BARBER: "A Follow up of School Leavers in Oxford City", Oxford College of Technology, Social Science Research Unit, Occasional Paper No. 2, June 1968 (mimeographed).

3. R. CONGDON: "The Costs and Benefits of Office Training", Ph.D. Dissertation, University of Lancaster, 1979 (unpublished), quoted in: G. WILLIAMS and M. WOODHALL: "Independent Further Education", Policy Studies Institute, Vol.XLV, No. 581, June 1979.

4. P.K. PEARSON: "Costs of Education in the United Kingdom, A Selection of Costs and Cost Analyses made for the National Development Programme in Computer Assisted Learning" (Council for Educational Technology, 1977).

may be gained from the following extract:

> "In the absence of accurate data we have, wherever possible, made estimates - often no more than informed guesses based on very small samples. There were many cases, however, where we could not even guess and several gaps and question marks remain."

Pearson used the national education statistics published annually by the Department of Education and Science[1] together with additional information relating to secondary schools supplied by a small sample of L.E.A.s and endeavoured to arrive at separate costings for the three secondary school age groups: under 14, 14-15, and 16 and over. Approximately 80% of total current costs could be so apportioned and the breakdown of this figure over the three age groups gave figures of, respectively, 40%, 30%, and 10%. The largest constituent item was teachers' salaries and this was sub-divided according to the proportions of teachers' time spent teaching these three age groups as shown by a survey conducted by the Department of Education and Science in 1974. The fact that older pupils tend to be taught by the more highly qualified and more experienced and therefore most costly teachers was thus ignored; this must impart a considerable bias to the calculations, in the direction of making the older pupils seem relatively less costly than is in fact the case. Subsequently when considering relative costs of various subject areas the study assumed that, for example, science teachers received, on average, the same salaries as their arts colleagues; in fact, however, the former are almost certainly more highly paid due to the continuing shortage of teachers of science and mathematics and the relative ease with which such teachers can obtain promotion to posts on higher salary scales, since their schools are anxious not to lose their services. The

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1. Department of Education and Science: "Statistics of Education" (annually) H.M.S.O.

bias imparted in the latter case would, however, be less serious than that referred to previously. Pearson concluded that, subject to a number of limitations, costs per student hour were as shown below, the main cause of the differences being the smaller teaching groups typically found in sixth forms.

	Cost per student hour (£)	
	Forms 1 to 5	Form 6
Arts	0.22	0.53
Sciences	0.24	0.58

This conclusion needs, however, to be treated with caution: quite apart from the points noted above and the limitations which Pearson himself acknowledges, there has been no reference to such aspects as the finding by Eileen Byrne, quoted above, that secondary schools typically deprive their younger pupils in order to concentrate more resources on the prestigious external examination classes. Further the "Forms 1 to 5" heading will obviously embrace wide variations with Form 5, for example, having relatively high costs. To conclude the book with such an apparently precise calculation seems in some ways frankly misleading yet it is an interesting example of the way that educational research is used and/or mis-used that the figures quoted, but none of the related conceptual or measurement problems, received wide publicity in the national educational press[1].

In a follow-up study[2], Fielden and Pearson concentrated on cost aspects of educational innovations and gave six detailed case studies of cost and other aspects of new projects. Perhaps the most interest of these was the Kent Mathematics Project ("Case Study E"), the report on which showed that the real costs

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1. For example, The Times Educational Supplement, 17th June 1977 (comment across three columns on Page 1 followed by report by Philip Venning).

2. J. FIELDEN and P.K. PEARSON: Costing Educational Practice (Council for Educational Technology, 1978).

of the project, on an opportunity cost basis, to (a) the individual teachers concerned and (b) the L.E.A., were quite different from any figures appearing in any educational accounts. In fact,

> "The actual costs incurred by Kent during the past ten years have not been shown as the phenomenal pattern of inflation would not enable the real growth in the level of development expenditure to be differentiated from increases in wage rates and prices."

Conceptually, of course, rates of inflation can be adjusted for by deflation by a suitable price index and it is at least arguable that a prime motive for an L.E.A. considering any such project will be the actual cost to itself, i.e. the level of additional finance it has to raise. All costs over the ten-year development period are calculated in 1976-77 prices but there is no attempt to adjust for the passage of time via Discounted Cash Flow techniques and in this sense the calculation of an "annual steady-state cost" of £67,000 from

$$\frac{\text{Total Development Costs}}{\text{No. of Years}} = \frac{£340,000}{10}$$

plus

on-going workshops and operating costs = £33,000

needs to be treated with caution, particularly as it is not entirely clear when benefits from the project can be dated; the latter must have accrued gradually over the period, at first quite slowly, but no precise calculations for benefits were attempted in the report.

An analytical survey of certain aspects of L.E.A.s' expenditure was given by Dawson[1] and is considered in more detail in Appendix B and the great difficulties L.E.A.s face in attempting any long-term

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1. Diane A. Dawson: "Determinants of Local Authority Expenditure", Appendix 7 to report of Layfield Committee on Local Government Finance, 1977.

planning of educational expenditure and in assessing the effects of the way they spend their money, were recently described by Dennison[1].

Only one attempt at assessing the costs of running an individual school can be traced and perhaps inevitably it appears to raise more questions than it can answer[2]. The total current costs for 1975-6 for Holyrood School (a Somerset L.E.A. 11-18 comprehensive school with 1124 pupils) were sub-divided over a number of headings and, after a number of gross assumptions had been made, were eventually allocated over the principal teaching subject areas (English, Science, etc.). The basis for such allocation lay primarily in the salaries of the teachers concerned with no allowance for such factors as variations in class sizes or in the sixth-form/lower school mix for different subjects. Even such items as telephone charges and school meals were "charged" to the various subject departments. In the circumstances to quote from the conclusions that on average a pupil-period cost £12, that a Humanities lesson cost some 25% more than one in foreign languages, or that lessons in Design were easily the most expensive, may be misleading, particularly if any attempt were to be made to use these figures to draw comparisons with figures from other sources. After examining each cost heading in turn, Knight[2] concluded that, within the framework of the existing educational and political system, there was little hope for effecting any significant savings in the costs of running the school.

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1. W.F. DENNISON: "Expenditure Planning in English Education - Recent Developments in the relationship between Central and Local Authorities", Journal of Educational Administration and History, Vol. 11, No. 1 Jan. 1979 and W.F. DENNISON: "Monitoring the Effectiveness of Educational Institutions", British Journal of Educational Studies, Vol. XXV1, No. 3 October 1978.

2. BRIAN A. KNIGHT: "The Cost of Running A School" (Scottish Centre for Studies in School Administration, Occasional Paper No. 6, 1977).

One official report[1] attempted to look in detail at the costs of running the secondary school system in one Scottish L.E.A. and at what savings might be realised if the system were to be reorganised but it might not unfairly be cited as illustrating some of the pitfalls to be avoided in conducting such a study. Firstly, some indication of the degree of approximation involved may be gained from the fact that the number of pupils emerging each year from the primary schools

> "was increased by 75% to allow for the expected rise in the population in their catchment areas";

secondly, use was made of simple linear regression analysis (for e.g. Teachers' salaries against number of pupils) but no attempts were made to measure goodness of fit to the estimated line, test the estimated coefficients for significance, or consider any alternative, non-linear, equation forms, which may well have provided a better fit line; thirdly, having assumed the total costs/number of pupils relationship to be linear, the text went on to discuss the average (per pupil) cost/number of pupils thus:

> "at first the cost per pupil falls very rapidly but then begins to level off"

which, of course, is mathematically impossible if the former relationship is linear; and fourthly, the redesigned system assumed that some of the existing secondary schools simply ceased to exist and that additional accommodation required at other schools appeared, costless, overnight - a position in which, regrettably, no L.E.A. can ever find itself.

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1. D.H. MAY and R.C. JOHNSON: "Economic Planning of Secondary Schools in West Perthshire" (Ministry of Technology, Industrial Operations Unit). My attempts to communicate with these writers were unsuccessful.

Other evidence relating to the costs of schools in the United Kingdom is sketchy in the extreme. Inter-authority comparisons of school expenditure were published by Pratt, Burgess, et al[1], and are considered in Chapter 5. The same volume includes case studies of three L.E.A.s, Doncaster, Bootle and Wiltshire, to show how great are the variations between them. Regarding Bootle, for example, the authors write:

> "The real trouble in Bootle's case is that resources must be spread very thinly. By our resources index it is one of the poorest authorities in England and Wales. Thus there is very little margin for error and, when mistakes are made, the effect is often drastic - and tragic. When the plans for establishing Educational Priority Areas were announced by the government, the Bootle council failed to apply on the grounds that no one school within the authority could be singled out as being much worse than any other. The result was that Bootle lost some valuable government aid".
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> "Vandalism is a problem in many of the authority's schools. Windows are the obvious targets, and some schools seem to undergo attacks of window-smashing several times a term. The authority cannot replace the windows quickly and, on many buildings, vast rows of plyboard wait patiently to be replaced. Litter also seems to be ubiquitous. Even at one of the newer primary schools the grounds were covered with a fine layer of small bits of paper, broken glass and other refuse."
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> "The lessons of Bootle are clear: nothing short of massive outside help will turn the tide. After more than 100 years of progressive legislation in education, Bootle still struggles with its appalling problems. And Bootle is not alone. All over the North of England there are authorities suffering from the same or similar problems. There are many authorities that do not have enough money to ensure that adequate facilities are waiting for pupils at newly reorganized schools, or can't afford to provide for all their pupils kept on by the new school-leaving age. There are local authorities which cannot even afford to pick up the broken glass from outside a primary school."

Such impressions make interesting reading but they do not provide firm evidence about the costs of schools, indeed they rather emphasise the difficulty of obtaining and interpreting such evidence.

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1. J. PRATT, T. BURGESS, R. ALLEMANO, M. LOCKE: "Your Local Education" (Penguin, 1973), and J. PRATT and T. BURGESS: "Change for the better?", The Guardian, 25th November 1975. An earlier comparison of 10 Midlands L.E.A.s may be found in: West Midland Study Group: "Local Government and Central Control" (Routledge & Kegan Paul, 1956).

At a different level but in similar pessimistic vein may be quoted the views of West[1]:

> "The present state of education, especially primary education, in England is one of unprecedented crisis. Government officials, intellectuals, policy consultants and administrators are bewildered by rebelling teachers on the one hand and protesting parents on the other. A situation of over-stretched schools, over-size classes, sub-standard buildings, and a critical teacher shortage is aggravated by a severe lack of funds, a lack whose cause is ... deep-rooted...."

Both the Gittins Report[2] and the research of R. Nash and his colleagues[3] in the Rural Education Research Unit, University College of North Wales, Bangor, showed small Welsh primary schools to be extremely expensive to run, mainly due to their very high per-pupil teachers' salary costs, but a recent report[4] argued that in the general interests of the community such schools should be retained. Paradoxically, despite their exceptionally high per-pupil costs, such schools often lack a number of basic resources and can only provide an education of a rather limited quality; Boulter and Crispin[5] reported on an experiment in Northamptonshire to allocate additional resources to such schools, including via the adaptation of special indices which had been devised by Shipman and Cole[6].

Particular aspects of costs are mentioned by a number of other writers. Tyrrell Burgess[7] showed that whilst the application

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1. E.G. WEST: "Economics, Education and the Politician", Hobart Paper No. 42 (Institute of Economic Affairs, 1968).
2. Central Advisory Council for Education (Wales): "Primary Education in Wales" (H.M.S.O., 1967).
3. R. NASH, H. WILLIAMS, and M. EVANS: "The One-Teacher School", British Journal of Educational Studies, Vol. 24, No. 1, February 1976.
4. C.J. TODD (Univ. of Durham): "Report of the Oakenshaw School Action Group; Evidence in support of Oakenshaw School" (1979).
5. H. BOULTER and A. CRISPIN: "Rural Disadvantage : the differential allocation of resources to small rural primary schools", Durham & Newcastle Research Review, Vol. 5, No. 41, Autumn 1978.
6. M. SHIPMAN and H. COLE: "Education Indices in the allocation of resources, Secondary Education, Vol. 5, No. 2.
7. T. BURGESS: "While there is nothing inherently wicked about Cost Limits .....", Where, No. 87, Dec. 1973

by the central government of specific cost limits to the building of new schools for approximately the first twenty years of the post-war period had largely beneficial effects in that significant increases in productivity and efficiency in the designing and building of schools were achieved, the maintenance of such cost limits during the more rapid inflation of the 1970's had disastrous effects: from 1966 to 1973, for example, Inner London faced price increases of around 100% whilst the permitted cost limits were raised by only 43%. The inevitable result has been reductions in quality, some of which will in turn raise future maintenance costs. Barbara MacLennan's earlier study of financial aspects of Grant-Aided schools in Scotland, (which were broadly similar to the Direct Grant schools south of the border) included comparisons with L.E.A. schools of cost and other aspects and showed the Grant-Aided schools to have not only more highly paid teachers, more favourable pupil-teacher ratios, and higher total costs per pupil, all of which might have been expected, but also expenditure growing significantly more slowly over time than the L.E.A. schools, for which no obvious explanation could be found. Blaug and Woodhall[1] found that over a thirteen-year period expenditure per pupil in British secondary schools had risen more rapidly than school "output" whether the latter was measured via post-school earnings, length of school, or academic achievements, hence the authors' widely-quoted conclusion that productivity in schools had declined.

The detailed study of comprehensive schools funded by the National Foundation for Educational Research[2] contained little or no direct information on costs but did include some indirect references: considerable emphasis was placed, for example, on

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1. M. WOODHALL and M. BLAUG: "Productivity Trends in British Secondary Education, 1950-63", Sociology of Education, Winter 1968, Vol. 41, No. 1.

2. T.G. MONKS, ed.: "Comprehensive Education in Action" (N.F.E.R., 1970) and T.G. MONKS "Comprehensive Education in England and Wales" (N.F.E.R., 1968).

the considerable freedom a local education authority enjoys over the question of allocating additional allowances on top of the basic Burnham Scale: these allowances were shown to be of considerable importance in the acquisition and retention of senior teaching staff and the implications for a school's costs, whilst not mentioned in the study, are obvious. Similarly the survey findings that one school spent more than ten times as much per pupil on the school library as did another school, that teachers of English on average work nine and a half hours per week more than teachers of practical subjects, that graduate teachers on average work four and a half hours per week more than non-graduates, or that patterns of school organization show an extremely wide variety, all have cost implications, if not always for the L.E.A. itself. A study which to a considerable degree overlapped with the above was that by Halsall[1] which contained little in the way of either explicit or implicit references to school costs save for her discussion of school size and her finding that in many schools much valuable time is lost by unnecessary movement of pupils around school buildings.

The level of expenditure by the local education authority, as revealed in the provision of over-size classes in either primary or secondary schools or both, and to a lesser extent in the pupil-teacher ratio, was shown by the Robbins Report[2] to be linked to "output" in sense of the proportion of an age group staying at school beyond age 17 or the proportion entering full-time higher education.

In the recent climate of cuts in educational expenditure programmes, reports have appeared of serious effects on the standard

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1. ELIZABETH HALSALL: "The Comprehensive School" (Pergamon, 1973). Dr. Halsall's aversion to large schools was repeated in her: "Coping with comprehensive size", Comprehensive Education, Summer 1978.

2. Report of the Committee on Higher Education, especially Appendix One, (Cmnd. 2154-I, H.M.S.O., 1963).

of the educational service being provided in some areas. Thus a report on Surrey schools[1] by six teacher unions referred to equipment and machinery not being maintained or replaced, funds for book purchases being inadequate and language laboratories having to be left unused. A similar report on Northamptonshire schools, by the Assistant Masters and Mistresses Association[2], draws a similarly pessimistic picture: "Science experiments have been curtailed and engineering courses dropped. Cookery lessons have been abandoned because of the cost of ingredients"; the overall conclusion was that as the cost of consumable materials and equipment rose beyond the school's budget, many lessons were reverting to "chalk-and-talk". The same climate has induced a number of L.E.A.s to reconsider their procedures for handling education expenditure decisions in the hope of achieving greater efficiency[3]. Many other reports of the effects of the cuts in educational expenditure have appeared in the national press[4]. Some of these reports were so disturbing that the Department of Education and Science felt obliged to investigate them[5].

There are many other volumes relating to educational administration, management or planning which might have been expected to include material relating to education costs in general and/or

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1. Quoted in report by Stephen Cohen, and in comment column, in The Times Educational Supplement, 13th October 1978.
2. Quoted by Stephen Cohen, The Times Educational Supplement, 20th October 1978.
3. See: Society of Education Officers: "Management in the Education Service, Challenge and Response" (Routledge & Kegan Paul, 1975); D. Birley (formerly Deputy Director of Education for Liverpool): "Planning and Education" (Routledge & Kegan Paul, 1972); and "Output Measurement and Education" (C.I.P.F.A., 1974).
4. For example, H. CLOTHER: "Cut Now, Pay Later", The Guardian, 17th June 1975; A. SPROULE: "The Cuts that mean three to a Hymn Book", The Guardian, 5th October 1976; M. O'CONNOR: "The Scandal of the Schools without Books", The Guardian, 6th March 1979, and M. O'CONNOR, The Guardian, 20th March 1979.
5. The Guardian, 27th March 1979.

to school costs in particular, but which in fact either include merely a brief reference to the subject or omit it completely[1].

A similar work[2] which did include a section on educational finance and costs could only come to rather pessimistic conclusions:

> "...the present methods of allocating non-teaching staff to schools can be wasteful, frustrating, and tend to inhibit experiment or change..."
>
> "...the present system does not encourage head teachers to be cost conscious except within narrow limits and along well-trodden paths..."
>
> "...head teachers and the teachers' professional associations, administrators in the education department, the authority's treasurer and his staff, must show a greater willingness than has generally been evident in the past to think, plan and work together as trustful partners in a common enterprise. Change is uncomfortable, but change there must be if new methods are to be devised to ensure that resources are used in the most effective way..."

W.J. Knight, formerly Chief Education Officer for Harrow, also wrote in harsh terms:[3]

> "...as matters now stand in local government the word 'control', whether applied to costs or staffing of establishments, is a misnomer. The major policy decisions which ultimately affect levels of expenditure in most of the services administered by local authorities are made nationally not locally, but even in those spheres where the local authorities still exercise some powers, effective controls rarely exist"

and went on to be particularly critical of the increasing practice of the costs of the activities of other departments in the L.E.A. (Architects', Treasurers', Chief Clerks') being, in part, costed to the education budget without any control on the part of anyone within

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1. For example: T.I. DAVIES: "School Organisation, a new Synthesis" (Pergamon 1969); L.J. LEWIS and A.J. LOVERIDGE "The Management of Education" (Pall Mall Press, 1965); K.A. FOX, ed.: "Economic Analysis for Educational Planning" (John Hopkins University Press, 1972); L. DOBSON, T. GEAR, A. WESTOBY, eds.: "Management in Education, Reader 2" (Ward Lock/The Open University, 1975); G. BARON and D. HOWELL: "The Government and Management of Schools" (Athlone Press, 1974); T. GREEN, ed.: Educational Planning in Perspective (I.P.C. Press, 1971).

2. R. BURTON (Deputy Education Officer, East Sussex): "Education Finance at local level", in G. TAYLOR, ed.: "The Teacher as Manager" (National Council for Educational Technology, 1970).

3. W.J. KNIGHT: "The Rising Price of Administration" in Education, 22 June 1973.

the education service. This point seemed particularly important since over time such costs were rising much more rapidly than direct education costs.

In similar vein another Chief Education Officer wrote:[1]

> "... the over-riding impression is of a precarious, indirect, insensitive and cumbersome method of financing education. In any severe cutback of grants to local authorities education must perforce suffer most, whatever plans the Secretary of State has in mind for the service",

and more recently Mr. Peter Newsam, Education Officer of the Inner London Education Authority has attacked "mismanagement, inefficiency and unwise spending in education", has described the financing of education as "a stupefyingly inefficient business", and has commented: "We don't really want more money. All we need is to be able to stop wasting the money we've got".[2]

It should be noted that many of the criticisms recorded above emanate from Chief Education Officers or the equivalent. It would, however, be quite wrong to infer that the latter have abandoned all effective means of financial control. A paper by J. Rendel Jones, Chief Education Officer for East Sussex, for example, described in detail the systematic process by which that authority's education budget was prepared, with careful distinctions being made between (i) committed expenditure needed to maintain the existing level of service, (ii) known expansion for which provision must be made, (iii) provision for increased prices, and (iv) improvements in the standard of the service and new developments.[3]

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1. D. BIRLEY: "The Education Officer and his World" (Routledge & Kegan Paul, 1970).
2. "Mismanaging of the Schools", The Guardian, 27th March 1979.
3. J. RENDEL JONES: "An Informative Way with Budgets", Education, 22 June 1973.

Neither a recent collection of papers on comprehensive schools published by the Department of Education and Science[1] nor S.J. Eggleston's large-scale research[2] into factors influencing staying-on rates in some 260 schools nor Miles' exhaustive study of 22 schools in the East Riding of Yorkshire, which identified 37 separate variables for each school and computed correlation coefficients between all of them contained any references to costs or expenditures in the schools.[3]

Of three interesting recent assessments of current major educational issues, two (David, Sofer)[4] contained no reference at all to questions of costs or expenditures but the third (Barnes)[5] did include a brief section reviewing trends in national current and capital expenditure. Credit must also be given to the Department of Education and Science for their detailed and systematic forward planning of the school building programme.[6]

A word of caution, if one were still needed, about the dangers of considering school cost questions in isolation from

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1. "Aspects of Comprehensive Education", Papers by H.M. Inspectorate (Department of Education and Science, 1978).

2. S.J. EGGLESTON: "Some environmental correlates of extended secondary education in England", as reprinted in S.J. EGGLESTON, ed.: "Contemporary Research in the Sociology of Education", (Methuen, 1974).

3. H.B. MILES: "Final Report to the Social Science Research Council on an Investigation of some Correlates of Academic Performance of Pupils in Secondary Schools, 1969-1972" (University of Hull, Department of Educational Studies, 1972). As Dr. Miles wrote to me: "I am afraid there was nothing in my investigation concerned with costs and the school variables were those that have been widely suspected of playing a part in determining attainment", (letter dated 23rd October 1975).

4. M. DAVID: "Parents and Educational Politics in 1977" and A. SOFER: "Educational arguments in 1977", both in M. BROWN and S. BALDWIN, eds.: "The Year Book of Social Policy in Britain 1977" (Routledge and Kegan Paul, 1978.)

5. J. BARNES: "Schools" in R. KLEIN, ed.: "Inflation and Priorities", (Centre for Studies in Social Policy, 1975).

6. Department of Education and Science: "A Study of School Building", (H.M.S.O., 1977).

relevant social, political and educational issues, may be gleaned from the study by Davies and Reddin[1] of the non-uptake of free school meals by children from low-income families. The case for a more active policy of inequality in spending, to give greater help to disadvantaged schools, was urged by Little[2].

For anyone embarking on a serious study of educational costs one of the most interesting of all the items of reading available to date is a volume by Coombs and Hallak[3] which, whilst containing some U.K. data, refers primarily to education systems in developing countries overseas. The book contains many words of caution for administrators in such countries setting up or expanding education systems and urges them, in terms which also seem relevant to this country, to identify and collect a variety of reliable cost data. Thus when Coombs and Hallak write:

> "all budget figures and statements of expenditures should be used with extreme caution and discernment"

and

> "cost analysis has become imperative... but is... still in a relatively primitive state"

it would be difficult to exonerate the United Kingdom from the criticisms implied. When we find the authors urging devloping countries to make detailed studies of comparative costs for different types of secondary schools, such as different sizes of school, single sex or co-educational, selective or comprehensive, rural or urban, it is difficult not to be struck by a feeling of irony in that for the United Kingdom, which has had a system of compulsory

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1. B. DAVIES and M. REDDIN: "Universality, Selectivity, and Effectiveness in Social Policy" (Heinemann, 1978).
2. A. LITTLE: "Schools - Targets and Methods" in H. Glennerster et al, eds.: "Positive Discrimination and Inequality" (Fabian research series No. 314, 1974).
3. P.H. COOMBS and J. HALLAK: "Managing Educational Costs" (Oxford University Press, 1972).

education for over 100 years, no such studies exist. Thus Coombs and Hallak write that, for the countries they are interested in, it is usually:

> "impossible to tell, for example, how much was spent for first graders as against second graders, or for learning to read and write as against learning arithmetic, or for what goes on inside the classrooms as against other school costs... these shortcomings reflect the fact that education budgets were originally designed to serve the purpose of appropriations bodies and auditors, not the needs of educational planning and management... cost analysis... has now become essential... budgetary accounts will have to be modified and amplified."

From the many other aspects of school costs discussed in this book particular mention may be made of the effect that inflation (which is typically a far more serious problem in developing than in developed countries) was found to have on educational spending:

> "budgets and salaries almost invariably lag behind the general rise in prices and wages, thereby robbing education's real purchasing power and reducing its ability to attract and hold good teachers and administrators."

Finally, a last quotation may serve to illustrate the conviction of Coombs and Hallak that a certain hard-headedness of attitude, concomitant with paying more attention to economic criteria, may be highly desirable in education systems:

> "... the romance and nostalgia which adults often feel for the one-room village school can impose heavy penalties on their children's education and on the public purse. A prerequisite for being able to afford good schools is that they be of at least the minimum size that is economically and pedagogically viable."

The book was accompanied by a further three volumes[1] of case studies relating to school costs, which contained a total of over thirty separate detailed studies drawn from developing countries all round the world.

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1. P. COOMBS & J. HALLAK, eds.: "Educational Cost Analysis in Action", Vols 1 to 3 (UNESCO/I.I.E.P., Paris).

As might be expected, the literature from other countries relevant to education costs (a) is extremely voluminous, (b) covers a very wide field, and (c) does not always come to conclusions which are clear-cut or which can necessarily be applied to the United Kingdom. Much of the literature stems from the United States and many references to educational costs and expenditure are found in works whose main emphasis lies elsewhere. As it would be impossible to review all relevant publications, the following survey endeavours to select those which seem the most important and/or the most relevant.

One of the most thorough of all studies was that published in two volumes by Leite, Lynch, Sheahan, and Vaizey[1]. The first volume analysed at length the conceptual and measurement problems involved, with particular reference to identifying full opportunity costs: if, as Robinson[2] found for the British labour force, some 70% of all women graduates are employed in teaching, how meaningfully can we identify their opportunity costs, i.e. alternative earnings? How valid is it to allow for incomes foregone by students either at times of mass unemployment or during a period when the school leaving age is being raised? The authors show what hit-and-miss methods have sometimes had to be used in this field: In calculations for the Mediterranean Regional Project, for example, it was assumed that the future growth of teachers' salaries would match that of real national income and that the ratio of teachers' salaries to total current costs could be taken to be 80% for secondary, 90% for primary, and in fact:

> "... the whole projection (was) made on a very inadequate statistical basis."

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1. M.F. LEITE, P. LYNCH, J. SHEAHAN and J. VAIZEY: The Economics of Educational Costing - Inter-country and Inter-regional Comparisons: Vol. 1: Costs and Comparisons, a Theoretical Approach and Vol. 2: The Production Function in Education, Teachers and Their Salaries and Regional Analysis (Instituto Gulbenkian de Ciencia, Centro de Economia e Financas, Libson, 1968).

2. E.A.G. ROBINSON, in E. ROBINSON and J. VAIZEY, eds.: "The Economics of Education" (1966).

The authors note that Edding[1] had similar problems and found:

> "...20% to 40% may have to be added to the total amount of teachers' salaries in respect of other current outlay".

Such an approach, which Sheahan describes as "rudimentary but widely accepted" must obviously give rise to wide forecasting errors, especially when extrapolated over time. A good example of the pitfalls involved in estimating future expenditure on education may be provided by a quotation from Vaizey and Knight[2], published in 1965:

> "it is clear that the expansion in teacher numbers will be large over the next twenty years...it is clear that the deficiency of primary school teachers will be overcome by about 1986."

Within a few years, these confident assertions were to make ironic reading.

Leite, Lynch, Sheahan and Vaizey urge that:

> "the study of unit costs and of efficient resource use is of increasing importance."

particularly in view of the trend, observable in practically every country in the world, that as National Income per capita rises the proportion of National Income devoted to education also rises (the greatest increases occurring to the non-teaching and non-personnel items within the education budget). The great difficulties attaching to any attempts to make international comparisons of unit costs, in view of problems relating to differing price and income structures, effective rates of exchange, differing practices regarding inclusion or exclusion of such items as welfare expenditure or transport, or the use of foreign teachers by developing countries, were also emphasised.

The second volume by Leite and others examined the problems of relating educational inputs to outputs and found these to be

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1. F. EDDING: "Methods of Analysing Educational Outlay (UNESCO, Paris, 1966).

2. J. VAIZEY and R. KNIGHT, in W. BECKERMAN, ed.: "The British Economy in 1975" (Cambridge University Press, 1965).

even more intractable than those analysed in Volume 1; for example:

> "it has proved impossible to achieve a satisfactory indicator of total output"

The authors are particularly scathing of attempts to assess the overall relationship of inputs and outputs over time and therefore of the work of Woodhall and Blaug, cited above; thus:

> "the notion of the general efficiency or productivity of the educational system, which could be said to have risen or fallen between, say, 1950 and 1960, is an evident absurdity".

They particularly cite the instance of an increase in the rate of staying on at school beyond the compulsory school leaving age which may be variously seen as an addition to outputs, or as an addition to inputs, or even as both.

A follow-up study by Vaizey, Hewton and Norris[1], published in Lisbon but relating to schools in the United Kingdom, included a chapter on "Costs in Secondary Schools" which endeavoured to sub-divide the I.M.T.A. statistics over various school levels and subject areas and concluded, for example, that some average current subject costs per pupil per year for 1969 were:

English	:	£23.50
History	:	£12.30
Biology	:	£4.50

However, the non-availability of any information regarding the costs of providing science laboratories and equipment must have understated the costs of science subjects whilst the use solely of average timetable time for the sub-division and thus the exclusion of any allowance for variations in class size, level of work, or instructional costs, must have distorted the results.

A major United States report by Levin, Muller and Sandoval[2] examined patterns of expenditure on education across school districts

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1. J. VAIZEY, E. HEWTON and K. NORRIS: "The Costs of New Educational Technologies" (Instituto Gulbenkian de Ciencia, Centro de Economia e Financas, Libson, 1971).
2. B. LEVIN, T. MULLER, C. SANDOVAL: "The High Cost of Education in Cities" (The Urban Institute, Washington, D.C., 1973).

in seven states and found wide discrepancies, a particular problem being the extremely high cost of providing education in central city districts and the difficulties in the way of any simple alleviation measures: proposals to aid "poor" districts would pass them by since wealth as measured by property values was in fact high - more than twice as much per pupil as for rural districts (New York, 1968/9). Central cities were shown to suffer from the problem of "municipal overburden" in that, with their multitude of social problems, high debts, and declining populations, they had to allocate a greater proportion of their property tax receipts to other services, leaving relatively less for education, and this in spite of the fact that they had a higher proportion of pupils "requiring higher cost programs" due to educational disadvantage of one kind or another.

Total current operating expenditures showed large variations even at the level of the states, the average per pupil ranging from $567 in North Carolina to $1,229 in New York, a factor of over 2. Central city districts were shown to spend more highly on education than most other districts in all states but in some states districts classified as "slow growth suburbs" spent even more highly. Central city districts had better qualified and more experienced teachers but they were not necessarily more highly paid since there is in the United States no unified national salary scale for teachers. "Fast growth suburbs" always spent less than "slow growth suburbs", a possible reason being that districts having to undertake heavy capital commitments (not included in the figures) appeared to depress their current expenditure to compensate. Some 60% to 70% of the expenditure differences between different districts related to teachers salaries. The authors endeavoured to distinguish between differences relating to varying levels of costs in the different localities (e.g. higher costs in city centres) and those relating to variations in educational provision but this proved to

be extremely difficult to do: for example, the question of whether the better qualified and more experienced (and therefore most costly) teachers provided a better quality of teaching could not be answered definitively.

At this point it is necessary to explain that in the United States in the latter 1950s and throughout the 1960s, there were hopes that inequalities in educational provision among different school districts would be substantially lessened by the administrative reform of merging small districts into larger units. Thus:

	Number of "dependent school systems"	Number of "independent school districts"[1]
1957	2,489	50,454
1962	1,457	15,781

It gradually became clear, however, that substantial inequalities remained. To revert to Levin, Muller and Sandoval they proceeded to examine the question, currently of great interest in the United States, of whether measures to equalise levels of expenditure in different school districts would achieve greater equality in terms of the education the pupils would receive and they conclude in the negative, at least for any such measures in simple form. Their answer would, however, be affirmative if a more complicated scheme were to be devised, incorporating allowances for:

" (i) cost differentials in providing equivalent education al services,
(ii) the concentrations of students who require additional educational services, and
(iii) the municipal overburden factor"

(the latter point referring to the crucial problems of central city districts which have a declining tax base, escalating costs for other services, and very high costs for educational provision, especially capital expenditure).

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1. From "Statistical Abstract of the United States 1974" (U.S. Bureau of the Census), quoted in R.S. HARRISON: "Equality in Public School Finance (Lexington Books, 1976).

The reference above to current interest in the U.S.A. in the euqalisation of expenditures relates to:

> "a frenetic period of litigation to overturn those state school finance systems which produced wealth-related disparities in per pupil spending among districts within a state"[1]

In reviewing what has taken place it is necessary to bear in mind:

(i) the distinction between the federal legal system and that of each state and the crucial point that state courts and legislatures are autonomous and cannot be overridden at federal level unless a principle of federal law is involved

and

(ii) the fact that where a written constitution exists any piece of legislation may be brought before the courts as allegedly violating the constitution, a situation that cannot arise in the U.K.

Although there had been some previous litigation, nation-wide interest in inequalities in the financing of schools was raised by the case of Serrano v. Priest before the California Supreme Court in 1971 in which the court decided that the quality of a child's education could not be a function of the wealth of his parents and neighbours without violating the Fourteenth Amendment to the Constitution of the United States, which refers to the "fundamental rights" of U.S. citizens. In 1973, however, in the case of San Antonia Indépendent School District v. Rodriguez, the United States Supreme Court reversed the above decision[1]: it held that education was not a "fundamental right" under either the Fourteenth Amendment or any other part of the U.S. Constitution and that plaintiffs could only rely on any provision in the constitution of each state which

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1. See: Summary of State-wide School Finance Cases since 1973" Lawyers' Committee for Civil Rights under Law, School Finance Project, Washington, D.C. (1977), which referred to this ruling as "Lamentable".

might prescribe that the provision of education was an obligation on that state. Just one month later, in the case of Robinson v. Cahill, the New Jersey Supreme Court ruled that inequalities in the financing of schools must cease in that they did violate the state constitution which required the provision of "a thorough and efficient system of free public schools".

By February 1974, 59 such cases had been filed in more than 30 states. In the period of eighteen months following the Rodriguez case, seven states were ordered by their state courts to revise their school finance systems; thereafter the pace slowed but in the ensuing four years this situation was repeated in a further four states; both litigation, and related legislative reforms, have continued ever since[1]. This is not the place to consider all the legal niceties involved but a number of relevant economic issues do arise. Firstly, how equal do school expenditures in different districts have to be, i.e. what degree of variation is permitted? The California State Court ruled:

> "the state may not...permit...significant disparities in expenditures between school districts...disparities must be reduced to amounts considerably less than $100 per pupil"[2]

Why $100? Is this figure inflation-proof, or will it need to be revised annually? Secondly would equalisation of annual expenditure in dollars be a good thing and would it necessary induce greater

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1. The publication cited above, dated February 1977, listed pending or terminated cases in twenty-one separate states. Separate and detailed accounts of the local positions in each of California, New Jersey, Massachusetts, and Baltimore, may be found in R.W. LINDHOLM, ed.: "Property Taxation and the Finance of Education" (University of Wisconsin Press, 1974).

2. In Serrano v. Priest, Los Angeles County Court, 1974. This case is cited in the literature as Serrano II since it represented a reintroduction of the original Serrano v. Priest case, on new grounds, following the decision of the U.S. Supreme Court referred to previously. The court held that in any attempt to justify the need for educational provision to be a function of district wealth, the onus of proof lay on the state and not on the plaintiff and the state failed to so prove. See B. LEVIN, op. cit.

equality of educational provision? The New York Supreme Court accepted the submission of the four largest cities in New York State that it would not: these cities argued that they faced a combination of exceptionally high costs and an above average proportion of disadvantaged students for whom high levels of expenditure were required. The Court held that the school systems must seek to equalise educational output rather than input, such output being defined as:

> "that educational opportunity which is needed in the contemporary setting to equip a child for his role as a citizen and as a competitor in the labour market"

The problems involved in interpreting and/or enforcing at law such a vague statement seem on the face of it to be insurmountable but a somewhat similar, if more specific, approach was adopted by the Seattle, Washington, Court which suggested that standards of schooling in Seattle must be raised to at least the average for the rest of the state: On one calculation this would have required expenditure on education in Seattle to be raised immediately from $47.3m to $72.8m (for 1975/6). (The court ignored the mathematical point that such action would raise the state average, which would in turn require a further adjustment, and so on - perhaps a sort of economic equivalent of the Uncertainty Principle of Werner Heisenberg[1]?) Other courts (in New Jersey and Texas) have held that a minimum adequate standard of education must be provided in all districts, above which variations may be permitted whilst the California Supreme Court held

> "that parent-taxpayers of children in some school districts may not be required to pay significantly higher tax rates than parent-taxpayers in other school districts"[2]

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1. Physical Science Study Committee: "Physics", 2nd edition (Heath, 1965).

2. B. LEVIN, op.cit.

New Laws have been passed in many states to include such measures as maximum tax rates, maximum revenue levels, ceilings on the annual rate of increase in per pupil expenditure, or changes in measures of district wealth and in most of these states further lawsuits have followed to challenge the new measures. (One commentator illustrates the clash of interests by showing that in many states traditionally such issues have been decided by referenda, in which only property owners have been permitted to vote.[1]) The ensuing position has become extremely complex, with considerable variations from one state to the next and few states left unaffected[2]. One report argues strongly that in many states the education statistics available do not enable one to identify whether inequality exists in any meaningful sense and if so to what extent:

> "most states do not have the capability to conduct a systematic analysis of their own school finance programme"[3]

To seek to equalise educational expenditure at the level of school districts might seem a daunting enough task but in a further, highly publicised, lawsuit, Hobson v. Hansen before the Washington, D.C., Court, the issue was that of unequal levels of expenditure between individual schools within a district. (i.e. instead of

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1. R.S. HARRISON, op.cit., who also writes: "Preoccupation with equalizing aid formulas is a delusion and a snare in the achievement of equitable funding".

2. It is not possible to give here details of all the financial changes introduced. An earlier report gave such details to date and also listed fifty separate publications on this subject which all appeared between 1970 and 1973: L. MUSMANNO and A.C. STAUFFER: "Major Changes in School Finance: Statehouse Scorecard", Education Commission of the States, Department of Research and Information Services, Research Brief Vol. 2, No. 2 (May 1974).

3. DR. MARY F. WILLIAMS: "Dollars and Sense, A Guide to the Data and Statistics of School Finance", Legislators' Education Action Project, National Conference of State Legislatures (1976).

district school boards suing the state, a board found itself being sued by a parent). This case was also noteworthy in that prominent economists were invited to present the economic and statistical arguments to be put forward by each side.[1] Regrettably, however, the Judge had to find not only that parts of their reports were in such technical language that they could not be read or understood by laymen but also:

> "the studies by both experts are tainted by a vice well known in the statistical trade - data shopping and scanning to reach a pre-conceived result; and the court has had to reject parts of both reports as unreliable because biased."

Differences in per-pupil spending in the public school system of Washington, D.C. were, of course, viewed by the plaintiff and the bodies supporting him as an aspect of racial segregation: the underprivileged schools containing largely black children were shown to have worse pupil/teacher ratios, less well qualified and less well paid teachers, and lower expenditures per pupil, than other schools. A major counter-argument put forward by the defence was that since substantial economies of scale existed in the larger schools, no conclusions regarding inequality of educational provision could be drawn. To these and other points (for example that predominantly white schools had older and longer-serving teachers who were naturally on higher salaries), the court ruled that "dollars count unless proven otherwise" and the defendants were largely unable to prove their assertions to the satisfaction of the court. The court considered that expenditure on such items as heating or vandalism might vary widely for a number of good reasons and even

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1. Their reports, together with a separate Introductory note, were published in The Journal of Human Resources, Vol. 7, No. 3, Summer 1972, as follows: W.H. CLUNE III: "Law and Economics in Hobson v. Hansen, an Introductory Note"; S. MICHELSON (for the plaintiffs): "Equal School Resource Allocation"; D.M. O'NEILL, B. GRAY, S. HOROWITZ (for the defendants): "Educational Equality and Expenditure Equalization Orders"; MICHELSON cites several other related but less well publicised attempts by under-privileged parents to sue school boards.

such items as teaching materials, text books and field trips were considered problematical so no order was made about any of these; for teachers' salaries and benefit expenditures, however, the court ordered that

> "expenditures...in any single elementary school...shall not deviate by more than 5 per cent from the mean per-pupil expenditure for all teachers' salaries and benefits" in the District of Columbia.

and as a consequence the school board has had subsequently to embark on a programme of transferring some of its more highly paid teachers to some of the more underprivileged schools. Barnett and Topham, of the University of Salford considered how some of these issues might be related to traditional economic theory.[1]

Could it ever happen here? Could an English Local Education Authority one day find itself being sued by a parent on the grounds that the Authority was not spending as much on the education of his or her child as it was (or some other L.E.A. was) on the education of some other child? It is difficult to imagine that a replication of the American experience could occur in this country in the foreseeable future partly because of the different constitutional and legal background and partly because variations in patterns of educational expenditure or attempts to equalise same have never aroused as much interest in this country as in the U.S.A. In California, for example, as early as 1965 the legislature commissioned an enquiry into ways of reducing inequalities in education and recommended, inter alia, the establishment of state-wide uniform salary scales for teachers, resource equalizing grants to aid poorer districts, uniform rates of local taxation in all districts, and additional grants for "Low Achievement Schools". California was shown

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1. R. BARNETT and N. TOPHAM: "Achievement grants and fiscal neutrality in school finance", Applied Economics, Vol. 9, 1977.

to be of particular interest since it had both the largest school system of any state (with 4.3m pupils against the next largest, New York, with 3.2m) and the highest per capita expenditure on education (with $165 against the next highest, Alaska, $153)[1].

A very large number of other studies have been published in the United States referring to patterns of educational expenditure, often attempting to link expenditure to one or more variables representing educational attainment. In total there have been so many books and articles that it would not even be possible to mention them all: inevitably it seems a rather sad comment to have to compare this plethora of studies with the very limited interest in such work in the United Kingdom. A number of American studies have as their main focus the question of economies of scale either in schools or in school districts and these will be considered separately in Chapter 8. The remainder of this chapter will survey what appear to be the most interesting or most relevant of the remaining studies.

H.M. Levin has demonstrated the very significant growth in expenditure per pupil in real terms, i.e. after removing the effects of inflation, in U.S. schools: from 1961-62 to 1971-72, for example, current expenditure per pupil in real terms rose by over 60%[2].

One exhaustive report on New York schools by a New York State Commission[3] notes substantial improvements in the quantity and quality of resources available to the educational system over the

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1. C.S. BENSON et al, eds.: "State and Local Fiscal Relationships in Public Education in California", Report of Senate Fact Finding Committee on Revenue and Taxation (Publ. by Senate of State of California, March 1965). The figures quoted are for 1963-64.

2. H.M. LEVIN: "Concepts of Economic Efficiency and Educational Production", in J.T. FROOMKIN, D.T. JAMISON and R. RADNER, eds.: "Education as an Industry" (N.B.E.R./Ballinger, 1976).

3. "The Fleischmann Report on the Quality, Cost and Financing of Elementary and Secondary Education in New York State", New York State Commission (Viking Press, 1973).

forty-year period to 1971 but found such resources, and particularly teacher/pupil ratios and average teachers' salaries, to vary widely from one school district to another (let alone within districts), despite the fall in the number of school districts over the same period from 9,118 to 760. It was largely because of such inconsistencies that the Commission recommended that the prime responsibility for financing education should be transferred from the school district to the state. The Commission strongly affirmed its belief in the need to move towards greater equality in educational expenditure, in the following terms:

> "the state cannot permit individual districts to tap a portion of the state's wealth for educational increments or "add-ons" for their children while children elsewhere are deprived of similar increments by reason of either the relative low wealth or relative lack of concern for education of the district in which they happen to reside..."
>
> "It is repugnant to the idea of equal educational opportunity that the quality of a child's education, in so far as that education is provided through public funds, is determined by accidents of birth, wealth, or geography; that a child who lives in a poorer district is, by reason of that fact alone, entitled to lower public investment in his education than a child in a rich district. It is unconscionable that a poor man in a poor district must often pay local taxes at higher rates for the inferior education of his child than the man of means in a rich district pays for the superior education of his child. Yet, incredibly, that is the situation today in most of the 50 states, and that is the case in New York. The New York State school system does not provide educational equality. In fact, its structure insures the continuance of basic inequality in educational revenue raising and expenditure."

The report goes on to illustrate the inequalities by statistics for two apparently typical Long Island school districts, the wealthy Great Neck and the poor Levittown, which levy identical rates for the local property tax which is the main source of funds for education: the former derives four times as much per pupil from this rate as the latter, due to its much higher property values and, despite a smaller state grant, ends up spending nearly 80% more on each pupil

than does Levittown. These are by no means extreme cases: one other district had expenditure per pupil of less than half that of Levittown. The Commission proposed a number of measures for remedying this situation of which the most immediate were:

> "we propose that expenditures of all districts be brought up to the level of the district spending at the 65th percentile in a ranking of districts according to their Base Expenditures."

and

> "we propose that students who score at a low level in reading and mathematics achievement be weighted at 1.5, as against a weighting of 1.0 for other children",

the latter point obviously referring to the fact that the poorest districts also have the highest proportion of disadvantaged children.

A major conceptual problem with any movement towards greater equality is the identification of exactly what is to be equalised. One review noted:

> "An equity criterion should also go beyond resource availability as a measure of equity. Educational opportunity involves achievement as well. And to date there is little evidence that greater resources alone will reduce disparities in achievement levels"[1]

and went on to quote from a survey conducted for the President's Commission on School Finance:

> "research has found nothing that consistently and unambiguously makes a difference in student outcomes"[2]

In so far as relationships between resources and performance have been identified, it appears that differences in physical resources are rather unimportant and that teacher characteristics, especially verbal ability, have more consistent effects. This at least was one of the conclusions of the Coleman report which has been termed the largest

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1. A.M. CRESSWELL: "Pitfalls and Policy Analysis in School Finance Reform" in R.W. LINDHOLM, ed.: "Property Taxation and the Finance of Education" (University of Wisconsin Press, 1974).

2. H.A. AVERCH et al: "How Effective is Schooling? A Critical Review and Synthesis of Research Findings", A Report to the President's Commission on School Finance (Rand, 1972).

and most comprehensive study ever made of the U.S.A. school system.[1] Unfortunately (from the point of view of the movement towards equalization of educational resources), the report also found that all the within-school factors considered had much less effect, on variations in children's verbal achievement, than did the children's own background and attitudes.

A study of educational expenditure in large cities of the U.S.A. by James, Kelly and Garms[2] described the extreme inequalities involved (taxable property per head, for example, varied from Philadelphia's $2,862 to San Francisco's $10,826, in 1960) but, in spite of many ambitious statistical calculations, was able to identify practically no clear relationships between educational expenditures and any other relevant variables applying in all the fifteen cities studied; as anticipated the most wealthy districts tended to have the highest levels of expenditure but significant differences in this and all other relationships were found for different geographical areas, the south often showing marked contrasts to the more northern cities. A subsequent study of high schools in one large city, Chicago, by Burkhead, Fox and Holland[3] found little in the way of very clear relationships between school inputs and output: out-of-school variables appeared as more important than in-school variables and within the latter there was some evidence that teachers were a more important influence than buildings but many of the relationships investigated were statistically not significant. The authors also

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1. J.S. COLEMAN et al: "Equality of Educational Opportunity, Summary" (Government Printing Office, Washington, 1966). For criticisms of the Coleman report see H.M. LEVIN: "New Model of School Effectiveness" in "Do Teachers Make a Difference?" (U.S. Office of Education, Bureau of Education Professions Development, 1970); S. BOWLES and H.M. LEVIN: "The Determinants of Scholastic Achievement - An Appraisal of some recent evidence" (Journal of Human Resources, Vol. 3, No. 1, 1968, and F. KERLINGER and E. PEDHAZUR: "Multiple Regression in Behavioural Research" (Holt, Rinehart, 1973).

2. H.T. JAMES, J.A. KELLY, W.I. GARMS: "Determinants of Educational Expenditures in Large Cities of the United States" (U.S. Office of Education, "Eric" Report, 1966).

3. J. BURKHEAD, T. FOX and J. HOLLAND: "Input and Output in Large-City High Schools" (Syracuse University Press, 1967).

commented:

> "What is disturbing is that...so little careful assessment is made of the contribution of additional resources devoted to one or another purpose...little attention has been paid to educational productivity...an absence of research that attempts to measure the relationships between costs and educational outputs of particular programs"

A third look at educational resources in large American cities[1], by Owen, used data for nine large cities to show that expenditure on teacher salary per pupil was lower in low-income and non-white neighbourhoods and that teachers in such areas were less experienced and had lower verbal ability scores than teachers in other areas. Overall there was:

> "a significant tendency for higher quality educational resources to be assigned to middle-class white neighbourhoods"

and

> "the typical urban teacher assignment system concentrates the lowest-salaried teachers in the slums and ghettos".

A prime reason was that the more experienced and more able teachers tended to request and be granted transfers to the more middle-class schools, leaving vacancies in the deprived schools to be filled by inexperienced and newly-qualified staff, plus the fact that in all but one of the nine cities the disadvantaged schools had worse staff/student ratios.

Carroll[2] investigated:

> "how local school districts behave in allocating their budgets among the main categories of school inputs"

and arrived at conclusions which suggested that in any adjustments

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1. J.D. OWEN: "The Distribution of Educational Resources in Large American Cities", Journal of Human Resources, Vol. 7, Winter 1972. Owen's findings were challenged by D.E. FREY: "The Distribution of Educational Resources in Large American Cities - A Comment", Journal of Human Resources, Vol. 8, Fall 1973 but, needless to say, Frey's points were refuted by Owen in "A Reply" published in the same issue.

2. S.J. CARROLL: "School District Expenditure Behaviour", Journal of Human Resources, Vol. II, No. 3, 1976.

at the margin, e.g. in any increases in expenditure following the school finance reforms referred to earlier, districts' marginal allocation of resources would be quite different from their average allocation of resources. In the latter, teachers' salaries were easily the most important item yet the indications were that in any marginal adjustments this item would change very little whereas non-teacher salaries would increase far more than proportionately. This finding resulted from regression analysis involving the use of nine separate variables but no reasons could be given for this result.

Thomas[1] studied the relative effects on the verbal scores of Negro students of (i) within-school variables and (ii) socio-economic background variables and found, contrary to Coleman, that the former, and particularly those relating to specific teacher attributes, did have important effects. Similarly, Klitgaard and Hall[2] looked at whether certain schools consistently produced exceptionally good results on reading and mathematics achievement tests, after due correction had been made for socio-economic background. After describing the notion that no clear relationship could be found between student learning and within-school variables as:

> "perhaps the most counter-intuitive finding in public policy research in the past decade"

Klitgaard and Hall assessed those schools whose scores were one standard deviation or more above the mean, calculated variation due to chance via the binomial distribution and then compared this theoretical chance distribution with the actual distribution via a chi-square test.

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1. J.A. THOMAS: "The Productive School" (Wiley, 1971).

2. R.E. KLITGAARD and G. HALL: "Are there unusually effective schools?", Journal of Human Resources, Vol. X, No. 1, Winter 1975.

Contrasting results were found for different groups of schools; for Michigan rural schools, for example,

> "the chi-square tests showed more consistently overachieving schools than chance alone would allow"

and there was a tendency for the same schools to re-appear as "exceptional" in successive years. For other groups of schools, however, the conclusions were the reverse. A similar aim of hoping to relate school inputs to performance may be found in the report by Tuckman[1] of research into 1,001 public senior high schools completing questionnaires for the U.S. Census Bureau, a further 6,700 replies not being useable since information on one or more variables were missing. The variables "percentage of teachers with 10 or more years of teaching experience" and "percentage of students who are male" were found to always have significant effects on school performance but "percentage of teachers with masters degrees" was not significant. Overall students' home and social background variables were shown to have much greater effects than within-school variables, the effect of the latter frequently being to reinforce the former[2]. A pessimistic conclusion as to what schools could achieve was reported by Barnow who conducted a detailed study of primary schools in Pennsylvania and concluded:

> "The effects of the school inputs have been statistically insignificant although usually of the expected sign,"

although the writer stressed the difficulties involved in measuring school inputs and outputs[3].

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1. HOWARD P. TUCKMAN: "High School Inputs and their Contribution to School Performance", Journal of Human Resources, Vol. 6, No. 4.

2. Tuckman's findings, and particularly the significance of the variable "percentage of students who are male", were criticised by J.C. HAMBOR, L. PHILLIPS, and H.L. VOTEY: "High School Inputs and their Contribution to School Performance, A Comment", Journal of Human Resources, Vol. 8, 1973, Part 1. The latter suggested that Tuckman's results may have been distorted by heteroscedasticity.

3. B.S. BARNOW: "The Production of Primary Education in Pennsylvania", University of Pittsburgh Working Paper No. 14, May 1975.

Baron's study of Chicago schools[1] in the early 1960s found some, albeit limited, tendency over time toward greater equality between school districts, and between individual schools, but that by the end of the period considered suburban schools were still spending significantly more on each child than were their central city counterparts. Baron found that:

> "...in a large school system, seemingly run by uniform and impersonal regulations, there was a persistent bias in the allocation of funds which favoured white pupils and those with higher socio-economic position"

and that when additional federal funds started to become available, these:

> "...have gone to peripheral activities that have not affected the regular programs; therefore they give little evidence of improving the quality of basic education".

In contrast Katzman's study of schools in Boston, Massachusetts[2], found that whilst inequalities persisted the overall effect of the city's schooling system was in fact to lessen them:

> "Paradoxically the Boston public school system, despite its inequalities, more effectively narrows the gap in educational opportunities afforded different income groups than do the fiscally autonomous small towns. Low income districts in Boston receive more expenditures per child and have more highly trained staffs than small towns of equal or higher income. On the other hand, high income districts in Boston, receive less expenditures per child than small towns of equal income".

The later investigation by Summers and Wolfe[3] of data for Philadelphia schools reached broadly similar conclusions, the more privileged schools having more experienced principals, fewer teaching vacancies, and teachers who are more experienced, themselves went to "better" schools, had higher examination scores and had more education credits beyond the B.A. Bartell wrote, in largely descriptive terms of the

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1. H.M. BARON: "Race and Status in School Spending, Chicago, 1961-1966", Journal of Human Resources, Vol. 6, 1971, Part 1.

2. M.T. KATZMAN: "Distribution and Production in a Big City Elementary School System", Yale Economic Essays, Spring 1968.

3. A.A. SUMMERS and B.L. WOLFE: "Intradistrict Distribution of School Inputs to the Disadvantaged - Evidence for the Courts", Journal of Human Resources, Vol. 11, No. 3, 1976. For a fuller report see Summers and Wolfe "Which School Resources Help Learning?", Federal Reserve Bank of Philadelphia Business Review, February 1975.

unequal expenditure patterns of some 150 Catholic schools in San Francisco and Youngstown[1]; Marco[2] calculated correlation coefficients between thirty separate within-school variables for seventy schools but had to conclude that any attempt to assess school effectiveness by such a method was highly problematical. A consideration of the theoretical problems involved in formulating an input-output model of a school was given by Cohn (1971)[3] whilst other attempts to relate school input and output variables were reported by Hanushek[4], by Hanoch[5] and by Morgan and Sirageldin[6]. A number of other studies are cited in the extensive literature reviews given in each of Cohn (1975)[7] and Guthrie et al[8].

A review of some of the problems involved in such studies was given by Huberman[9] of the University of Geneva who noted, with

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1. E. BARTELL: "Costs and Benefits of Catholic Elementary and Secondary Schools" (University of Notre Dame Press, 1966).

2. G.L. MARCO: "A Comparison of Selected School Effectiveness Measures based on Longitudinal Data", Journal of Educational Measurement, Vol. 2, No. 4, Winter 1974.

3. E. COHN: "Economic Rationality in Secondary Schools", Planning and Changing, Vol. 1, 1971.

4. E. HANUSHEK: "Teacher Characteristics and Gains in Student Achievement: Estimation Using Micro Data", American Economic Review, Vol. 61, 1971.

5. G. HANOCH: "An Economic Analysis of Earnings and Schooling", Journal of Human Resources, Vol. 2, Part 3, Summer 1967.

6. J. MORGAN and I. SIRAGELDIN: "A Note on the Quality Dimension in Education", Journal of Political Economy, 1969.

7. E. COHN: "Input-Output Analysis in Public Education", (Ballinger, 1975).

8. J.W. GUTHRIE, G.B. KLEINDORFER, H.M. LEVIN, R.T. STOUT: "Schools and Inequality" (M.I.T. Press, 1971).

9. M. HUBERMAN: "Evaluating the Effectiveness of Schooling", International Review of Education, Vol.19, 1973.

regret, that:

> "in most countries, the total sum of resources and energies goes into carrying out routine operations and into maintaining salaries, supplies and the physical plant. This leaves little time or funds for planning, diagnosis and innovation. Research and evaluation functions are seldom built into school operations and, when they are, tend to be taken up with administrative data-collecting and book-keeping. Curiously enough, national education officials have not been willing in the past to invest significant amounts of public funds in experimentation or evaluation of the school system".

A number of other relevant points emerge from the essays printed in two major O.E.C.D. reports[1] and from the interesting discussion of cost-aspects of education given by Ahmed.[2]

It would clearly be impossible to attempt to give any neat summary of such a large and diverse body of literature from which, it has to be admitted, few clear or very convincing conclusions emerge. The various writings cited point to continuing inequalities in education, both regarding expenditure and from other points of view, in the U.K., the U.S.A., and elsewhere, and they give little cause for satisfaction or complacency. Clearly very much more work has been done in other countries, especially the U.S.A., than in the U.K. Very many of the books and articles cited urge the need for more detailed studies of educational costs especially at the level of individual educational institutions. It is hoped that the work described in the remainder of the present thesis will make some small contribution towards filling this gap.

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1. "Budgeting, Programme Analysis and Cost-Effectiveness in Educational Planning" (O.E.C.D., Directorate for Scientific Affairs, Paris, 1968) and "Efficiency in Resource Utilization in Education". (O.E.C.D. Directorate for Scientific Affairs, Paris, 1969).

2. M. AHMED: "The Economics of Nonformal Education - Resources, Costs and Benefits" (Praeger, 1975).

CHAPTER 3. COSTS IN ECONOMIC THEORY

Throughout this work there will be references to various aspects of costs and it therefore seems necessary to include a review of the standard presentation of the place of costs in economic theory. This material is presented here with the aid of fairly copious use of diagrams; identical conclusions can also be reached algebraically but the latter presentation tends to be less acceptable to less mathematically minded readers. In order to emphasise that all the material used in this chapter is quite standard and that there is no suggestion that any originality is being attempted here, the diagrams used have all been photocopied from well-known economics text-books. One consequence is that the nomenclature used for variables tends to change slightly from one diagram to the next. This chapter includes no direct references to education but cross-references to the theoretical material presented here will appear in subsequent chapters.

Any discussion of costs in economics must commence with the productive process. The basic unit of economic production is the firm, which utilises a variety of inputs (a, b, c) to produce an output (x), as expressed in the production function:

$$a = f(a, b, c).$$

> "the physical relation between the firm's input of resources and its output of goods or services per unit of time, leaving prices aside"[1]

Whenever the firm has to decide, at the margin, to increase (or decrease) output, it can either:

(i) increase (or decrease) the quantities used of all resources,

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1. R.H. LEFTWICH: The Price System and Resource Allocation, 4th edition, 1970 (Holt, Rinehart, Winston). Although diagrams are used throughout the remainder of this chapter, the production function itself cannot be presented diagrammatically since, in the form used above, it includes four variables: x, a, b, and c.

the proportions in which they are combined remaining unchanged,

or,

(ii) vary the proportions in which the resources are combined,

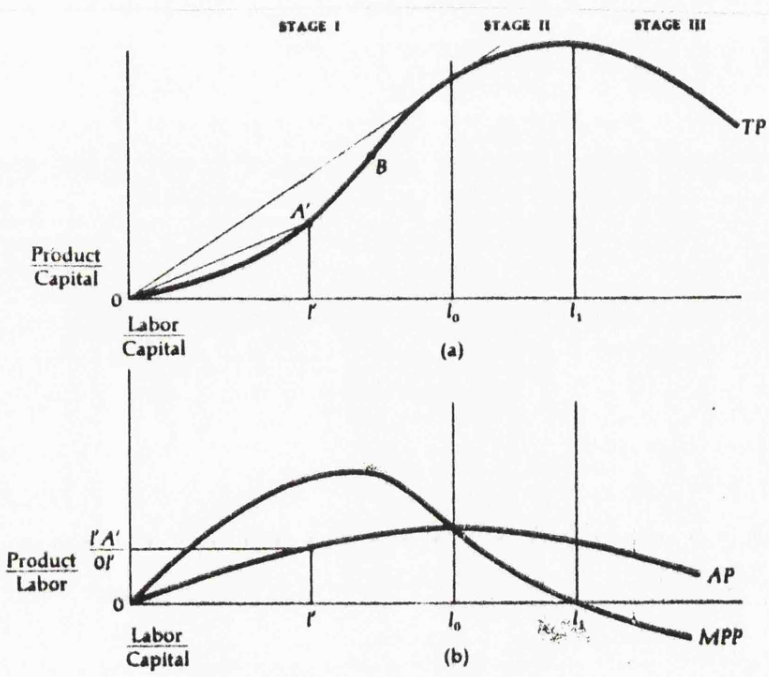
i.e. perhaps increasing (or decreasing) the quantity used

of one factor of production only.

Option (i) will be available only in the long-run, a period sufficiently long that all factors can be varied, option (ii) will be available in both the long and the short-run.

In the former case, the characteristics of the production function will determine whether increasing, constant, or decreasing returns to scale will obtain. In the latter case, as increasing quantities of one factor (say, labour) are applied to constant quantities of one or more other factors (say, capital), successively increasing, constant, and decreasing returns to the variable factor must apply: beyond B in Diagram 1 (a) equal increments of labour result in successively smaller increments in total product; this is also indicated in (b) by the shape of the marginal physical product curve which declines from this point on. Between l_o and l_1 whilst the marginal physical product of labour is declining, the marginal physical product of capital is still increasing. Total product is maximised at l_1.

Diagram 1



TP = Total Product
AP = Average Product
MPP = Marginal Physical Product

(To the right of l_1 total product per unit of capital would even decline, although no firm should normally find itself in such a position).

All this tells us little about the optimum efficiency point for the firm until we have details of the prices it will have to pay for the factors in question, i.e. of their relative costs to the firm: if the relationship between ouput (X) and two factors of production (A,B) is viewed, from the origin, as an initially concave and subsequently convex surface in a three-dimensional diagram, as in Diagram 2 (a) overleaf[1], and contour lines are drawn around the surface and projected downwards, these give, as in (b), isoquants, i.e. lines connecting all combinations of A and B at which the specified output, in this case x_3, can be produced. An isoquant map, as in Diagram 3 overleaf[2], shows the relationship of successive isoquants as output is increased (or decreased) via changes in the quantities of all the factors, the feasible set of points for the firm lying within the boundaries OC and OD. The downward slope, from left to right of each isoquant indicates the degree of technical substitutability of factors which in turn is determined by the parameters of the original production function, whereas the distance apart of successive isoquants indicates returns to scale or degree of homogeneity of the production function.

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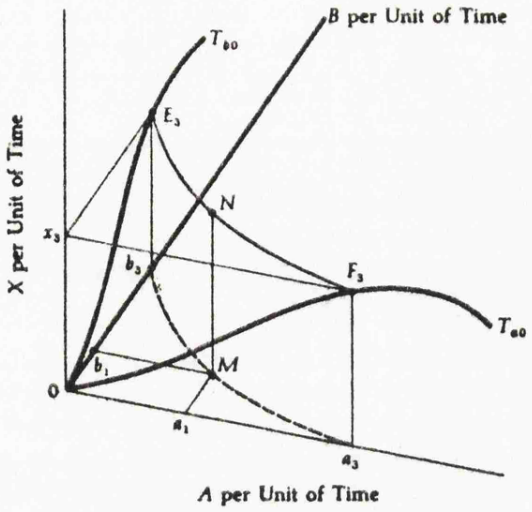
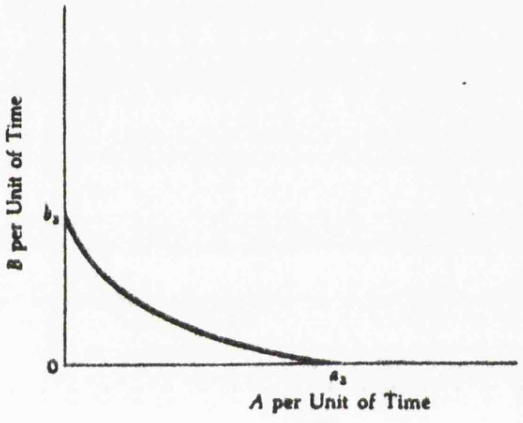
1. R.H. LEFTWICH: The Price System and Resource Allocation, 4th Edition, 1970 (Holt, Rinehart, Winston).

2. idem.

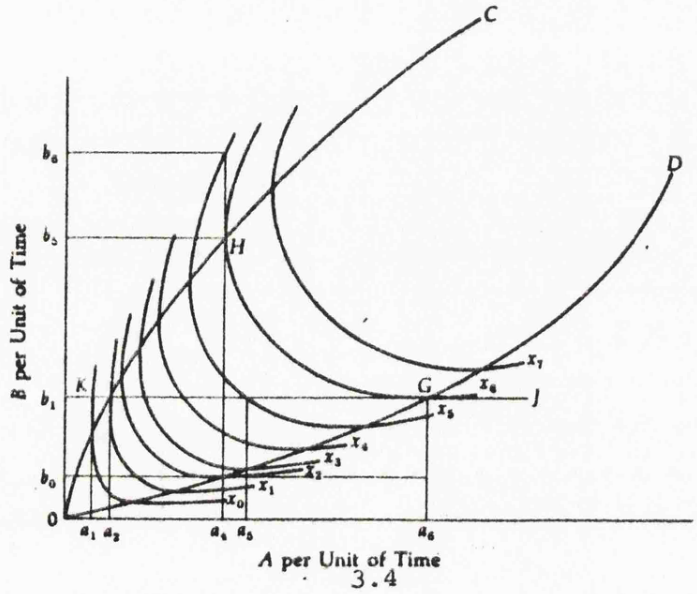
Diagram 2





A, B = Inputs
X = Output
T = Total Cost

Diagram 3

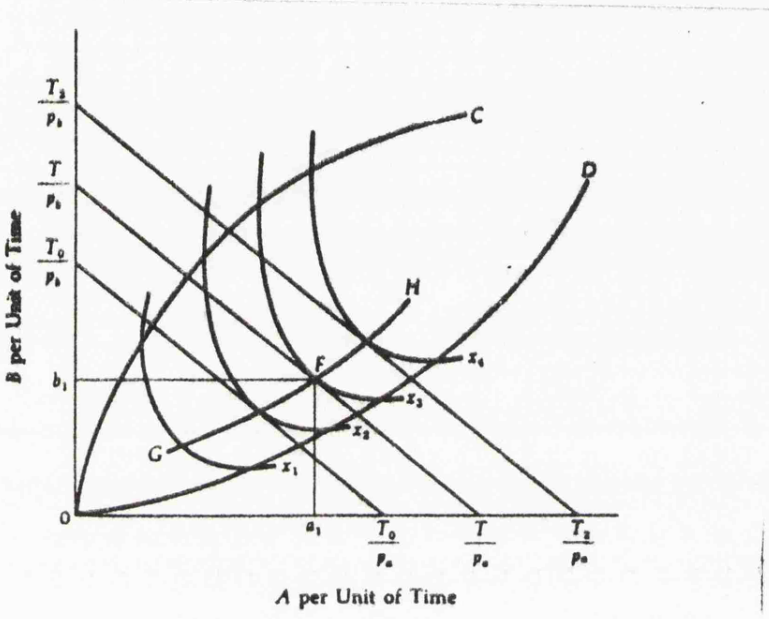


3.4

A, B = Inputs
X_i = Levels of output

If now, as in Diagram 4, we add[1] the ratio of factor prices or isocost lines, we find the Least-Cost Combinations of the factors for each level of output. Equilibrium points for the firm are therefore located

Diagram 4



T = Total Cost
Pa = Price of a
Pb = Price of b

along its expansion path, GFH. At each equilibrium point the isocost line is tangential to the isoquant, or, in terms of their respective slopes, which must be identical at that point,

$$\frac{P_A}{P_B} = \frac{MPP_A}{MPP_B}$$

Expansion and substitution possibilities open to the firm in the short- and long-run can clearly be seen with the aid of isoquant

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1. R.H. LEFTWICH: The Price System and Resource Allocation, 4th Edition, 1970 (Holt, Rinehart, Winston).

diagrams. In the long-run, assuming relative factor prices stay unchanged, expansion along GFH as above represents the optimal expansion path (and since, over the three equilibrium points shown, the isoquants are equally-spaced, there are constant returns to scale). If relative factor prices do change, as in Diagram 5, the firm will move to a new equilibrium point on the new isocost line[1]: if initial equilibrium was at A, after a relative price switch against K and in favour of L (either rise in price of K, or fall in price of L, or both), the equilibrium position moves to B, the input of L increasing, the input of K decreasing, whilst output, X, stays constant.

Diagram 5

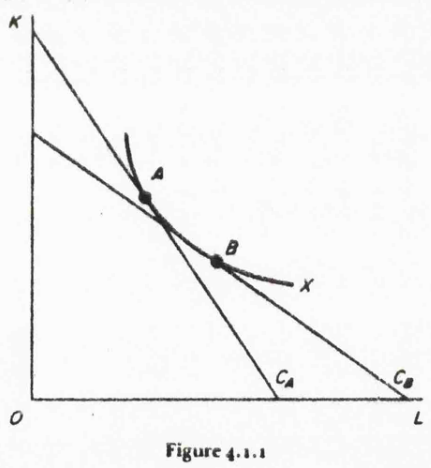


Figure 4.1.1

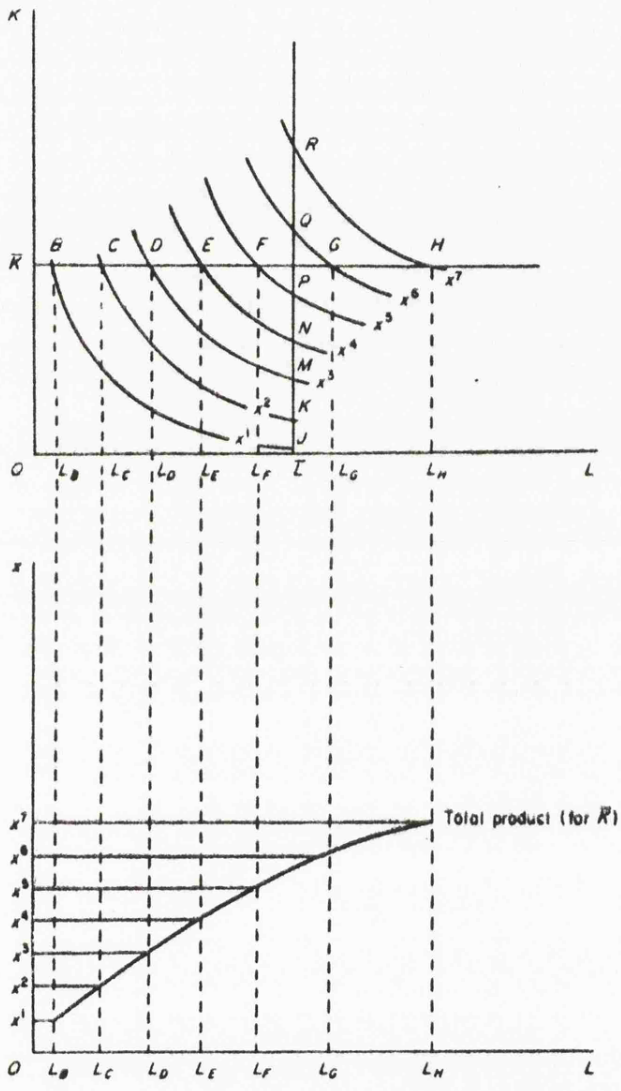
K = Capital
L = Labour

---

1. From W.J.L. RYAN, Price Theory (revised edition, revised by D.W. PEARCE, 1977, Macmillan).

In the short-run,[1] however, the firm cannot vary the quantity of the fixed factor, K, as in diagram 6.

Diagram 6



$\bar{K}$ = Fixed quantity of K

$\bar{L}$ = Fixed quantity of L

---

1. From W.J.L. RYAN, Price Theory (revised edition, revised by D.W. PEARCE, 1977) (Macmillan).

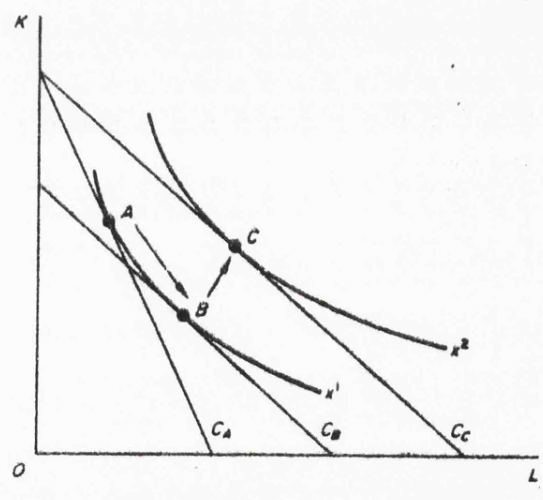
Hence the short-run expansion path, BH, can only consist of applying successively greater quantities of L to the fixed quantity of K, in which case diminishing returns must eventually apply: this is indicated by the insoquants being spaced further and further apart along BH, i.e.

$$x^7 - x^6 = x^6 - x^5, \text{ but}$$

$$L_H - L_G > L_G - L_F$$

The lower part of Diagram 6 shows the same situation on the total product curve, which is converging exponentially on its maximum level. Short-run adjustment to a change in relative factor prices is shown[1] in Diagram 7.

Diagram 7



K = Capital
L = Labour

If the initial equilibrium was at A and then the price of L falls, a new equilibrium position would be at C, K being unchanged, X^1 increasing to X^2, and L increasing from C_A to C_C; the diagram shows this move decomposed into substitution effect (AB) and income effect (BC).

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1. From W.J.L. RYAN, Price Theory (revised edition, revised by D.W. PEARCE, 1977) (Macmillan)

the above discussion has been presented in terms of

(i) a clear dichotomy between the short-run and the long-run,

(ii) a single-product firm,

and

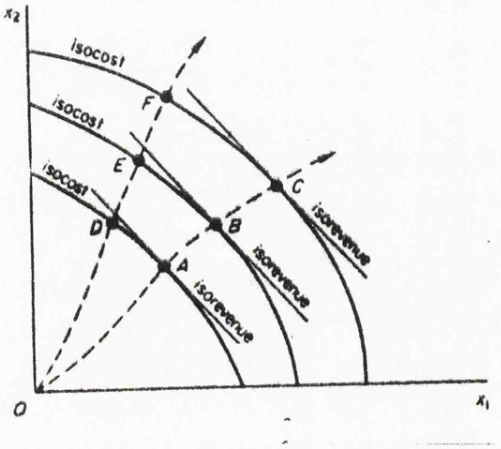
(iii) continuous variations in the factors being possible

In practice, however,

(i) the difference between the short-run and the long-run may be very much a matter of degree with a number of intermediate positions possible, depending on the nature of the product and factor(s) in question, for example, new equipment may be obtained more speedily by incurring higher costs.

(ii) the majority of firms are multi-product and the practical decision may revolve around, or include, the question of switching factor(s) between products. This, as diagram 8 shows[1], involves the rate of transformation of factors between

Diagram 8



x_1 = First product

x_2 = Second product

usage in the production of, in this case, x_1 and x_2, shown by the isocost lines, which at equilibrium must

1. From W.J.L. RYAN, Price Theory (revised edition, revised by D.W. PEARCE, 1977) (Macmillan) 3.9

be tangential to the isorevenue lines derived

from the prices of the two products,

and

(iii)many inputs are "lumpy" or evidence "indivisibities",

particularly e.g. large units of capital equipment,

and an uneven or discontinuous expansion path will

result.

It is apparent that the cost aspects of the production process depend crucially on previous decisions taken by the firm and on the pre-existing size of the plant in question. Thus we see in Diagram 9 that output OR can be produced by plant of size k(1) or k(2) or k(3), with short-run total costs indicated by RS, RT, and RU respectively.[1] Whilst plant size k(1) clearly gives lowest total costs RS for output OR, the firm cannot adjust to this point in the short-run if plant of size k(2) or k(3) is

Diagram 9

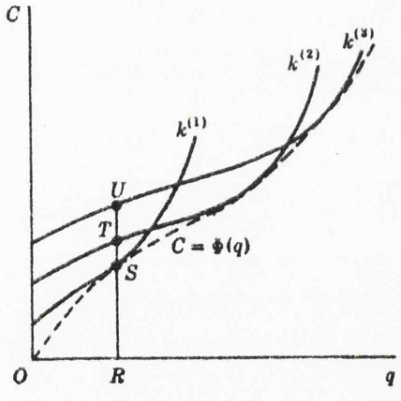


Fig. 3-9

OC = Total costs
OQ = Output
k^1, k^2, k^3 = Sizes of (capital) plant

already in existence. In the long-run, all such adjustments can be made and hence we have the resulting long-run cost curve (the dashed

---

1. J.M. HENDERSON and R.E. QUANDT: "Microeconomic Theory, A Mathematical Approach", 2nd Edition, 1971 (McGraw Hill).

line in the diagram, denoted C = $\bar{\Phi}(q)$ which gives the lowest cost level attainable for each output. Static diagrams can give a misleading impression here: as Professor Hicks emphasised long ago, whether it will be worthwhile for the firm to expand its capital plant to meet an increase in demand depends crucially on its view of whether this will be sustained over time:

Diagram 10

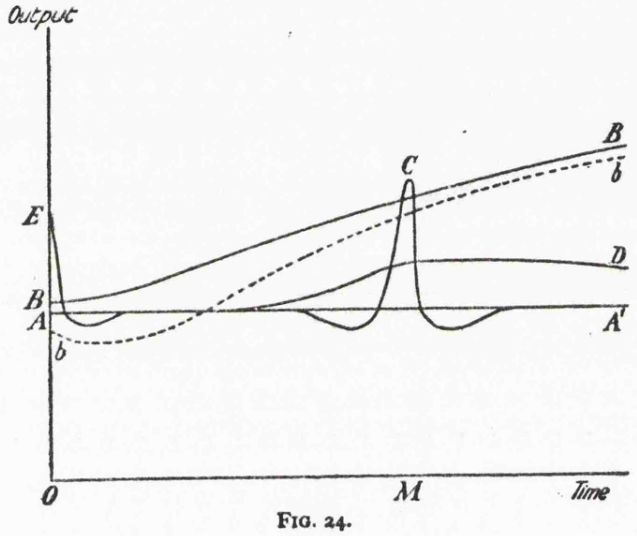


FIG. 24.

B,C,D = Patterns of demand over time.

In diagram 10 each of the lines denoted by B,C, and D, denote quite different patterns of demand over time, that indicated by C being particularly problematical for the entrepreneur[1].

In each of the short-run and the long-run, from total cost (TC) of production of N units per period of time, we derive average cost (AC) as:

$$AC = \frac{TC}{N} \text{ , and}$$

marginal cost (MC), the addition to total cost from increasing output by one unit, as:

$$MC = TC_N - TC_{N-1}$$

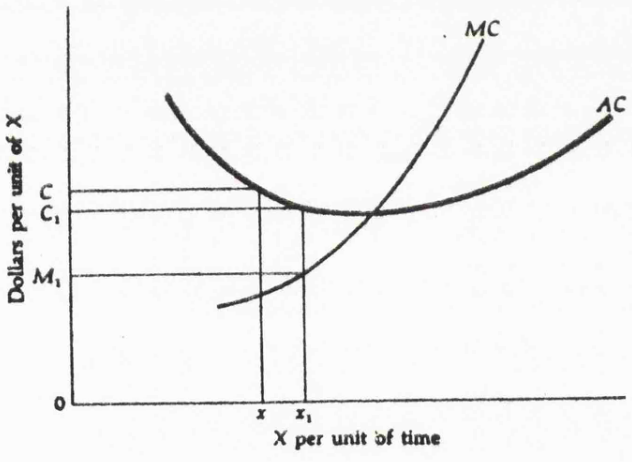
---

1. J.R. HICKS: Value and Capital, 2nd Edition (O.U.P., 1946).

The concepts of total and average per unit costs include both those costs which are fixed, and remain the same regardless of output, and those which are variable, and depend directly on the quantity produced; marginal costs can only relate to the change in variable costs. The shape of the Average Cost curve, as shown in Diagram 11, is a matter of some dispute[1]: as output expands, e.g. over the range x to x_1 shown, there are sound reasons for average costs per unit to fall but what is not certain is whether they will:

(i) reach some minimum point and then commence to rise, as is traditionally assumed and as the diagram shows,

Diagram 11



AC = Average cost
MC = Marginal cost
X = Output

(ii) reach some minimum level and then, over a fairly large range of output, stay at that level, before eventually rising (Empirical evidence for this view is provided by Professor Johnston's study of power

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1. R.H. LEFTWICH: The Price System and Resource Allocation, 4th Edition, 1970 (Holt, Rinehart, Winston).

stations of differing sizes, which is summarised in Diagram 12[1]).

Diagram 12

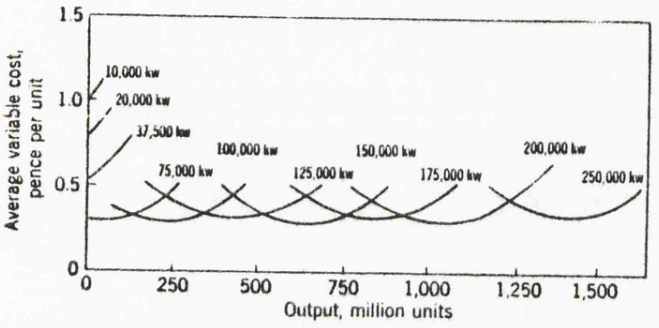

FIG. 4-11

or

(iii) continue falling throughout.

For different products and different industries, examples can be found of all three.

For each of the short-run and the long-run the Marginal Cost curve has a purely mathematical relationship with the Average Cost curve, being below the latter when the latter is falling, cutting through at the latter's minimum point and being above the latter when the latter is rising, as shown in diagram 10. On this there is no room for discussion. Therefore, when writers dispute the shape of the Marginal Cost curve, or the relationship between short-run marginal cost and long-run marginal cost, they are really reverting to the previous point about the shape of the Average Cost Curve. An example is when Professor Stigler suggests that, whilst short-run marginal cost must rise as output is expanded, long-run marginal cost may be horizontal over the potential output range, as in Diagram 13[2] :

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1. J. JOHNSTON: Statistical Cost Analysis (McGraw Hill, 1960).
2. G.J. STIGLER: The Theory of Price, (Macmillan, 4th edition, 1966).

Diagram 13

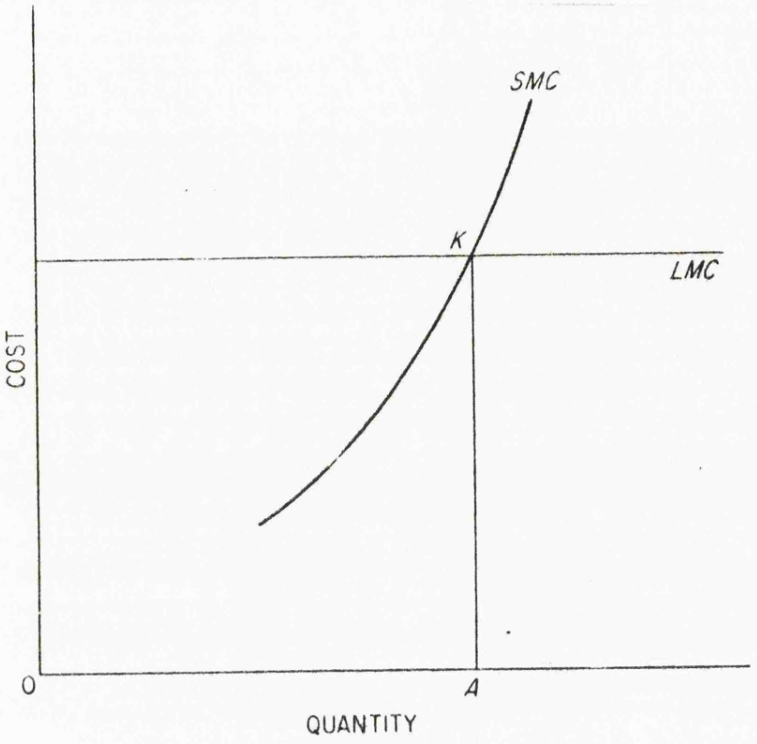
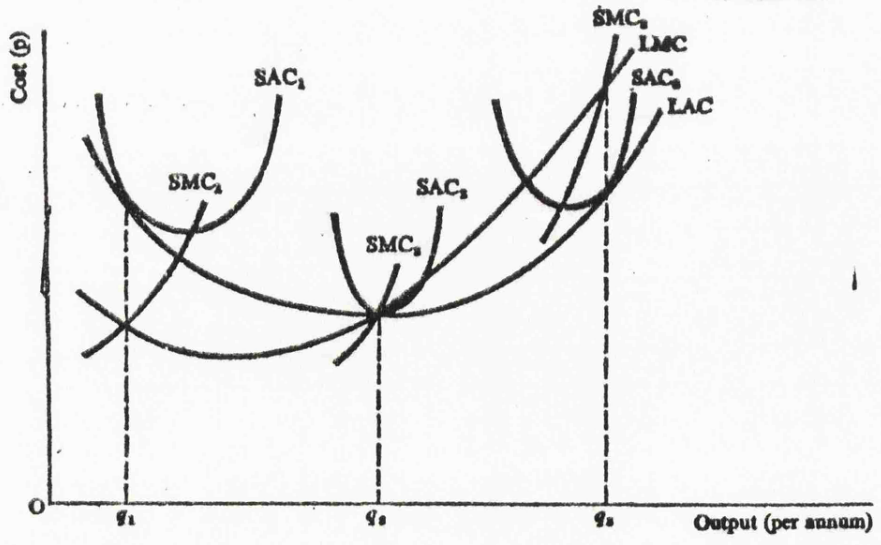


Figure 8-2

SMC = Short run marginal cost
LMC = Long-run marginal cost

The relationship between short-run and long-run marginal and average costs may be summarised as in Diagram 14[1] :

Diagram 14



SMC = Short-run marginal cost
SAC = Short-run average cost
LMC = Long-run marginal cost
LAC = Long-run average cost

1. M.G. WEBB: "The Economics of Nationalised Industries", 1973 (Nelson)

the long-run average cost "envelope" (LAC) embraces a succession of short-run average cost curves (SAC_1, SAC_2, SAC_3), each of which is tangential to LAC at one point only; at only one level of output (Oq_2) does this point occur at the minimum of either SAC or LAC. Each short-run marginal cost curve (SMC) cuts through each SAC at its minimum, as does LMC with LAC, and at each point of tangency of SAC and LAC, the corresponding SMC and LMC are equal (over an infinitesimally small range).

All of the above relates to the firm's private costs. These are to be distinguished from the social costs or externalities which arise from the production process, which the firm itself does not bear and which have become increasingly important in contemporary discussions of such matters as environmental pollution.[1] Economists in fact emphasise the opportunity cost approach, opportunity cost being defined thus:

> "the cost of any productive service to use A is the maximum amount it could produce elsewhere. The foregone alternative is the cost."[2]

Thus the opportunity cost to society of a specific quantity of product x being produced at a particular time refers to the alternative uses to which the resources in question could have been put and the term embraces social costs and private costs in the widest sense.[3] The firm using a building long-since paid for, or an entrepreneur giving freely of his spare time to his firm, should recognise that the lack of financial payment for, respectively, rent or overtime wages in no way lessens the fact that each represents an opportunity cost.

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1. See the classic article by R.H. COASE: "The Problem of Social Cost", Journal of Law and Economics, Vol. 3, October 1960.

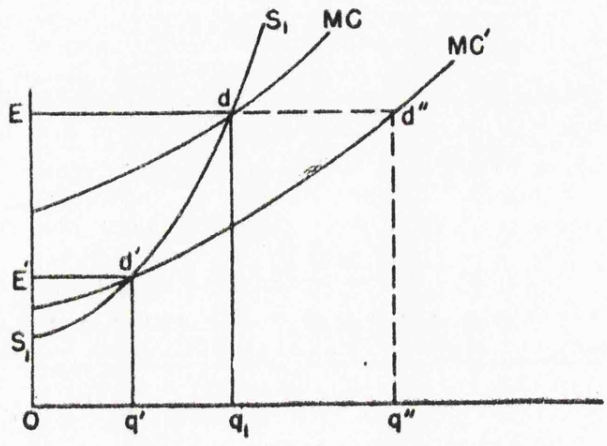
2. G.J. STIGLER: The Theory of Price (Macmillan).

3. At least among English-speaking economists; French economists often use a narrower definition: e.g. Jacques Hallak: "Opportunity costs represent the real changes resulting from the operation of education systems which do not occasion actual expenditure", in "The Analysis of educational costs and expenditure" (I.I.E.P./UNESCO, Paris, 1969).

A further distinction of crucial importance is that between monetary and real cost. Monetary figures recorded by a firm over time may be readily available but will be of little use for comparative or analytical purposes unless related to changes in the value of the monetary unit over the same period. If all of a firm's costs rise by x% and its revenue by x%, then its real situation may be unchanged; more typically, some costs or items of revenue rise more rapidly than others and so relative real changes do occur. During an inflationary period, a monetary price increase may turn out to be a real decrease and a particularly perverse effect is that some rates of interest, which may be costs to one firm but revenue to another, have sometimes had negative real values in recent years, a point not unconnected with the increasing calls for the indexation of such items.

To move from the firm's marginal cost curve to its supply curve would be a simple matter if prices of factors of production were fixed, for the supply curve would simply be the rising, right-hand, part of the MC curve. More realistically, prices of factors may be expected to rise as the firm demands more of them, hence the relationship becomes as in diagram 15[1], below:

Diagram 15



OE = £ Oq = Output MC = Marginal cost

1. M. FRIEDMAN: "Price Theory", 2nd edition (Aldine Publishing Co., Chicago).

With expansion of output from Oq' to Oq_1, the firm seeks to expand along curve MC' but, finding that the prices of factors rise, it actually expands along S_1S_1.

And, finally, the equilibrium of demand and supply curves determines, for each product, equilibrium output and price.

All of the exposition of costs and the productive process outlined thus far follows the standard text-book approach and is now generally taken to be non-controversial common ground by economists of most persuasions. Mention should also be made, however, of the school of thought which exerted considerable influence on economic thinking in this country from approximately the mid-1930s to the early 1960s and which still finds advocates today, notably Professor J.M. Buchanan. This school of thought, which was based in this country at the London School of Economics and elsewhere in the leading Austrian universities, denied that costs could be as objective or as measurable as the traditional approach assumed. The L.S.E. view, far from being static, developed over time, but the following quotations may be taken as representative of its general alignment :

F.A. VON HAYEK (1936)[1] : "... two concepts of 'data', on the one hand in the sense of the objective real facts, as the observing economist is supposed to know them, and on the other in the subjective sense, as things known to the persons whose behaviour we try to explain, are really fundamentally different and out to be kept carefully apart".

R.H. COASE (1938)[1] : "costs and receipts cannot be expressed unambiguously in money terms."

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1. From essays reprinted in J.M. BUCHANAN, ed: "L.S.E. Essays on Cost" (Weidenfeld & Nicolson, 1973).

G.F. THIRLBY (1946)[1] : "Cost is not something which is objectively discoverable .... by another person .... it is something which existed in the mind of the decision-maker."

and

J.M. BUCHANAN (1969)[2] : "... cost is that which the decision-taker sacrifices or gives up when he makes a choice. It consists of his own evaluation of the enjoyment or utility that he anticipates having to forego."

the logical conclusion from this subjective emphasis being (Buchanan) "we cannot draw the standard cost curves".

The implications of this emphasis on the subjective nature of costs are enumerated by Buchanan as :

"(1) Most importantly, cost must be borne exclusively by the decision-maker; it is not possible for cost to be shifted to or imposed on others.

(2) Cost is subjective; it exists in the mind of the decision-maker and nowhere else.

(3) Cost is based on anticipations; it is necessarily a forward-looking or ex ante concept.

(4) Cost can never be realized because of the fact of choice itself: that which is given up cannot be enjoyed.

(5) Cost cannot be measured by someone other than the decision-maker because there is no way that subjective experience can be directly observed.

(6) Finally, cost can be dated at the moment of decision or choice."

It will be apparent that had the "L.S.E. approach" found general acceptance among economists much of this chapter would have to be re-written or, indeed, could not be written at all. From this point

1. From essays reprinted in J.M. BUCHANAN, ed: "L.S.E. Essays on Cost" (Weidenfeld & Nicolson, 1973).

2. J.M. BUCHANAN: Cost and Choice (Markham Publishing Co., Chicago, 1969).

of view it is therefore perhaps fortunate that in the course of time objectivity gained general acceptance, despite Buchanan's sarcasm that this leaves us with an

> "image of cost (which) calls up carefully specified algebraic functions, sharply etched geometrical figures, or actual numbers carried to at least two decimal points in accountants' worksheets"[1]

A careful re-reading of texts typical of the objectivist approach does, however, reveal subjective L.S.E.-type strands not far below the surface.[2]

Cross-references will be made in subsequent chapters to the theory developed above. Perhaps the points that will be of most relevance will be:

(i) the many different possible uses of the term "costs", so that careful definition becomes essential each time it is used.

(ii) the distinction between adjustments in the short-run and in the long-run, the former denoting the period of time within which at least the quantities of one or more inputs cannot be varied, and,

(iii) the departures that may in practice be found from the diagrammatic or algebraic theory.

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1. J.M. BUCHANAN (1969), op cit.

2. e.g. R.G. LIPSEY, An Introduction to Positive Economics (Weidenfeld & Nicolson, 2nd edition, 1966, P.248 and W.J.L. RYAN, Price Theory (Macmillan, 1st edition, 1958), P.264.

CHAPTER 4. NATIONAL EXPENDITURE ON EDUCATION

Chapter 2 described in some detail previous studies relating to national expenditure on education in the United Kingdom, of which much the most important were those by Vaizey[1] and by Vaizey and Sheahan.[2] The latter, published in 1968, included education statistics up to and including the financial year ended March 1965; no comparable study of subsequent years has ever been published and this chapter will therefore attempt to review trends in national expenditure on education over the period approximately 1965 to 1977, the latest year for which statistics are usually available. This task is far easier than that which initially confronted Vaizey sine most of the statistics required are now published annually in one volume.[3]

Table 4.1 shows clearly the way educational expenditure has mushroomed over the years 1965 to 1977 from a figure of £1,585m. in 1965 to £7,853m. in 1977. Such figures are, however, not very useful for comparative purposes in view of the inflation which persisted throughout this period and which reached high rates in the 1970s. Expressing the expenditure as a percentage of Gross National Product[4] is more meaningful since this indicates the allocation of the total resources available to the country in a particular year; as is shown in column 4 of Table 4.1, this

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1. J. VAIZEY: The Costs of Education, op. cit.
2. J. VAIZEY and J. SHEAHAN: Resources for Education, op.cit.
3. Department of Education and Science: Statistics of Education, Volume 5, Finance and Awards, 1976 (HMSO). This volume includes statistics for the year ended March 1977 but labels them "provisional". Whilst most statistics are presented by financial year others are by calendar year.
4. At factor cost, thus removing the effects of any variations in indirect taxes or subsidies; this is the same basis as was used by VAIZEY and SHEAHAN, op. cit.

Table 4.1

Educational Expenditure and Gross National Product, 1965-1977

(Calendar Years)

Cal. Year	United Kingdom		
	Total education expenditure (excluding meals and milk) (£ million)	Gross National Product (£ million)	Education expenditure as a percentage of Gross National Product (%)
(1)	(2)	(3)	(4)
1965	1,585	31,647	5.0
1966	1,700	33,470	5.1
1967	1,893	35,255	5.4
1968	2,096	37,723	5.6
1969	2,250	39,836	5.6
1970	2,532	43,924	5.8
1971	2,899	49,656	5.8
1972	3,414	55,492	6.2
1973	3,949	64,815	6.1
1974	4,601	74,958	6.1
1975	6,561	93,978	7.0
1976	7,340	110,259	6.7
1977	7,853	123,791	6.3

Sources: 1965-1976: from "National Income and Expenditure 1966-76" and reprinted in "Statistics of Education", Vol.5", op. cit.

1977: from "National Income and Expenditure 1967-77".

Note: This calculation can only be made on a United Kingdom basis since no figure of GNP for England and Wales is available.

percentage increased steadily, if unevenly, throughout the period, from 5.0% in 1965 to 6.3% in 1977. The apparent sharp increase from 6.1% in 1974 to 7.0% in 1975 and subsequent decline to 6.7% in 1976 must, in the words of the Department of Education and Science,[1] "be treated with caution" in view of the payment of the Houghton salary award, including back pay for 1974, in the calendar year 1975.

The percentage fell again to 6.3% in 1977. In view of the cuts in public expenditure imposed by both Labour and Conservative governments, the steady decline in the size of the school population over the next ten years or so, and Britain's current economic problems which increasingly look as if they may take some years to resolve, it may well be that the proportion of Gross National Product devoted to education has now ceased to rise and may not again reach a level as high as that recorded in 1976 for several years. We should note that whereas the information given in Table 4.1 refers to the whole of the United Kingdom, almost all the other statistics contained in "Statistics of Education" refer solely to England and Wales.

The monetary figures quoted in Table 4.1 are of little significance until the effects of inflation can be removed, to give changes in real terms, as in Table 4.2 which extends from 1960/61 to 1976/77. The initial figures for recurrent and capital expenditure for each calendar year have been corrected via the re-pricing factor given in column (c) and the educational price index in column (d) to give values at constant (1977) prices. The figures in column (b) differ from those in Table 4.1 because they are (i) for financial years instead of calendar years and (ii) for England and Wales only.

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1. In: Statistics of Education, op. cit.

Table 4.2

Recurrent and Capital Expenditure by Public Authorities on Education at Constant (1977 Survey) Prices and Changes in Real Terms

Financial Years	Recurrent and capital expenditure at outturn prices £ million.	Column (b) repriced to Survey prices for appropriate year to nearest £ million	Price index of educational expenditure (base year 1969-70 = 100)	Recurrent and capital expenditure revalued at 1977 Survey prices £ million	Change in real terms compared with the previous year (1) %	Change in GNP in real terms compared with the previous year %
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1960-61	819.6	-	65.7	3,157.4	-	-
1961-62	931.6	-	68.5	3,442.2	9.0	3.0
1962-63	1,051.8	-	74.1	3,592.6	4.4	2.0
1963-64	1,154.0	-	77.1	3,788.3	5.4	4.5
1964-65	1,261.1	-	78.3	4,076.4	7.6	4.9
1965-66	1,422.6	-	85.3	4,221.1	3.5	2.5
1966-67	1,567.8	-	87.4	4,540.2	7.6	1.9
1967-68	1,755.3	-	92.1	4,823.7	6.2	2.8
1968-69	1,855.0	-	94.1	4,989.4	3.4	3.0
1969-70	1,984.8	-	100.0	5,023.5	0.7	2.1
1970-71	2,277.4	-	107.3	5,371.9	6.9	2.3
1971-72	2,679.6	-	118.0	5,747.5	7.0	2.2
1972-73	3,175.5	-	131.2	6,125.9	6.6	3.1
1973-74	3,650.7	-	140.4	6,581.1	7.4	5.3
1974-75	4,732.4	4,971	190.5	6,604.5	0.4	-1.4
1975-76	5,960.1	6,036	227.8	6,706.4	1.5	-1.0
1976-77	6,692.5	6,746	253.1	6,745.9	0.6	2.1

(1) Changes in real terms reflect the net effect of changes in child population and participation in non-compulsory education and improved standards of provision.

Source: D.E.S.: Statistics of Education, Vol.5, Finance and Awards, 1976, Table A, p.vi.

The Department of Education and Science comments on this table as follows:

"The price index of education expenditure shown in column (d) of Table (4.2) makes it possible to estimate expenditure on education at constant prices. The index has been calculated by weighting two separate indices, in respect of recurrent and capital expenditure, in the proportions of actual expenditure year by year. Both component indices reflect, as far as is practicable, the re-pricing factors used in calculations underlying the annual Public Expenditure White Papers, and the price index in column (d) therefore reflects the increases in prices agreed for the Public Expenditure Survey from one year to the next. (Survey prices generally represent the pay and price levels of the November preceding the Survey year, e.g. 1977 Survey prices are at November 1976 levels.) The component of the index for recurrent expenditure from 1968-69 onward used price information provided by Local Education Authorities for Rate Support Grant Increase Orders and related purposes: the best information available to the Department was used for earlier years. For the capital component of the index, the Public Expenditure White Paper re-pricing factor has been used for 1976-77, and the index for gross domestic fixed capital formation published in Table 2.5 of National Income and Expenditure 1966-76 has been taken as the basis for the earlier years. The statistical discontinuities do not appear to have resulted in any significant distortion.

No data are available to express expenditure at Survey prices for the earlier period, when any differences between expenditure out-turn and similar expenditure at Survey prices based on November in the same financial year would have been relatively small: the effects of the timing of price changes are self-cancelling so long as prices change at a fairly steady rate. In the financial year 1974-75 the difference between out-turn and the 1975 Survey prices was exceptionally large mainly because of the salary award for teachers which was a result of the Houghton Report. In Table (4.2) showing expenditure at constant (1977 Survey) prices, expenditure in column (e) for the years 1960-61 to 1973-74 has been calculated by applying the index shown in column (d) to the out-turn expenditure for those years shown in column (b): for the years from 1974-75 onward, the index has been applied to out-turn expenditure as re-priced to the Survey price level appropriate to each year, shown in column (c).

The estimate of changes in educational expenditure in real terms is dependent on the accuracy of the price index, which, in turn, depends on the completeness of reporting by the spending authorities of changes in component prices. While the possible errors in the index which result from incomplete or delayed reporting seem unlikely to be significant when overall prices change relatively little, this may not be true during periods of rapid price change: the error margin in the price index could become significant in relation to the underlying real change in volume of education expenditure in such circumstances, and the effects would be even more noticeable when the cumulative

effect is calculated. Estimates of volume change should therefore be interpreted with especial caution for years of rapid inflation from 1973-74 onward.

With the reservations referred to in the paragraph above, the figures of expenditure at constant prices in column (e) of Table (4.2) provide an approximate measure of the real changes of the education service in "volume terms", in the wording of the Public Expenditure White Papers. Such constant price measurements, however, are complicated by the fact that the prices of different goods and services do not change in the same proportion over time, giving rise to changes in relative prices not apparent from the educational price index shown above; for example, since education has a high content of labour services - the cost of which has tended to rise over time relative to other prices - the relative costs of education as a whole has risen accordingly. This phenomenon is known as the "relative price effect."[1]

All price indices are of necessity indicators of only approximate accuracy and, as the comment by the Department of Education and Science makes clear, the price index of educational expenditure is no exception. It indicates for educational expenditure an overall rate of price increase which when applied to gross national figures, in years of only moderate inflation, and when no quite exceptional items obtrude, can be used with reasonable accuracy, e.g. to distinguish monetary from real changes as is done in Table 4.2. But the early 1970s with their high rates of inflation and the quite exceptional occurrence of the Houghton award were abnormal years; further, any attempt to apply the index to any local or regional statistics would have to be based on the assumption that the pattern of educational expenditure was identical in each locality, which is unlikely to be the case. A further problem is that over such a lengthy period as is indicated in Table 4.2 the "basket" of goods on which the index is based will change considerably, and this creates further computational problems.

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1. Statistics of Education, op. cit.

Nevertheless, this price index is as reliable a measure as can be obtained and it can reasonably be used with caution.

The effects of the revaluation into 1977 prices, as shown in column (e) in constant prices and in column (f) in percentage terms, are to make clear that education expenditure in real terms increased in every year during this period, the percentage increase varying from 9.0 in 1961/2 to 0.4 in 1974/75. Up to 1973/74 many years showed increases of the order of 5, 6 or 7% but from 1974/75 onwards the rate of increase is very much smaller, due no doubt to the successive cuts in public expenditure in those years. Up to 1974/75 in every year except one (1969/70) the rate of increase of educational expenditure in real terms, shown in column (f), was greater than the rate of increase of GNP in real terms, shown in column (g). From 1974/75, any increase in GNP in real terms is non-existent, negative changes being recorded for two successive years, and the close of the 1976/77 financial year still seeing a level of GNP lower in real terms than that of three years earlier: concomitantly, very slow rates of increase in educational expenditure are shown in column (f) for the same years. As commented above, the previous high rates of increase are unlikely to be seen again for many years.

We can now consider the pattern of breakdown of expenditure within each of the primary and secondary schools sectors, as shown in Tables 4.3 and 4.4. These tables show the respective rates of increase of the main constituent items of educational expenditure over the period 1965 to 1977, together with similar information for the sub-periods 1965 to 1971 and 1971 to 1977, to give some indication of how the rates of increase in the earlier years compare with those in the later years. The figures shown

are all in current monetary values with no adjustment for inflation and they therefore do not give any indication of rates of increase in real terms; nevertheless, they can be used to compare monetary rates of increase.

Tables 4.3 and 4.4 do not include all items recorded in the education budget but extract "educational expenditure" and exclude "related expenditure" such as on the school meals and milk services. It must at the same time be admitted that this distinction is not entirely clear-cut: it was not shown at all in the 1965 statistics and the basis for it altered marginally between the 1971 and the 1977 statistics, "transport, home to school" being excluded from "educational expenditure" in 1971 but included in 1977. Here it is included in both tables, to make for a more valid comparison. Despite such problems it has been a relatively straightforward matter to compile Tables 4.3 and 4.4 on a standardised basis.

It is apparent from Tables 4.3 and 4.4 that the compound rate of increase per annum of total expenditure, current plus capital, on primary schools over 1965-77 (15.2%) is almost identical to that on secondary schools (15.1%), which is contrary to Vaizey's finding that in the years to 1965 expenditure on the secondary school sector was rising more rapidly. The rates of increase were higher after 1971 than before but this effect must be attributed more to the higher rates of inflation in the later years than to any other cause. Within each sector Vaizey's finding that teachers' salaries were increasing less rapidly than other educational expenditure and were thus becoming a smaller percentage of the sectoral total is continued over the period 1965 to 1971 in the case of primary schools with the percentage

Table 4.3

Expenditure on Primary Schools 1965-1977

(Financial Years ended 31st March)

	1965		1971		1977		Compound Rate of Increase Per Year(1)		
	£000m.	As % of Total	£000m.	As % of Total	£000m.	As % of Total	1965-71 %	1971-77 %	1965-77 %
Education Expenditure - Current									
Teachers' salaries	184,789	62.5	327,946	59.8	1,058,484	65.8	10.0	21.6	15.7
Other Salaries	20,961	7.1	44,643	8.1	169,527	10.5	13.4	24.9	19.0
Premises - Works, Services, Rent and Rates	37,799	12.8	69,068	12.6	184,348	11.5	10.6	17.8	14.1
Supplies and Services	11,909	4.0	22,806	4.2	57,836	3.6	11.4	16.8	14.1
Establishment expenses	1,191	0.4	2,937	0.5	10,960	0.7	16.2	24.5	20.3
Transport, home to school	2,273	0.8	4,373	0.8	12,923	0.8	11.5	19.8	15.6
Other	397	0.1	-271	-	-4,868	-	-	-	-
Total Current	259,319	87.7	471,502	85.9	1,489,210	92.57	10.5	21.1	15.7
Capital	36,342	12.3	77,251	14.1	119,533	7.4	13.4	7.5	10.4
Total, Current and Capital	295,661	100.0	548,753	100.0	1,608,743	100.0	10.9	19.6	15.2
Loan Charges	22,248	-	51,108	-	133,411	-	14.9	17.3	16.1
Number of pupils at January(2)	4,273,101	-	4,985,318	-	4,712,093	-	2.6	-0.1	0.8

1. Compound Rate of Increase from formula: $i = \left[\left(\frac{FV}{PV}\right)^{\frac{1}{n}} - 1 \right] \times 100$

2. The primary school population reached its peak in 1973 with 5,066,624 pupils, since when it has been contracting steadily.

Table 4.4

Expenditure on Secondary Schools 1965-1977

(Financial Years ended 31st March)

	1965		1971		1977		Compound Rate of Increase per Year (1)		
	£000m.	As % of Total	£000m.	As % of Total	£000m.	As % of Total	1965-71 %	1971-77 %	1965-77 %
Education Expenditure - Current									
Teachers' Salaries	205,086	53.7	347,415	53.9	1,248,039	60.2	9.2	23.8	16.2
Other Salaries	21,995	5.8	45,524	7.1	179,534	8.7	12.9	25.7	19.1
Premises - Works, Services, Rent and Rates	44,136	11.6	77,406	12.0	227,064	11.0	9.8	19.6	14.6
Supplies and Services	21,454	5.6	36,683	5.7	101,985	4.9	9.4	18.6	13.9
Establishment expenses	1,621	0.4	3,532	0.5	16,564	0.8	13.9	29.4	21.4
Transport, home to school	9,508	2.5	17,618	2.7	55,207	2.7	10.8	21.0	15.8
Fees to pupils in independent and direct grant schools	9,874	2.6	17,144	2.7	42,496	2.1	9.6	16.3	12.9
Other	1,018	0.3	-1,988	-	-5,011	-	-	-	-
Total Current	314,692	82.4	543,334	84.4	1,865,878	90.0	9.5	22.8	16.0
Capital	67,051	17.6	100,753	15.6	207,025	10.0	7.0	12.8	9.9
Total, Current and Capital	381,743	100.0	644,087	100.0	2,072,903	100.0	9.1	21.5	15.1
Loan Charges	50,039	-	85,404	-	208,978	-	9.3	16.1	12.7
Number of pupils at January (2)	2,819,054	-	3,088,593	-	3,793,317	-	1.5	3.5	2.5

1. See Table 4.3, Note 1.
2. Excluding pupils in middle schools.

falling from 62.5% to 59.8%; thereafter the trend is reversed and the percentage rises sharply to 65.8% in 1977, largely influenced by the Houghton salary award. In the secondary sector, teachers' salaries as a percentage of the total increased very marginally from 1965 to 1971 (53.7% to 53.9%) and thereafter rose more rapidly to 60.2% in 1977, for the reason already noted.

Over the whole period total current expenditure rose relatively somewhat more rapidly in secondary schools than in primary (16.0% to 15.7% per annum) but capital expenditure rose more slowly (9.9% to 10.4%): in the early years, 1965-71, capital expenditure in primary schools rose nearly twice as fast as that in secondary schools (13.4% to 7.0%) but over 1971-77 this trend was reversed (7.5% primary to 12.8% secondary): whereas the earlier years saw stress laid on the replacing of ageing primary school buildings, in the later years the emphasis was more on the expanding secondary schools. Loan charges partly mirror these trends in capital expenditure but are also greatly influenced by the escalation of rates of interest in the 1970s.

Vaizey's finding that salaries of non-teachers and establishment expenses were rising relatively more rapidly than other items is repeated in these figures: both items, for both primary and secondary sectors, show the largest increases of any items in the tables, and show the increased costliness of support staff in schools. For primary schools expenditure on salaries of non-teachers was 10.9% of that of teachers in 1965 but by 1977 it had risen to 16.0% (secondary schools: 1965: 10.7% to 1977: 14.5%).

Any attempt to compare the rates of growth of monetary expenditure with those of the numbers of the corresponding pupils in schools would be meaningless unless the effects of inflation could be removed and the expenditure re-expressed in real terms. In order to do this we have to make use of the index of educational

expenditure discussed previously; this index is a composite figure relating to the whole of educational expenditure and to apply it separately to each of the primary and secondary sectors would involve some degree of approximation unless the pattern of expenditure in each sector were to mirror that for the whole of the education service. The latter clearly is not the case, one only has to think of the different kinds of materials and equipment used and the different pattern of teachers' qualifications and salaries in secondary schools as compared with primary; nevertheless, any resulting error is likely to be small. An even stronger caveat would be needed regarding any attempt to apply the composite price index to separate items in Tables 4.3 and 4.4; ideally we would need separate price indices for each but regrettably these do not exist.

From Table 4.2 we extract the price index for the years in question, and express the increments as (compound) rates of increase, as follows:

Year	Index	Compound rate of increase per annum	
1964-65	78.3		
		5.4%	
1970-71	107.3		overall
		15.4%	= 10.3%
1976-77	253.1		

Bearing in mind the degree of approximation already referred to, where this rate of increase is close to any of the rates of increase shown in Tables 4.3 and 4.4 we must conclude that we are unable to say with confidence whether the item in question is in fact increased or decreased in real terms. This is true of, for example, capital expenditure in primary schools which increased over the whole period at a (compound) average rate of 10.4% per annum, compared with the overall inflation rate shown above of 10.3% per

annum; we can, however, say with confidence that whereas this item rose significantly in real terms over 1965-71 (increase of 13.4% per annum, compared to apparent rate of inflation of 5.4% per annum), it certainly declined in real terms over 1971-77 (increase of 7.5% per annum, compared to price increase of 15.4% per annum).

It is now apparent that over 1965-71 every item listed in Tables 4.3 and 4.4 increased steadily and significantly in real terms, since all the figures given are well above the apparent rate of inflation of 5.4% per annum. To attempt to answer the question considered by Vaizey of whether expenditure in real terms increased more rapidly than the rate of increase in pupil numbers, so as to attempt to say whether real expenditure per pupil increased, we need to deduct the rate of inflation from the rate of increase of monetary expenditure to obtain rates of increase in real terms which can therefore be compared with the growth in pupil numbers over 1965-71, viz. 2.6% per annum for primary, 1.5% per annum for secondary. It is visually apparent from Table 4.3 that for primary schools every item is well in excess, total current and capital expenditure rising at 10.9 - 5.4 = 5.5% per annum in real terms. For secondary schools the same is true for every item except capital expenditure, total current and capital expenditure rising at 9.1 - 5.4 = 4.3% per annum in real terms; for capital only, the real increase = 7.0 - 5.4 = 1.6% in real terms, which is extremely close to the 1.5% growth in pupil numbers. The caveat previously noted must therefore apply and we cannot say with confidence whether real capital expenditure per pupil increased or decreased.

The years 1965 to 1971 were years of only moderate inflation and to apply to each item in Tables 4.3 and 4.4 the composite price

index, particularly in cases where the rates of increase in monetary expenditure are well in excess of the apparent rate of price change, as is so with almost every item considered, seems a not unreasonable thing to do. Any attempt to do likewise for the years 1971-77, however, must be far more problematical, in view of the exceptional character of those years as noted above. The separate rates of inflation for the various constitutent items may have diverged quite sharply. The composite rate of increase calculated from the price index amounts to 15.4% and from this it appears that both total primary expenditure (increase of 19.6%) and total secondary expenditure (21.5%) did continue to increase in real terms but at a slower rate. In secondary schools, with the pupil population continuing to increase at 3.5% per annum, the tentative rate of increase of real expenditure per pupil is given by: (21.5% - (15.4% + 3.5%) = 2.6% per annum. In primary schools with the school population falling on average by 0.1% per year (it actually rose slowly to 1973 before subsequently declining), real expenditure per pupil apparently rose by : 19.6% - (15.4 - 0.1%) = 4.3% per annum. These rates of increase in real expenditure per pupil are lower than those obtaining for the years prior to 1971 but are still significant. The results of these calculations need to be compared with those presented later in this chapter (page 4.19). 1971 was not chosen for the above calculations as representing any particular watershed other than that of being half-way through the period but the two sub-periods thus defined so in fact seem to provide definite contrasts.

Taking the period 1965-1977 as a whole, the composite rate of price change is calculated at 10.3% per year and, in the case

of both the primary and secondary sectors, all items of current expenditure, but not capital, recorded overall monetary increases well in excess of this figure. With all the items in Table 4.3 and with the majority of the items in Table 4.4, it appears that there was a positive increase in expenditure per pupil in real terms over the period as a whole.

The final aspect of the national published educational statistics that is of interest relates to the calculation of average or unit costs for different levels of education, as given in Tables 4.5 and 4.6. Table 4.5 relates to recurrent expenditure for the financial year 1976-77 whilst Table 4.6 shows the pattern of unit costs over the period 1966-67 to 1976-77 at constant 1977 prices, i.e. in real terms. The latter table shows costs per pupil/student:

> "converted to a constant price base by means of the re-pricing factors appropriate to each sector concerned, i.e. the re-pricing factors on which the recurrent component of the index shown in column (d) of Table (4.2) was based".

The various "re-pricing factors" are not published but the fact that they have been utilised means that this table avoids some of the problems of assessing changes in real terms over time which were discussed above. The preparation of these two tables does, however, give rise to a number of other problems: the expenditure figures used exclude loan charges, revenue contributions to capital outlay and central administration and inspection costs, certain middle schools have been treated as primary and others as secondary according to individual school Deeming Orders, the years 1973-4 to 1975-6 again show exceptional fluctuations due to the Houghton salary award (part of which was assessed as being a "real terms component"), and particular difficulties arise in connection with the further and higher education area which has been changing rapidly in these years but which, perhaps, fortunately,

is outside the scope of this study. None of these reservations, however, seriously impairs the figures for our purposes.

A potentially more serious problem relates to the weightings applied to the raw student numbers. For Table 4.5 (but not for Table 4.6) the Department of Education states that "conventional weightings are used" and defines these (in "explanatory note 10")[1] as:

> "A part-time pupil has been counted as 0.5 of a full-time pupil. Under further education establishments a sandwich student has been counted as 1.0, a part-time day student as 0.25, an evening only student as 0.1 and an evening institute student as 0.1 of a full-time student. These weights are under review and are likely to be changed."

Further, "explanatory note 47" states:

> "Weighted costs have been calculated for different groups of pupils/students within an institution, when it is known or suspected that one group costs more than another. Various data are used to calculate the differential costs."

The former of these two notes scarcely seems applicable to primary or secondary schools and therefore need not detain us, except to note with interest the clear implication that the use of such weightings is far from being a clear-cut matter. In the absence of any further details regarding the latter note, we cannot be certain whether the weightings referred to therein relate to primary and/or secondary schools. I understand that the main system of weighting used in the Department for secondary schools is 1.6 for sixth-form pupils against 1.0 for secondary pupils below the sixth-form but it is not entirely clear how this could have been applied to Table 5 since the table already gives separate lines for "pupils under compulsory school leaving age" and "pupils over compulsory school leaving age". The Department does not publish any other information regarding the system of weightings

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1. "Statistics of Education", op. cit.

Table 4.5

Recurrent institutional expenditure per full-time pupil/student

Financial year 1976-77 (based on provisional out-turn)

£ at 1977 Survey Prices

	Number of pupils/ students (000s)	Gross cost per pupil/student				Private sector contri-bution (£)	Net cost to public funds (£)
		Teachers' salaries (£)	Other wages and salaries (£)	Other costs (£)	Total gross costs (£)		
Pupils/students in							
Nursery schools	34	285	340	91	716	2	714
Primary schools							
nursery classes	92	187	166	74	427	1	426
ordinary classes	4,953	212	35	49	296	1	295
all primary	5,045	211	37	50	298	1	297
Secondary schools							
pupils under compulsory school leaving age	3,716	296	47	82	425	3	422
pupils over compulsory school leaving age	288	542	86	150	778	5	773
all secondary	4,004	314	50	87	451	3	448
All primary and secondary schools	9,049	257	43	66	366	2	364
Special schools	135	729	449	309	1,487	26	1,461
Evening Institutes	186	165	35	45	245	50	195
Major establishments of further education (excluding Polytechnics)							
non-advanced work	512	610	210	240	1,060	170	890
advanced work	92	940	320	370	1,630	260	1,370
all students	604	660	230	250	1,140	180	960
Polytechnics							
non-advanced work	10	670	330	350	1,350	110	1,240
advanced work	113	1,040	510	550	2,100	170	1,930
all students	123	1,020	490	530	2,040	160	1,880
Universities (Great Britain)	281	1,000	750	700	2,450	50	2,400

Source: Statistics of Education, op. cit.

Table 4.6

Net recurrent institutional expenditure per full-time pupil/student from public funds at constant (1977 Survey) prices. (Financial years)

	1966-67	1973-74	1974-75	1975-76	1976-77
	(£)	(£)	(£)	(£)	(£)
Nursery schools	359	473	603	679	714
Primary schools	182	224	279	288	297
Secondary schools					
pupils under compulsory school leaving age	292	357	421	419	422
pupils over compulsory school leaving age	534	640	813	766	773
Special schools	905	1,083	1,317	1,386	1,461
Evening Institutes	125	155	185	205	195
Major Establishments of further education (excluding polytechnics)					
non-advanced work	830	800	920	900	890
advanced work	1,290	1,230	1,430	1,400	1,370
Polytechnics					
non-advanced work	-	1,230	1,410	1,460	1,240
advanced work	-	1,900	2,190	2,260	1,930
Colleges of Education	970	1,120	1,290	1,550	N/A
Universities	2,450	2,425	2,400	2,425	2,400

Source: Ibid.

used in Table 4.5, how it has become "known or suspected that one group costs more than another", or what are the "various data" which have been utilised, as intimated in the note quoted above.

Table 4.5 shows the unit cost per pupil for "ordinary" primary classes (i.e. excluding nursery classes) to be £296, of which £212 (71.6%) is devoted to teachers' salaries (£212 + 35 = £247 (83.4%) to all salaries); in secondary schools the overall unit cost of £451 (i.e. 1.83 times the primary figure) includes £314 (69.6%) for teachers' salaries (£364 (80.7%) for all salaries) but these overall figures are broken down into:

	Unit Cost	Teachers' Salaries		All salaries	
		£	%	£	%
below compulsory school leaving age	£425	296	69.6	343	80.7
over " " "	£778	542	69.7	628	80.7

One post-age-16 pupil therefore costs around 1.83 times one under 16 secondary pupil or around 2.63 times one primary school pupil; the relationship between the former figure and that of 1.6 mentioned earlier is not clear.

Table 4.6 gives, over the period 1966-67 to 1976-77, trends in unit costs including for primary school pupils, secondary pupils under compulsory school leaving age and secondary pupils over school leaving age, but not a composite secondary figure. It would appear from these figures that for each line in Table 4.6 there has been a steady and significant increase in expenditure in real terms throughout the period, ignoring the deviation caused by the Houghton "hiccup" in 1974-75; one certainly could not conclude from the latter that expenditure per pupil in real terms fell from 1974-75 to 1975-76, as the figures seem to show, but these deviations do emphasise the problematical nature of such calculations - in the latter case they

depend crucially on the point noted above, on page 4.15, that some part of the large Houghton salary increase was assessed as being a "real terms component".

In 1966-67 one over-compulsory-school-leaving-age pupil cost 1.83 times as much as one under compulsory school leaving age pupil, this ratio being identical to that in 1976-77 (it actually rose to 1.93 in 1974-75 before falling again) despite any change due to the raising of the school leaving age in 1972. In 1966-77 one over-compulsory-school-leaving-age secondary pupil cost 2.93 times as much as one primary pupil, a ratio that has fallen fairly steadily to the 1976-77 figure of 2.63 quoted above.

Although outside the scope of this study, the last line of Table 4.6 shows clearly how university expenditure has been depressed during this period, with less per student in real terms being spent in 1976-77 than ten years previously. The secondary under compulsory-school-leaving-age/university unit cost ratio fell from 8.39 in 1966-67 to 5.69 ten years later. This is, however, more a commentary on the state of university finance than anything to do with expenditure in schools.

CHAPTER 5. COST COMPARISONS BETWEEN INDIVIDUAL LOCAL EDUCATION AUTHORITIES

As was mentioned in Chapter 2, the official published education statistics have until now contained no information at all regarding educational costs or expenditures on the part of individual local education authorities, or even different regions of the country,[1] save for a listing of "new awards to students and entrants to courses of Initial Teacher Training" from each LEA. Detailed statistics for each LEA are, however, published by The Chartered Institute of Public Finance and Accountancy[2] and these can be used to attempt to compare patterns of provision and expenditure across the country. For many years these "CIPFA statistics" have met with criticism from educational researchers in that the basis on which the figures were compiled was not standardised from one LEA to the next. Over a period of years in the late 1960s/early 1970s, however, LEAs gradually came to adopt more standardised accounting procedures so that such discrepancies lessened. At the same time, the statistics each year contained some omissions, if a small number of LEAs did not provide all the statistics required. Therefore, from the year 1974/75 onwards (i.e. as from the date of the last major re-organisation of local government), the CIPFA statistics are compiled directly from Form RO1, "Education Revenue Account for year ended 31st March 19..", which all LEAs have to return each year to the Department of the Environment (which passes copies on

1. The reasons lie in the policy of the Department of Education and Science not to interfere in the running of the education service by local education authorities. Certain data on a regional basis will, however, be included in future years.

2. Education Statistics, 1975-76 Actuals, C.I.P.F.A., London, 1977. These statistics are based on authorities' final accounts, C.I.P.F.A. also publishes a separate series of statistics based on Approved Estimates which are available at a much earlier date for any particular financial year but, in view of the frequent discrepancies between estimates and out-turns, the latter figures have not been used here.

to the Department of Education and Science, which, in turn, liaises with C.I.P.F.A. over the publication of their statistics). Some problems remain in that nine LEAs[1] did not furnish returns and the published figures still contain some omissions and some instances where a single figure has been bracketed over two, three, or even four, headings.[2] Nevertheless, as far as can be ascertained, it would appear that the statistics are now rather more valid for comparative purposes than was previously the case.

The CIPFA statistics list, for each LEA, and for each of the primary, secondary, special schools, and further education sectors, expenditure on such headings as teachers' salaries, non-teachers' salaries, repair and maintenance of buildings, books, educational equipment, and various other headings, together with total net expenditure (after allowing for various, usually relatively small, items of income). For secondary schools, we have used these figures, together with statistics of the numbers of pupils, numbers of teachers and pupil/teacher ratios in secondary schools in each LEA at January 1976 supplied by the Department of Education and Science,[3] and statistics of estimates of population at 30 June 1976 for each local government area published by the Office of Population Censuses and Surveys (OPCS),[4] to produce the ratios shown in the tables included in this chapter, for the 88 English local

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1. Bexley, Havering (London Boroughs); Doncaster, Sandwell, Sheffield, Wirral (Metropolitan Districts); Dyfed, Lincolnshire, Nottinghamshire (Non-Metropolitan Counties).

2. And there are even problems over what is or is not an LEA, since the DES list includes Isles of Scilly, which is excluded from the CIPFA list.

3. Published in "Press Notice" headed "Pupil/Teacher Ratios in each Local Authority", 16/12/1976 (DES). It should be noted that such ratios published by the DES now only take qualified teachers into account.

4. OPCS Monitor, Ref.PP1 77/2, dated 18/10/1977.

education authorities. Ideally the various statistical services in question should all relate to exactly the same date but in practice such information is not available and in any event any correction to the figures used would be minimal. All of these ratios relate to secondary schools, with which this thesis is mainly concerned, but similar calculations could also be made for primary schools.

The CIPFA statistics were used by Burgess and Pratt in their work[1] mentioned in Chapter 2, the main focus of which was to indicate which LEAs at that time (financial year 1970-71) were "high" or "low" spenders on education, by means of statistics of expenditure per pupil. The same writers published revised figures in 1975[2] showing that the disparities reported previously remained largely unchanged three years later (financial year 1973-4). More recently there has been a brief report in the national press[3] of a study by Mr. Ian Coutts, a Conservative member of Norfolk County Council and chairman of the Association of County Councils' finance committee, of wide differences in the levels of education per head on various services, including education, on the part of individual county councils, on the basis of figures compiled from the CIPFA statistics. Subsequently, Mr. Coutts kindly sent me a copy of this article,[4] the main emphasis in which was to focus on the variations in the cost of, or expenditure on, apparently comparable services on the part of different LEAs, as the following extract shows:

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1. J. PRATT, T. BURGESS, et. al., Your Local Education (Penguin, 1973).

2. J. PRATT and T. BURGESS, "Change for the Better?", The Guardian, 25/11/1975.

3. The Guardian, 25/9/1979.

4. IAN COUTTS, "Cuts and Costs", County Councils Gazette, September, 1979.

"Has Bedfordshire something to learn from Lancashire where they educate primary school children at a cost per pupil 30 per cent lower than Bedfordshire? Is Suffolk super-efficient in that it educates secondary school pupils at a cost per head 20 per cent less than does Surrey? Are the cooks more cost-conscious in Hereford and Worcester than in Buckinghamshire, that they produce school meals that cost 20 per cent less in the former county than the latter? ..."

Mr. Coutts then proceeded briefly to discuss how meaningful were such figures and what conclusions might be drawn from them.

Other research using the C.I.P.F.A. statistics, and seeking to relate educational variables to other variables for each LEA, has been reported by Jackman[1] and Howick[2]. None of these writers, however, proceeded on the lines indicated below.

Our analysis of the data may commence with some of the initial disparities revealed by the figures, as indicated in Table 5.1; this approach is on the same lines as, but gives more details than, the comparisons drawn by Burgess and Pratt or by Coutts. It shows, for the main items of educational expenditure and for certain related statistics, the extent of variation around the mean and the amounts for, and names of, the LEAs with the highest and lowest figures. All of the items are expressed per pupil except where otherwise stated. Net expenditure per pupil has a mean of £466 but a range from the lowest figure £366 (Leeds) to the highest £594 (ILEA), a variation of over 62%. Much the largest constituent item of this expenditure is, of course, teachers' salaries which has a mean of £279 (59.9% of £466) and a variation from Leeds' low of £222 to Harrow's high of £356. On the lines of the question posed by Mr. Coutts, but noting much wider variations than those on which he commented, we may apparently ask: Why does ILEA spend two and a half times as much per pupil on non-teachers' salaries as Cornwall,

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1. R. JACKMAN: "A Model of Local Authority Expenditure with preliminary application to Education" (Centre for Environmental Studies, 1979, mimeo.).

2. C. HOWICK, with H. HASSANI: "Education Spending: Primary" (C.E.S. Review No. 5, 1979) and "Education Spending : Secondary" (C.E.S. Review No. 8, 1980).

Table 5.1

Selected Statistics for all 88 LEAs (1975-76)

	Mean (£)	Minimum		Maximum		Standard Deviation	Coefficient of Variation
		£	LEA	£	LEA		
Teachers' Salaries	279	222	Leeds	356	Harrow	24.0	8.6
Non-Teachers' Salaries	38	27	Cornwall	78	ILEA	7.4	19.5
Repairs and Maintenance	17	10	Dudley	38	Sunderland	4.9	28.8
Fuel and Lighting	15	8	Isle of Wight	20	Manchester	1.9	12.7
Rent and Rates	16	10	Sefton	24	Ealing; Barnet	2.9	18.1
Books	5	1	Durham	9	Bedfordshire	1.4	28.0
Ed. Equipment	13	2	Rochdale	25	ILEA	2.9	22.3
Debt Charges	47	20	Sutton	80	Brent	11.9	25.3
Net Expenditure	466	366	Leeds	594	ILEA	41.7	8.9
Teachers' Salary per Teacher	4747	4104	Leeds	5443	Ealing	263.7	5.5
Net Expenditure per Population	37	27	East Sussex	52	Knowsley	4.6	12.4
Pupils per Teacher	17	15.0	Harrow	19.5	Isle of Wight	0.8	4.7
Population per Pupil	13	9	Knowlsey	19	Ealing	1.9	14.6

Note: Expenditure items are expressed per pupil except where otherwise stated.

Source: C.I.P.F.A. Education Statistics, 1975-76, Actuals.

Why do repairs and maintenance per pupil cost Sunderland nearly four times as much as Dudley, Why does fuel and lighting per pupil cost two and a half times as much in Manchester as in the Isle of Wight, rent and rates two and a half times as much in Ealing or Barnet as in Sefton, Why is expenditure on books in Durham only one-ninth of that in Bedfordshire or expenditure on educational equipment in Rochdale less than one-twelfth of that in ILEA, or how is it that Knowsley can afford to spend, per head of population, nearly double the figure for East Sussex, which is supposedly one of the more affluent authorities?

As is indicated by the coefficient of variation, shown in the final column of Table 5.1, the greatest relative variations across the 88 LEAs occur under the headings of repairs and maintenance and books. The former may obviously relate to such factors as the age and condition of school buildings which it is difficult to vary or control in any way but from the latter is is apparent that LEAs' policies relating to the purchase and provision of books in schools varies very widely indeed. The least variation recorded in this column occurs with the pupil/teacher ratio, where there is presumably pressure on LEAs from the Department of Education and Science to conform reasonably closely to the national norm.

It would be a simple matter to continue to discuss variations in recorded expenditure in this way but two obvious objections may be raised against doing so.

Firstly, to some extent we are not comparing like with like: ILEA, for example, would be expected to have a very high expenditure on teachers' salaries for the simple reason that the Burnham salary scales provide for large extra payments to be made to all teachers

in the London area, with the largest additions in inner London. Similarly, land values, rates, and certain other items in central London could all be expected to be well above the national average. We may imagine that perhaps rather more in the way of heating and lighting is required in Manchester than in the Isle of Wight, or that Brent's debt charges per pupil are four times those of Sutton because the former authority has had more need, for a variety of reasons, to undertake a heavy programme of school building or to acquire land at very high prices. In general, perhaps very urbanised authorities may be seen as operating in quite different circumstances from those with more rural components. At the same time, it may be disputed whether such objections are entirely valid in that, despite the Burnham provision noted above, ILEA does not in fact have the highest figure for teachers' salaries per pupil in that it ranks second after Harrow, or that the London weightings are certainly not sufficient to explain why teachers in Leeds on average receive a salary of £4104 whilst those in Ealing on average receive £5443, an addition of £1339 or nearly one-third; similarly, climate or environmental factors alone can scarcely require Manchester to spend two and a half times as much per pupil on heating and lighting as the Isle of Wight, and none of these factors can explain the nine-fold variation in expenditure on books between Durham and Bedfordshire.

Secondly, a complication is introduced by the fact that of the 88 English LEAs, 29 have a system of education which includes middle schools, which overlap with the normal distinction between primary and secondary schools. In theory, the distinction is maintained in that each individual middle school has a "deeming order" which

deems it to be either a primary or a secondary school, based largely on the age composition of the children in the school, and it is then included in the relevant education statistics under that category. Thus the CIPFA secondary school expenditure statistics include those middle schools deemed to be secondary. However, the inclusion of such schools, with some of their pupils aged only 9 or 10, means that the figures include a range of education which qualifies for fewer points on the Burnham salary scale, requires less in the way of expensive educational equipment, and on which less would normally be spent in the way of books or other materials. For the purposes of this chapter, therefore, their inclusion may well distort the statistics.

We have therefore adopted the following classification of the 88 LEAs for the purposes of the statistics under consideration: the first number in each box in the body of the following matrix refers to the relevant table to be found in the remainder of this chapter; the second figure (in parentheses) indicates the number of authorities in that category:

	County LEAs	Metropolitan District LEAs	London Boroughs and ILEA
No Middle Schools	Table 5.2 (20)	Table 5.4 (21)	Table 5.6 (18)
With Middle Schools	Table 5.3 (17)	Table 5.5 (11)	Table 5.6 (1)

Thus the County LEAs have been distinguished from the Metropolitan Districts (located in the great conurbations of the country) and each of these in turn from the London area. Tables 5.2, 5.4 and 5.6 include an additional two columns containing figures relating to

size of school and total expenditure on each school which were not available in the case of LEAs with middle schools and in any event would not be valid for comparative purposes even if they were available. It must again be emphasised that the figures used in these tables are themselves averages over the whole of the secondary school system of each LEA and conceal much wider variations between individual schools.

Table 5.2 gives, in column 1, expenditure and provision ratios for those (20) county councils with no middle schools and shows their total net expenditure to vary from £431 (Cleveland; Durham) to £517 (Surrey) and £520 (Buckinghamshire), with a mean of £464; at the upper end of the scale there is a large variation from the next highest figure, £482 (Cheshire), suggesting both Surrey and Buckinghamshire as exceptionally affluent authorities, as might have been expected. Teachers' salaries (in column 2), much the largest constituent item of total expenditure, ranges from £256 (Norfolk) to £315 (Surrey) about a mean of £275 (59% of £464). Column 3, expressing teachers' salaries as a percentage of total expenditure shows no very clear pattern between high- and low-spending authorities. Teachers' salaries per teacher have a mean of £4708 but, perhaps not surprisingly, are highest in Surrey (£4994) and Buckinghamshire (£4883) and are lowest in Cheshire (£4556) and Durham (£4584). Whilst Cheshire and Hampshire have well above average net expenditure per pupil but their teachers are on average some of the lowest paid in the country, Cornwall and, to a lesser extent, Devon have low figures for total expenditure per pupil but teachers receiving salaries well above the average. Obviously, both the percentages

Expenditure and Provision Ratios for each LEA - County Councils with no Middle Schools (1975/76)

(Expenditure figures are expressed per pupil unless otherwise stated)

1 LEA	2 Teachers' Salaries (£)	3 Total Expenditure (£)	4 Col.2 as % of Col.3 (%)	5 Teachers' Salaries per Teacher (£)	6 Pupil Teacher Ratio	7 Population per pupil	8 Expenditure per head of Population (£)	9 Pupils per School	10 Expenditure per School (£)
Salop	275	479	57.4	4642	16.9	12	39	627	300330
Cornwall	272	433	62.8	4722	17.3	14	32	748	324067
Warwickshire	279	449	62.1	4720	16.9	14	32	676	303374
Cumbria	288	471	61.1	4671	16.2	12	39	642	301862
Gloucestershire	268	455	58.9	4715	17.6	12	37	743	338198
Buckinghamshire	297	520	57.1	4883	16.5	16	33	646	336082
Cleveland	257	431	59.6	4700	18.3	10	42	915	394436
Durham	270	431	62.6	4584	17.0	12	36	677	291581
North Yorkshire	274	454	60.3	4670	17.0	13	35	749	340311
East Sussex	278	460	60.4	4810	17.3	17	27	847	389603
Norfolk	256	447	57.3	4659	18.2	15	30	639	285299
Berkshire	282	478	59.0	4731	16.8	13	38	801	383161
Leicestershire	269	440	61.1	4606	17.1	12	37	813	357787
Cheshire	261	482	54.1	4556	17.5	13	38	920	443338
Avon	282	467	60.4	4729	16.8	14	35	1094	511200
Devon	266	448	59.4	4740	17.8	15	29	755	338038
Surrey	315	517	60.9	4994	15.9	16	32	754	389832
Lancashire	271	462	58.7	4597	16.9	13	34	821	379118
Essex	272	479	56.8	4843	17.8	12	38	978	468384
Hampshire	275	471	58.4	4593	16.7	14	35	951	447839
Averages	275	464	59.0	4708	17.1	13.4	35	790	366192

SOURCE: C.I.P.F.A. Education Statistics, 1975-76, Actuals.

shown in column 4 and the pupil/teacher ratios shown in column 6 are of importance here but to some extent these simply confirm variations already noted: the most favourable pupil/teacher ratio (15.9) is to be found in Surrey and the worst (18.3) in Cleveland. Columns 7 and 8 should give some indication of the size of the educational sector in relation to the total population in the area but are not always easy to relate to the figures already discussed: East Sussex has 70% more population per pupil than Cleveland and is thus presumably more easily able to bear a higher level of expenditure but it has in fact expenditure per pupil below average. On the other hand, Cleveland, which had the lowest figure for expenditure per pupil, has, as a result of its exceptionally low figure for population per pupil, the highest level of expenditure per head of population. The final two columns give some indication of average size of school in these LEAs but since average size may relate to geographical or locational factors, it is difficult to relate these too closely to expenditure. Correlation coefficients were calculated between the various constitutent items of expenditure, such as teachers' salaries, non-teachers' salaries, repairs and maintenance, books, and were almost all positive but not statistically significant. Regarding the ratios in Table 5.2, however, total expenditure per pupil is strongly correlated, at the 0.5% (= 5 per mille) level, negatively with the pupil/teacher ratio ($r = -0.5805$) and positively with teachers' salary per teacher ($r = 0.5662$) and at the 5% level positively with population per pupil ($r = 0.4160$); population per pupil is correlated negatively with expenditure per head of population ($r = -0.8897$) at the

0.1% (= 1 per mille) level and positively with teachers' salary per teacher (r = 0.5272) at the 1% level. Those authorities with the highest levels of expenditure per pupil tend to have the most favourable pupil/teacher ratios, the most highly paid teachers, and the highest population/pupil, but, by implication, the lowest levels of expenditure per head of population. And the converse of all of these is true for those authorities with the lowest levels of expenditure. For evidence of economies of scale in schools, at the LEA level, we would require a negative correlation between total expenditure per pupil and number of pupils per school but whilst such a correlation is found it is very weak (r = -0.0060) and is not statistically significant at any acceptable level (S = 0.49).

For those 17 Counties who do have middle schools, Table 5.3 gives similar details to those discussed above and provides only weak support for the notion that these counties would have, on account of the inclusion of the middle schools, lower levels of expenditure than those shown in Table 5.2. Thus total expenditure per pupil shows a mean of £457 compared with £464 in Table 5.2, teachers' salaries per pupil £266 compared with £275 and average teachers' salaries £4649 compared with £4708, pupil/teacher ratio slightly worse at 17.4 compared with 17.1 but expenditure per head of population higher at £38 compared with £35. Within these figures there is obviously a very great deal of overlap, thus total expenditure per pupil in Hertfordshire (£518) and Bedfordshire (£504), both included in Table 5.3, exceed almost all the counties listed in Table 5.2. The figure for the Isle of Wight (£386) is much lower than that for any other authority in either table.[1]

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1. A representative of the Isle of Wight L.E.A., to whom I mentioned this point, informed me that there were particular reasons for believing that the figures for the Isle of Wight may not have been reported accurately for the year in question.

Table 5.3

Expenditure and Provision Ratios for each LEA - County Councils with Middle Schools (1975/76)

(Expenditure figures are expressed per pupil unless otherwise stated)

1 LEA	2 Teachers' Salaries (£)	3 Total Expenditure (£)	4 Col. 2 as % of Col. 3 (£)	5 Teachers' Salaries per Teacher (£)	6 Pupil/ Teacher Ratio	7 Population per pupil	8 Expenditure per head of Population (£)
Isle of Wight	224	386	57.9	4363	19.5	10	38
Northumberland	265	472	56.1	4632	17.5	10	47
Somerset	254	427	59.5	4693	18.5	14	31
Bedfordshire	271	504	53.8	4476	16.5	11	46
Northamptonshire	261	456	57.1	4472	17.2	12	39
Wiltshire	260	452	57.4	4649	17.9	12	37
Oxfordshire	276	489	56.3	4720	17.1	12	40
Cambridgeshire	280	473	59.2	4738	16.9	14	34
Suffolk	252	428	58.9	4560	18.1	12	37
Dorset	272	464	58.7	4736	17.4	15	32
Hereford and Worcester	265	436	60.8	4664	17.6	11	38
West Sussex	264	454	58.1	4746	18.0	14	32
Berkshire	282	478	59.0	4731	16.8	13	38
Humberside	273	435	62.8	4639	17.0	10	43
Derbyshire	257	435	59.2	4535	17.6	13	35
Hertfordshire	309	518	59.7	4962	16.1	11	46
Staffordshire	274	473	57.8	4665	17.0	13	38
Kent	263	465	56.5	4784	18.2	13	37
Hampshire	275	471	58.4	4593	16.7	14	35
Averages	266	457	58.0	4649	17.4	12	38

SOURCE: C.I.P.F.A. Education Statistics, 1975-76, Actuals.

The remaining 14 LEAs in Table 5.3 all lie within the range £427 to £489. Hertfordshire has the highest figure for teachers' salaries per pupil (£309), the most highly paid teachers (at £4962) and the most favourable pupil/teacher ratio (16.1) and with a low population per pupil ratio it also has one of the highest figures for expenditure per head of population; the Isle of Wight has both the worst paid teachers (£4363) and the worst pupil/teacher ratio (19.5) but still has expenditure per head of population up to the average level.

The figures in Table 5.3 give patterns of correlation coefficients similar to those for Table 5.2: as before the various constituent items of expenditure almost always showed positive correlations which were not at statistically significant levels; regarding the calculated ratios, total expenditure per pupil is strongly correlated negatively with the pupil/teacher ratio ($r = -0.8720$) at the highest 0.1% (= 1 per mille) level and positively with teachers' salary per teacher ($r = 0.5678$) at the 1% level; population per pupil is correlated negatively with expenditure per head of population ($r = -0.8253$) at the 0.1% (= 1 per mille) level and positively with teachers' salary per teacher ($r = 0.3542$) but only at a weak (= strictly non-significant) level ($S = 0.082$). In contrast to Table 5.2, however, total expenditure per pupil is correlated positively with expenditure per head of population ($r = 0.4683$) at the 5% level and the pupil/teacher ratio is correlated negatively with expenditure per head of population ($r = -0.5856$) at the 1% level. It would seem that in the case of the Counties with middle schools, a high level of expenditure per pupil is associated with a high level of expenditure per head of population whereas the reverse was the case with

Counties which had no middle schools but it must be remembered that the latter association was by implication only and was not a direct correlation.

Tables 5.4 and 5.5 relate to Metropolitan District Councils respectively without and with middle schools and they indicate differences between the two groups which are rather wider than those between the two groups of County Councils noted in Tables 5.2 and 5.3. The mean figure for teachers' salaries per pupil for Metropolitan Districts without middle schools is £272 compared with £266 for those with, total expenditure per pupil £449 compared with £434, the pupil/teacher ratio 16.9 compared with 17.1, and average teachers' salary £4601 compared with £4534. Since the number of Metropolitan District authorities without middle schools is only eleven, it is obviously more difficult to draw meaningful conclusions either from the data noted above or from the pattern of correlations between the calculated ratios mentioned below.

In the case of those (21) Metropolitan District authorities without middle schools, total expenditure per pupil is negatively correlated with the pupil/teacher ratio ($r = -0.5018$) at the 1% level but is not correlated with any of the other ratios, not even with teachers' salary per teacher, at any statistically significant level. Population per pupil is correlated negatively both with total expenditure per head of population ($r = -0.8439$) at the 0.1% (= 1 per mille) level and with teachers' salary per teacher ($r = -0.4893$) as just outside the 1% level. For the 11 Metropolitan District authorities with middle schools, total expenditure per pupil is again correlated negatively with the pupil/teacher ratio ($r = -0.6552$) at just outside the 1% level and is also correlated

Table 5.4

Expenditure and Provision Ratios for each LEA -
Metropolitan Districts with no Middle Schools (1975/76)

(Expenditure figures are expressed per pupil unless otherwise stated)

1 LEA	2 Teachers' Salaries (£)	3 Total Expenditure (£)	4 Col.2 as % of Col.3 (%)	5 Teachers' Salaries per Teacher (£)	6 Pupil/ Teacher Ratio	7 Population per pupil	8 Expenditure per head of Population (£)	9 Pupils per School	10 Expenditure per School (£)
South Tyneside	274	447	61.3	4682	17.1	11	40	787	352176
Gateshead	267	448	59.6	4542	17.0	13	36	882	394859
Sunderland	270	462	58.4	4594	17.0	11	40	1086	501525
Rotherham	267	422	63.3	4684	17.5	11	38	1056	446342
Knowsley	279	455	61.3	4617	16.6	9	52	1036	471495
St. Helens	270	474	57.0	4543	16.8	14	33	841	398709
Sefton	261	426	61.3	4670	17.9	11	38	967	412522
Liverpool	280	446	62.8	4714	16.8	11	42	663	295857
Calderdale	274	424	64.6	4829	17.6	12	35	647	273924
Bury	251	435	57.7	4326	17.2	15	30	657	285868
Tameside	263	431	61.0	4440	16.9	12	35	713	307356
Trafford	265	469	56.5	4504	17.0	12	38	700	328231
Oldham	262	439	59.7	4456	17.0	14	32	925	405812
Bolton	274	462	59.3	4597	16.8	13	35	665	307345
Salford	274	432	63.4	4594	16.7	12	35	787	340000
Stockport	268	474	56.5	4590	17.1	13	38	1099	520507
Manchester	306	508	60.2	4922	16.1	12	42	755	383316
Solihull	279	463	60.3	4532	16.2	12	40	956	442603
Wolverhampton	276	428	64.5	4533	16.4	11	38	1082	462954
Coventry	275	448	61.4	4537	16.5	12	37	1291	577888
Birmingham	285	439	64.9	4723	16.6	11	39	835	366584
Averages	272	449	60.6	4601	16.9	12	38	878	394089

SOURCE: C.I.P.F.A. Education Statistics, 1975-76, Actuals.

Table 5.5

Expenditure and Provision Ratios for each LEA - Metropolitan Districts with Middle Schools (1975/76)

(Expenditure figures are expressed per pupil unless otherwise stated)

1 LEA	2 Teachers' Salaries (£)	3 Total Expenditure (£)	4 Col. 2 as % of Col.3 (%)	5 Teachers' Salaries per Teacher (£)	6 Pupil/ Teacher Ratio	7 Population per Pupil	8 Expenditure per head of Population (£)
North Tyneside	272	457	59.6	4544	16.7	10	46
Newcastle-upon-Tyne	291	520	55.9	4592	15.8	12	43
Barnsley	264	423	62.6	4508	17.1	12	36
Wakefield	262	429	61.2	4697	17.9	11	40
Kirklees	266	422	62.9	4693	17.6	12	36
Bradford	261	429	60.9	4690	17.9	10	44
Leeds	222	366	60.8	4104	18.5	10	35
Rochdale	281	462	60.8	4500	16.0	11	41
Wigan	274	423	64.3	4556	16.6	12	37
Walsall	273	440	61.5	4481	16.4	10	43
Dudley	261	395	66.1	4512	17.3	14	29
Averages	266	434	61.3	4534	17.1	11	39

SOURCE: C.I.P.F.A. Education Statistics, 1975-76, Actuals.

positively with expenditure per head of population (r = 0.6767) at just outside the 1% level, whilst the latter variable is correlated negatively with population per pupil (r = 0.7291), at the 0.5% level.

Comparing all County Councils (Tables 5.2 and 5.3) with all Metropolitan Districts (Tables 5.4 and 5.5) we find that the former have on average appreciably higher levels of expenditure per pupil (£464 and £457 compared with £449 and £434), more highly paid teachers (£4708 and £4649 compared with £4601 and £4534) but rather less favourable pupil/teacher ratios (17.1 and 17.4 compared with 16.9 and 17.1) and rather lower expenditure per head of population (35 and 38 compared with 38 and 39).

In the case of the 19 London LEAs (18 London boroughs and ILEA), as listed in Table 5.6, total expenditure per pupil showed a mean of £513, a higher figure than those in any of the other tables, as was only to be expected, and ranging from Merton's £423 to ILEA's £594. The particular circumstances relating to the high figure for ILEA have already been noted, as have the Burnham salary scale provisions which lead to the high average teachers' salary of £5159. Following the reasoning used previously, it can be argued that Merton should be excluded from Table 5.6 in that it is the only London authority to have a system of schooling which includes middle schools. The figures were therefore run both with and without the inclusion of Merton: exclusion of this borough had the effect of increasing the mean total expenditure per pupil from £513 to £518, mean teachers' salaries per pupil from £313 to £315, average teachers' salaries from £5159 to £5170, and

Table 5.6

Expenditure and Provision Ratios for each LEA - London Boroughs and ILEA (1975/76)

(Expenditure figures are expressed per pupil unless otherwise stated)

1 LEA	2 Teachers' Salaries (£)	3 Total Expenditure (£)	4 Col. 2 as % of Col. 3 (%)	5 Teachers' Salaries per Teacher (£)	6 Pupil/ Teacher Ratio	7 Population per pupil	8 Expenditure per head of Population (£)	9 Pupils per School	10 Expenditure per School (£)
Kingston-upon-Thames	315	517	60.9	5047	16.0	15	35	755	389973
Barking	303	455	66.6	4958	16.3	12	39	1187	540395
Sutton	299	464	64.4	5185	17.3	14	34	712	330305
Richmond-upon-Thames	321	549	58.5	5378	16.8	19	29	672	369261
Merton	268	423	63.4	4973	18.5	10	42	N/A	N/A
Harrow	356	564	63.1	5349	15.0	18	32	749	422225
Hounslow	303	492	61.6	4965	16.4	13	39	1054	518105
Haringey	321	530	60.6	5208	16.2	14	38	1085	574915
Newham	306	502	61.0	5350	17.5	12	41	1161	582447
Waltham Forest	347	541	64.1	5238	15.1	14	39	599	324036
Hillingdon	298	497	60.0	5036	16.9	13	39	818	407007
Redbridge	302	519	58.2	5150	17.1	15	36	692	358903
Enfield	284	444	64.0	4973	17.5	13	35	929	412425
Brent	333	582	57.2	5165	15.5	13	44	1081	629333
Ealing	330	546	60.4	5443	16.5	19	29	984	536537
Barnet	310	482	64.3	4963	16.0	14	36	788	380235
Bromley	305	520	58.8	5174	17.0	14	38	673	350265
Croydon	293	525	55.8	5038	17.2	13	40	720	377924
Inner London Education Authority	348	594	58.6	5439	15.6	14	43	907	538249
Averages	313	513	61.0	5159	16.5	14	37	865	446808

Note: Merton is the only LEA in this table which has middle schools.

SOURCE: C.I.P.F.A. Education Statistics, 1975-76, Actuals.

to improve pupil/teacher ratio from 16.5 to 16.4, none of which could be said to be very great differences. Table 5.6 makes it apparent that the London authorities have expenditure figures above the national average not solely on account of the Burnham London weightings but also because of their more favourable pupil/teacher ratios which are significantly below those found elsewhere. As before, those authorities with the highest levels of expenditure per pupil (ILEA, Brent, Harrow) tend to have the highest figures for teachers' salaries per pupil, the most favourable pupil/teacher ratios, and the most highly paid teachers. Enfield, on the other hand, ranks last, or very nearly last, in each of these columns.

For the 18 London LEAs excluding Merton, teachers' salaries per pupil are positively correlated with non-teachers' salaries per pupil ($r = 0.5125$), fixtures and fittings ($r = 0.5515$), books ($r = 0.4637$), and educational equipment ($r = 0.7741$), all at least the 5% level: those authorities which spend highly, per pupil, on one of these items tend also to spend highly on the others, a pattern which had been expected but which was not found from Tables 5.2, 5.3, 5.4 or 5.5. Total expenditure per pupil is again correlated negatively with the pupil/teacher ratio ($r = -0.4843$), at the 2.5% level, positively with teachers' salaries per teacher ($r = 0.7014$) at the 0.1% (= 1 per mille) level, and positively with population per pupil ($r = 0.4524$) at the 5% level. Other significant correlations are population per pupil ratio with teachers' salary per teacher (positive, $r = 0.6058$, 0.5% level) and with expenditure per head of population (negative, $r = -0.8288$, 0.1% level). A comparison of all these results with those found from running the figures with the inclusion of Merton shows only

very small differences: all of those correlations previously noted to be significant remain so, with the levels of statistical significance changing in some cases.

Throughout this chapter it must be borne in mind that not all itmes of expenditure on, or provision in, schools are included: for example, any funds provided by parent-teacher associations or other support groups would not be included. Almost certainly such support would, for socio-demographic reasons, be highest in those schools which already have highest levels of provision. Further, it should be apparent that there are obvious reasons for divergencies, once manifest, to continue over time: schools or LEAs with the highest levels of expenditure will also tend to have the highest rates of increase or educational improvement over time.

This chapter has demonstrated some of the apparently interesting results that can be obtained from manipulation of the educational expenditure statistics published by CIPFA with other available information for each LEA. Some of the conclusions noted above, and especially the patterns of correlations between the various calculated ratios, would seem to repay further investigation, possibly making use of the more detailed information which each LEA would possess. At the same time perhaps the chapter demonstrates the limitations of working with such global figures for each LEA and points towards the need for studies at a more disaggregated level.

CHAPTER 6. STATISTICAL METHODOLOGY

In connection with the calculations made as part of this study and discussed in detail in Chapters 7 and 8, a number of problems of a statistical nature arose and are discussed below, as follows:

1. The use of variables expressed as ratios

In connection with the statistical calculations carried out as part of this study and reported in this thesis, a particular problem arose, namely the use of correlation and regression techniques when the variables in question are themselves ratios. That this is largely the case in this work becomes obvious when it is recalled that such a term as "expenditure per pupil" is itself the ratio of two variables, the total of expenditure and the number of pupils.

Some writers, including some of the leading authorities in this field, have in at least some instances used variables in the form of ratios in calculations of correlations or regression equations without any particular reference to the fact that to do so may be problematic, whilst other writers have stressed the need for caution in these circumstances. The former include Professor J. Johnston, who (i) uses a ratio of indices of two separate sets of prices as an independent variable,[1] and (ii) implies that it is valid to regress AC($=\frac{TC}{N}$) against size and when discussing sources of bias does not mention this point;[2] Kendall and Stuart, who use statistics of yields of wheat per acre and potatoes per acre;[3] and Croxton and Cowden who refer to the

1. J. JOHNSTON, Econometric Methods, Table 5.4, p.147
2. J. JOHNSTON, Statistical Cost Analysis (p.72 and p.102 respectively).
3. M.G. KENDALL and A. STUART, The Advanced Theory of Statistics, Vol.2 (Charles Griffin, London), Table 26.3, p.291.

possible calculation of a correlation coefficient using statistics of retail sales per family and percentage of families in urban areas.[1] The writers who have stressed the need for caution include K. Pearson,[2] in a classic paper written in 1897, Kuh and Meyer,[3] and Belsley,[4] apart from a number of other writers cited in both the latter articles. To quote from Belsley's article, which gives both the neatest and the most useful summary of the problem:

> "Applied econometricians have long been careless in the way they introduce deflators into linear models. Deflation is undertaken (or deflated variables are simply substituted for originally-specified undeflated variables) without any regard to any implications this procedure will have for the biasedness or efficiency of the resulting least-squares estimators ... a casual perusal of any journal demonstrates that in most instances in which deflated variables are introduced ... the problems dealt with here are being ignored".

The essence of the problem is that if we commence with a simple linear model:

$$Y = a + bX + U \qquad (1)$$

in the undeflated variables Y and X, these variables are frequently then deflated by another variable, say Z, to give

$$\frac{Y}{Z} = c + d\frac{X}{Z} + V \qquad (2)$$

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1. F.E. CROXTON and D.J. COWDEN, Practical Business Statistics, 3rd edition (Prentice-Hall, 1960), p.525.

2. K. PEARSON, "On a Form of Spurious Correlation which may arise when Indices are used in the Measurement of Organs", Proceedings of the Royal Society of London, Vol.60, 1897. It seems curious that a point with such a long history has received little attention in economics research.

3. E. KUH and J.R. MEYER, "Correlation and Regression Estimates when the Data are Ratios", Econometrica, Vol.23, 1955, pp.400-416.

4. D.A. BELSLEY, "Specification with Deflated Variables and Specious Spurious Correlation", Econometrica, Vol. 40, No. 5, September 1972, pp.923-927. Belsley goes on to acknowledge that he himself was guilty of precisely the same error in an earlier piece of work. I am grateful to Professor K. Wallis, Professor of Econometrics at the University of Warwick, who, in reply to an enquiry I addressed to him, drew my attention to the Belsley article.

(in which the coefficients have been named, c, d, and the variance form, V, to show that they are not intended to be identical to the previous a, b, and U). But in fact correct deflation of equation (1) by Z should give not (2) but:

$$\frac{Y}{Z} = e.\frac{1}{Z} + f.\frac{X}{Z} + \frac{U}{Z} \qquad (3)$$

and in (3) it is evident that:

(i) we have introduced the new variable $\frac{1}{Z}$, and

(ii) we have constrained the intercept to equal zero,

i.e. there is no constant term in the equation.

Equation (2) would in fact be a deflation of:

$$Y = gZ + hX + U \qquad (4)$$

which is not at all the same as equation (1). Previous writers suggested that incorrect or careless deflation would of itself introduce correlation between the dependent and independent variables but Belsley shows that whether or not such "spurious correlation"[1] exists depends crucially on the statistical properties firstly of the error term and secondly of the variables themselves. In particular, it will generally be necessary to work with an equation of the form of (3).

In reply to an enquiry I addressed to him, Professor Alan Stuart, Professor of Statistics of the London School of Economics, and already cited in footnote 3 on page 6.1 above) was kind enough

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1. And KUH and MEYER comment: "A possibly unexpected result is that in the context of spurious correlation the ratio correlations may just as well be spuriously low as spuriously high", op. cit., p.403.

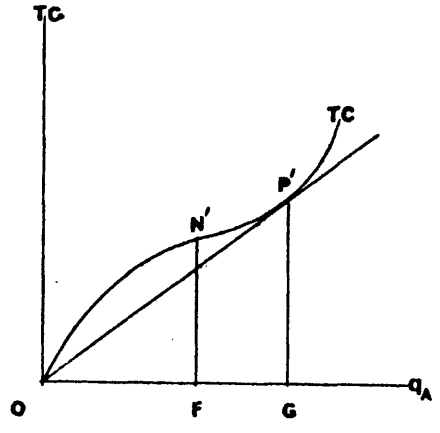
to write to me as follows:[1]

> "The spuriousness of 'spurious correlation' depends on whether one is fundamentally interested in the correlation between ratios or not. You will find that view expressed at the end of Exercise 26.18 of Volume 2 of our work. In the problem outlined in your letter, it seems to me quite reasonable to be directly interested in the various heads of expenditure per pupil. If so, I should forget about spuriousness altogether. In our Table 26.3 ... there was no sense in considering crop-yields except on a per-acre basis, so that is what we did, and should do now".

(Thus confirming the comment by Kuh and Meyer:[2] "The question of spurious correlation quite obviously does not arise when the hypothesis to be tested has initially been formulated in terms of ratios".)

Now the problem of testing for economies or diseconomies of size in groups of schools, and/or possible "optimum size" of school, may equally validly be expressed in terms of the slope and point of curvature of the Total Cost curve:

Diagram 1



(as in Chapter 3, diagrams 2 and 9.)

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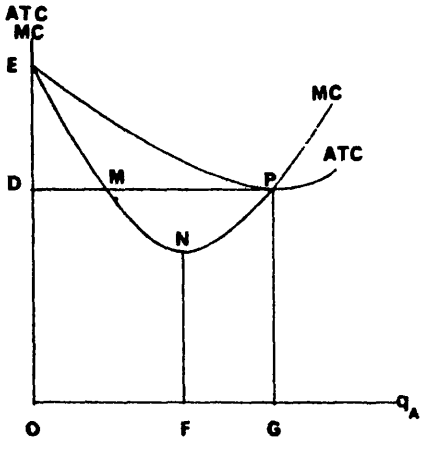
1. Private letter to me dated 8 March 1978. I am grateful to Professor Stuart for his assistance.

2. Op. cit., p.401.

or in terms of the slope and minimum point of the Average Cost curve:[1]

Diagram 2



(as in Chapter 3, diagrams 11 and 14)

The estimations of the point at which average cost is lowest should be identical regardless of whether they are obtained from:

(i) estimating, via regression analysis, the equation of the Total Cost curve shown in Diagram 1, finding the point P' and then calculating $AC=\frac{TC}{N}$ at that point, or

(ii) estimating, via regression analysis, the equation of the Average Cost curve shown in Diagram 2, finding the minimum point of this curve via differential calculus in the normal way and ascertaining Average Cost at that point (P).

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1. These diagrams are standard in economics text-books. Here they have been taken from M. Fleming, Introduction to Economic Analysis (Allen & Unwin, 1969).

In fact for a number of groups and sub-groups of schools both procedures (i) and (ii) were followed and the results were found to differ by up to about 10% (a not negligible variation) either way, thus confirming the comment by Kuh and Meyer:[1]

> "A possibly unexpected result is that in the context of spurious correlation the ratio correlations may just as well be spuriously low as spuriously high".

How then are we to decide whether we are "fundamentally interested in" (Professor Stuart) or whether "the hypothesis to be tested has initially been formulated in terms of" (Kuh and Meyer)[2] Total Costs or Average Costs? There is an undoubted subjective element in this question and no definitive answer seems possible. It does, however, seem clear that if some spuriousness or bias has been introduced into the results by the use of ratios as a variable in the regression equations, this can only have occurred in procedure (ii). Therefore the results for economies of size discussed in this thesis (Chapter 8) were estimated via procedure (i), in which no such distortion can have taken place. Since either procedure could be used, it seemed only sensible to choose the latter.

In the case of correlation coefficients, as discussed in Chapters 5 and 7, however, no such alternative was available and the results of calculations using ratios as variables have had to be used. Thus the correlation coefficient of "Teachers' salaries per pupil" $(\frac{TS}{N})$ with "Non-teachers' salaries per pupil" $(\frac{NTS}{N})$ involves N as the deflator in both variables, but there is no alternative to

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1. Op. cit.

2. Nor is this decision aided by the subsequent explanatory comment by Kuh and Meyer: "Spurious correlation can only exist when a hypothesis pertains to undeflated variables and the data have been devided through by another series for reasons extraneous to but not in conflict with the hypothesis framed as an exact, i.e. non-stochastic, relation".

its use: to calculate the correlation coefficient for (total) teachers' salaries with (total) non-teachers' salaries would clearly be meaningless since the largest schools obviously have the largest totals for both. Kuh and Meyer state that any induced bias will be engligible if the "coefficient of variation" (ratio of standard deviation to mean) is "small" but they give no indication of how small is "small".

Here, also, it seems reasonable to refer back to the wording cited above and to say that we are "fundamentally interested in", or that the problem was "formulated in terms of", correlations on a per pupil, i.e. ratio, basis. Finally, we may mention in passing that although many of the books or articles mentioned in Chapter 2 or earlier in the present chapter use variables in the form of ratios in calculations in some way or other, none of them appears to refer to this problem or to acknowledge that to do so may itself introduce an error into the calculations. (Riew, Cohn, Osburn, and Kiesling, all used "per pupil expenditures" as their dependent variable).

2. Orthogonal Polynomials

My colleagues in Loughborough University's Computer Centre[1] were anxious that any calculations of regression equations should be effected via the use of orthogonal polynomials[2] and many basic

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1. To whom I am grateful for their ready assistance, and for their patience with my attempts at Fortran programming.

2. The basic properties of orthogonal polynomials are discussed in such texts as: N. DRAPER and H. SMITH, Applied Regression Analysis (Wiley, 1966); F.E. CROXTON and D.J. COWDEN, Applied General Statistics (included in second edition but omitted from third edition) (Prentice-Hall); F.E. CROXTON and D.J. COWDEN, Practical Business Statistics, 3rd edition (Prentice-Hall). A fuller treatment is given in: J.G. HAYES, "Curve fitting by Polynomials in One Variable" in J.G. HAYES, ed., Numerical Approximations to Functions and Data (Athlone Press, 1970).

computer routines such as NAG routines (modifications of which were used for my calculations) are expressed in terms of Chebyshev polynomial series, a form of orthogonal polynomials.

Suppose we wish to fit data to an equation of the form:

$$Y = a + bX + cX^2 + dX^3 + \ldots$$

and to gradually add on additional terms for higher powers of X, then each time the estimates of all the other coefficients (a, b, c ...) will have to be re-calculated. Orthogonal polynomial equations, however:

> "involve a transformation of such a nature that as new constants are added the old constants remain the same. Such equations are very convenient to use, since we merely build up our equation by adding new constants until a satisfactory fit is obtained".[1]

Thus in lieu of calculating a, b, c, direct coefficients of X, X^2, X^3, we calculate coefficients of X_1, X_2, X_3, where the X_i are expressions including X^1, X^2, X^3; for example the Chebyshev coefficients take the form:

2 (the intercept); 1 (X); $(2X^2-1)$; etc.

The use of orthogonal polynomials is said to avoid the following disadvantages of ordinary (simple) polynomial equations:

> "1. Each time the degree of the equation is increased, approximately half of the trend constants must be recomputed.
>
> 2. Solving of simultaneous equations is required for all simple polynomial equations beyond a straight line.
>
> 3. The values of X^2, X^3, X^4, etc., become rather large when n is large ...
>
> 4. Testing the significance of simple polynomial trend constants is laborious."[2]

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1. F.E. CROXTON and D.J. COWDEN, Applied General Statistics, op. cit., p.289.

2. F.E. CROXTON and D.J. COWDEN, Practical Business Statistics, op. cit., p.516.

Whilst: "the trend values obtained by the two methods are exactly the same",[1] it is also true that:

> "the power-series form has to be used with caution, since it can lead to a considerable loss of accuracy, particularly if the original, un-normalised variable X is used"[2]

(because of the very large numbers and probable machine rounding involved in calculations where X is raised to a high power),[3] so that the Chebyshev form will in practice give greater accuracy than ordinary, simple, polynomials, at such high powers. To further ensure the advantages of working with small numbers, the standard computer packages also "normalise" the original variables by transforming them to lie within the range -1 to +1, with mean = 0.

The effect of all this has been as follows:

(i) since we are not concerned with powers of X higher than 2 or 3, the complications (and possible errors) introduced at much higher powers can be ignored.

(ii) output of the standardised computer packages has had to be transformed back into "ordinary" and "un-normalised" variables, which has involved some tedious calculations.

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1. F.E. CROXTON and D.J. COWDEN, Applied General Statistics, op. cit., p.289.

2. J.G. HAYES, op. cit., p.47.

3. Hayes suggests, by implication, that "high" here means 11, 12, or higher.

(iii) my colleagues in the Computer Centre assured me that it was standard practice amongst academics in physical science departments to present results expressed in terms of orthogonal polynomials and/or normalised variables; since, however, I can find no writers within the fields of economics or education who have done so, I did not feel it incumbent on me to be the first.[1]

3. Choice of Variables

A difficult problem in connection with the use of multiple regression analysis relates to which variables to include in the equation, and in what form, particularly in connection with the estimations of economies of scale: are we to express the equation as:

(i) the simple linear form (ordinary least squares):

$$TC = a + b(N) \qquad (1)$$

Where TC = total costs per school

N = number of pupils per school

or (ii) multiple regression equations (ordinary least squares) of the form:

$$TC = a + b(N) + c(N^2) \qquad (2)$$

or

$$TC = a + b(N) + c(N^2) + d(N^3) \qquad (3)$$

etc.

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1. As Dr. B. Negus of Loughborough University's Computer Centre subsequently wrote to the NAG Central Office (responsible for producing standard computer packages) at Oxford University:

"... many users of curve fitting software appear to want to publish the fitted function and are not happy to publish the result as a Chebyshev series. I can see no way of persuading a general user population that they should publish results in a form that seems to them mathematically obscure and I feel very strongly that NAG must allow users to obtain polynomials in a standard power series form in the original independent variable ... May I suggest that NAG considers including in the library a routine for transforming from the Chebyshev series in the normalised variable to a power series in the original variable. No doubt this routine may be unsatisfactory to a numerical analyst..."

I am most grateful to Dr. Negus for his assistance.

The attractiveness of these polynomial forms lay in the fact that if statistically significant and valid to use they might provide a point of "minimum costs" (about which there has been much speculation in the literature, as noted in Chapter 8), which would not be the case with (1). The normal methods used would be differentiation, setting the first derivative to zero, and finding the sign of the second derivative (in the case of (2), and differentiation and solving the quadratic (in the case of (3)), but, as noted above, in this case similar, but unbiased results would be obtained via the point of tangency with the total cost curve.

For each data group, a simple linear equation in N, and curvilinear equations in (i) N and N^2, (ii) N, N^2 and N^3, and (iii) N, N^2, N^3, and N^4, were tested and the results compared via the standard and Incremental forms of the F-test, as discussed below. As Croxton and Cowden emphasise:

> "Polynomial trends ... can be extended to any degree. As the degree of equation is larger the variation around the trend line gets smaller; i.e. the quantity $\Sigma(Y-Y_x)^2$ gets smaller. However, the number of degrees of freedom declines by one every time an additional term is added to the equation. If there are as many constants in the equation as there are observations, the trend will coincide with every point, but the trend equation will be meaningless ... polynomial equations often fit the data well within the range of the data. However, it is usually impossible to find any logical basis for a polynomial equation."[1]

There are, however, a number of other forms of expression in N which could be utilised, the most obvious of which would be logarithms, i.e. log N. For samples of groups of schools, therefore, the values of N were transformed into logarithms and

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1. F.E. CROXTON and D.J. COWDEN, Practical Business Statistics, op. cit., p.524.

equations were tested of the form: $TC = a + b (\log N)$. In each case the estimated equation gave a worse fit to the data, in the sense of a lower value both for R^2 and for the standard F-test; it therefore seemed clear that the use of logarithms was not valid in this instance.

One side-effect of the use of TC as the dependent variable is that it will not be possible to attach very great significance to the values of R^2 which will be mentioned in Chapter 8.

4. The Incremental F-Test (or t-test).

Producing results for different equation forms does not in itself enable us to assess the validity of including, for example, the term in N^2 and/or the term in N^3. The usual explanation of the standard statistical F-test is that

$$F = \frac{\text{explained variation}}{\text{unexplained variation}}$$

where the explained and unexplained variations (the vertical measurements to, and deviations from, the hypothesised regression line) are summed and squared and subsequently corrected for degree of freedom. This test simply investigates whether the overall equation in the form currently in question provides a reasonable fit to the data without considering whether this form is better or worse to use than any other. The more rigorous test[1] we require is a variation of the F-test, best explainable as the Incremental F-test, which tests, for an equation of the form (2), as specified previously:

$$F = \frac{\text{Explained Variation (for } N^2, N) - \text{Explained Variation (for } N)}{\text{Unexplained Variation}}$$

against the tabulated F values. In other words, we are now

1. See K. YEOMANS, Statistics for the Social Scientist, Vol. 2, p.223 (Penguin, 1968) and J. JOHNSTON, Econometric Methods, op. cit.

specifically testing the validity of the inclusion of the term in N^2. Similarly for equation (3):

$$F = \frac{\text{Explained Variation (for } N^3, N^2, N) - \text{Explained Variation for } (N^2, N)}{\text{Unexplained Variation}}$$

is tested against the tabulated F values. As Yeomans makes clear, the result of this test is always identical to the t-test on the significance of the coefficient in question.[1] Results of the tests are given in Chapter 8.

5. Heteroscedasticity

In many studies which involve the use of econometric methods, a particular problem is caused by the presence of heteroscedasticity.[2] Frequently, the assumption of a constant variance for the disturbance term (or "homoscedasticity"), on which the correct use of regression analysis depends, is unrealistic, especially where cross-section data is used, as in the case in this study. To see visually whether or not the variance of the disturbance term is constant, for each data point, the actual Y can be subtracted from the estimated Y and the differences plotted: unless they evidence a random or non-systematic pattern, if, for example, the larger Y have the larger (or the smaller) variations or if the variations show a bulbous or bottle-shape, then the variance of the disturbance term is clearly not constant and is heteroscedastic (although, again, most of the previous studies make no mention of this point).

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1. Save that the (always one-tailed) F-test result is equivalent to the result from a two-tailed t-test: for a one-tailed t-test, as with our results, a further correction is necessary. See introduction to D.V. LINDLEY and T.C.P. MILLER, (Cambridge Elementary Statistical Tables (CUP, 1961).

2. See: J.L. MURPHY, Introductory Econometrics, ch.14;
J. JOHNSTON, Econometric Methods, 2nd edition, ch.4;
or C.F. CHRIST, "Econometric Models and Methods", (Wiley, 1966).

The precise procedure to be followed to remove the effect of the heteroscedasticity must, however, depend on what form the heteroscedasticity takes and in fact:

> "there is scant empirical evidence on the likely type of heteroscedasticity in economic relationships"[1]

If heteroscedasticity is present, the estimator(s) will still be unbiased, as usual, but they would not be the "best" or most efficient estimator(s) possible,[2] i.e. there would be some loss of predictive power (or a smaller R^2). How serious the problem would be is not entirely clear:

> "Little is known, either analytically or as a result of sampling experiments, of the seriousness of the error involved in using the conventional t-test when in fact various degrees of heteroscedasticity are present."[3]

Perhaps the most-used, although by no means the only, test for heteroscedasticity, is that developed by Goldfield and Quandt.[4] Essentially this test consists of dividing the data for any one group into three, by size of dependent variable, calculating the ratio of the Unexplained Variations of the largest and smallest sub-groups and comparing this ratio with tabulated F-ratios at varying levels of significance. Further reference will be made to heteroscedasticity in Chapter 8.

6. Autocorrelation and Multicollinearity

The two other problems which frequently cause difficulties with studies of an econometric nature are autocorrelation and multi-collinearity but, in view of the nature of the data used and the tests carried out, neither of these arose or had to be dealt with.

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1. J. JOHNSTON, Econometric Methods, 2nd edition, p.217.
2. Idem.
3. J. JOHNSTON, Statistical Cost Analysis, p.34.
4. And described in detail in J. MURPHY, op. cit., pp.302-7. Professor Murphy explains the method very clearly but his calculations as printed are in fact incorrect: I wrote to Professor Murphy about this but to date have received no reply.

CHAPTER 7. THE DATA ON SCHOOL COSTS

We can now turn to a consideration of the statistics of school costs that were compiled in the offices of the four Local Education Authorities which agreed to co-operate with this research. It is initially necessary to consider the nature of the statistics in question, i.e. what kinds of "costs" are we referring to? As we saw in Chapter 3, "costs" in economics is a term which may be used in a variety of ways and which requires careful definition.

Firstly, it should be clearly understood that we are not considering the total resource costs (as embodied in the "Total Costs" of Chapter 3, diagram 2) of the education in question, for two reasons:

(i) no statistics of actual capital costs for each school are available. Almost all previous studies of school costs confine themselves to the current operating costs of schools, with the definition of the latter varying relatively little between them; for example, by the inclusion or exclusion of such items as transportation costs. The inclusion of capital costs in such studies has always been regarded as extremely problematic, because of the difficulty of comparing loan charges for different school buildings: these will vary widely according to the age and type of building, what costs limits were in operation at the time of construction, prevailing rates of interest, whether the debt was borrowed at fixed or fluctuating interest rate, and over how long a period the debt is being amortised. Practically all previous writers have concluded that to ascertain such outstanding debt charges for each of a particular sample of schools on any one date, and thence to attempt to draw

conclusions relating, for example, to the question of economies of scale would be quite meaningless. Moreover, there is the overriding practical problem that it appears that no local education authority keeps records of the outstanding capital charges for individual schools, the general practice being to borrow in bulk. Indeed, authorities have indicated that if, as is usually the case, their total borrowing comprises a number of loans contracted at different dates and at varying rates of interest, they would have no way of apportioning some part of these to individual schools.

The inclusion of capital charges in a detailed study of school costs is therefore not possible.

Whilst it would be a simple matter to arrive at an "annual equivalent capital cost" (for example, on the lines indicated by Pearson[1]) such a figure could be no more than an approximation for any particular school, (for instance, the land on which school X stands might be, or have been, particularly expensive); and it would tell us little, indeed it might well positively mislead us, in connection with inter-school variations.

(ii) there has been no attempt to include all "opportunity costs" (in the sense in which the term was defined in Chapter 3, page 3.15), such as the value of pupils' time for those pupils over the school leaving age or alternative uses of the buildings and land. To endeavour to do so for all the

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1. From P.K. PEARSON, op. cit:

"the annual equivalent capital cost" is:
"an estimate of the equivalent annual cost of providing one student place in perpetuity in each sector, and is derived as one tenth of the present capital construction cost per place. The rationale behind this is that, using the Treasury test discount rate of 10%, amortised capital over any period in excess of 40 years will result in an annual equivalent which is increasingly close to one tenth of the capital amount as this period is extended."

schools involved would be a Herculean task and again it could be misleading from the point of view of costs of educational establishments: for example, if there were high unemployment amongst school leavers in a particular town in any one year, the value of pupils' time might have to be either zero or some very low figure. For some purposes this would be a valid computation, for example, if we were interested in the marginal resource costs of providing additional courses for 16-year-olds, but if our immediate object is in effect to compare school X with school Y from a cost point of view, it could well cloud the issue.

Secondly, the cost figures in question are available, for each school and each functional heading, as annual totals and, usually, are divided by numbers of pupils to give <u>average</u> per pupil figures. (Mention will be made later of the problematic question of giving weights for different ages or levels of pupils). <u>Marginal</u> cost figures are not available and it can easily be imagined how difficult it would be to arrive at same. (The distinction between average cost and marginal cost was emphasised in Chapter 3, diagram 11, and the related discussion.) The "margin" in economics is a term with a certain flexibility and in this case might be applied to, say the accommodation of one extra pupil in the school, the addition of one more optional subject to the timetable, or the addition of one extra tutor group. In each case it is obvious that the marginal cost would relate directly to the availability of spare capacity within the school, which would differ for each group of pupils. No one figure for marginal cost could be forthcoming unless we were given, for some reason of policy, some more precisely defined concept, such as "the addition of one more pupil to the fifth form year group" and even then the figure would depend, for

example, on which optional subjects the hypothetical pupil wished to follow. Therefore, although inter-school comparisons of marginal costs would be useful for certain policy purposes, they would be fraught with even more difficulties than those of average costs. The problems discussed here are quite apart from, and in addition to, the essential distinction between short-run marginal cost and long-run marginal cost which was emphasised in Chapter 3, diagram 13.

Thirdly, we should mention that whilst the cost statistics used, as mentioned above, are basically "current" in nature, some deviation from this is found in practice. Local education authorities vary in the amount of discretion they give to individual schools but some may give discretion to purchase small items of, for example, education equipment out of the schools' capitation allowance and such items could therefore be included under "current". Further, it seems to be general practice among L.E.As that whereas new furniture in a new building is classified as "capital", new, i.e. replacement, furniture in an existing building is classified as "current". To an economist, of course, both are capital. Taken together, both these factors would have relatively little impact on total annual cost figures and we can, therefore, be reasonably sure that any such departures from a strictly correct "current" classification will be relatively unimportant.

Fourthly, and rather more complex, is the question of whether the total (or average) costs in use relate to the short-run or long-run. Economic theory draws a neat distinction between the variation of costs in the long-run, when the period is long enough to permit all factors of production to be varied as necessary to achieve the lowest cost combination, and variations in the short-run within which expansion can only take place by making more intensive use of existing capital equipment and other facilities, with

necessarily higher costs per unit. This distinction is endemic throughout the theory presented in Chapter 3 and is particularly emphasised in diagrams 6 and 9.

With regard to school costs, however, the distinction is less clear cut; in the short-run an L.E.A. may have to make a variety of temporary provisions to provide education for all the children for which it is responsible. A larger influx into one school in one year may result in the need for more mobile classrooms which are cheap to provide but costly to heat and maintain, or improvised transport arrangements might be needed to make use of temporary accommodation elsewhere. In the long-run such temporary adjustments can give way to more permanent arrangements, such as the construction of new buildings, always depending on whether forecasts of future enrolments justify doing so. If not, the long-run solution may never be reached. Thus many schools at any one time will have a mix of the long-run and the short-run: the sight of permanent buildings flanked by mobile classrooms is familiar at schools throughout the country. In terms of the graphical presentation of theory in Chapter 3, this position might be represented in diagram 6 by a line for $\bar{K}$ which deviated from the horizontal, perhaps moving upwards in steps, or in diagram 9 by some intermediate positions in between the lines for k^1 and k^2 and/or those for k^2 and k^3.

Nevertheless such mobiles, or their labour equivalent, temporary staff, in nearly every case form but a small percentage of the total. Most schools, most of the time, do most of their work in permanent buildings with permanent staff. Further for the majority of schools the deviation from the long-run cost pattern caused by the use of temporary expedients is unlikely to be large in relation to total costs. To take one example, one large school visited has six mobile classrooms and estimates

these may cost an additional £5 per week each to heat: for some 30 weeks per year this gives a cost of some £900. Whilst this sum is not negligible it has to be compared with the total annual running costs of that school for that year which amounted to some £900,000, i.e. a ratio of 1 per mille (=0.1%). It seems reasonable to conclude, therefore, that the figures with which we are working can be taken to be long-run average costs (as in Chapter 3, diagram 14), and any variations from this can be assumed to be relatively unimportant.

Fifthly, the prime aim of the research has been to examine inter-school cost variations within one authority, inter-authority comparisons being fraught with even more difficulties than those indicated above. As previously indicated, L.E.A.s' accounting procedures are by no means uniform, in connection with such matters as how much discretion to allow individual schools to switch funds between different types of expenditure, how much in the way of small capital purchases to permit out of current funds, how much of the L.E.A.s' own office expenses to apportion over individual schools, and how much rent to charge for other uses of school buildings, quite apart from such questions as whether L.E.A.s have bulk-purchasing arrangements to achieve economies of scale.

Finally, there is the question of comparing movements of cost levels from one year to the next, to which we shall revert later.

Of the four L.E.A.s, no two kept their data in the same way or recorded items of cost under the same headings or sub-headings but with relatively simple or minor adjustments it has been possible to present the data on a basis of broad similarity, if not of comparability, as discussed above. Three of the four L.E.A.s each had standardised procedures for coding individual cost items and inserting same into their on-going computer record of school costs which was automatically brought up-to-date month by month.

The fourth L.E.A. had no such cumulative record and information had to be gathered from a number of separate departments within the L.E.A. For capitation expenditure, for example, the practice was to enter each item by hand into a ledger from which sub-totals could be drawn periodically but the process was not pursued to the very end of the financial year. There must therefore be some degree of approximation in its end-of-year totals and it is difficult to say with confidence whether this would have any effect on inter-school comparisons. There clearly would be if, for example, one or more schools were in the habit of submitting large expenditure claims within the closing weeks of the year but, fortunately, enquiries of the L.E.A.'s officials indicated that there was no evidence of any such trend. On balance we were assured that we could have confidence in the figures.

In any meaningful examination of the school cost figures, it is necessary to divide the total costs for each school by number of pupils, to arrive at average cost per pupil (or "unit cost"), but to do so raises a methodological problem which it is not easy to resolve, namely the question of whether or not the pupil figures used should be weighted in some way. Almost all previous studies relating wholly or partly to the costs of individual schools appear to use straightforward, unweighted, pupil numbers as the demonimator (often one has to assume this to be the case since frequently there is no explicit reference to this point). In fact, it is well known that, in most school systems, larger sums per pupil are spent on the education of older pupils, whether because such pupils are taught in smaller groups or by more highly-paid teachers or because of larger allocations of money for consumable materials or some combination of all these factors. In the U.K. older pupils carry extra-proportional weighting in the

Burnham salary scale system; also, many L.E.A.s have for many years had differential allocations for per capita expenditure for older pupils although the basis on which they have done so has varied widely and in recent years there has been a tendency for this practice to diminish. It would, therefore, be possible to arrive at quite complicated systems of weighting with, for instance, fifth-form pupils weighted more heavily than fourth-formers. One could also justify doing so in terms of, example, a pupil at 'A' level being "worth" more to the community than one at 'O' level. In terms of the theory presented in Chapter 3, the analogy might be drawn either with the multi-product firm as in diagram 8 or with a firm producing e.g. refrigerators of different sizes and calculating "square foot of refrigerator produced" for each.

Whatever system was used could only be an approximation in that the degree of additional expenditure on older pupils would vary widely from school to school. To make precise calculations for each school would require a detailed analysis of the teaching timetables of all the teachers in each school, which would clearly be beyond the scope of this study. An unofficial suggestion from the Department of Education and Science[1] was that pupil numbers should be weighted on the fairly simple basis that sixth-form pupils = 1.6 whilst all pupils below sixth-form level = 1.0. The intention of this weighting would be to reflect the way in which sums are allocated to L.E.A.s in the rate support grant calculations, which are broadly on this basis. Such a weighting is clearly somewhat arbitrary in that it ignores, for example, any question of higher expenditure per fifth-form pupil as compared with younger pupils, any question of differential

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1. I am grateful to the Head of Financial Services Division, Department of Education and Science, for his advice on this point.

subject teaching costs, and how each L.E.A. actually spends money in each school. In view of the doubts that must remain about using such a system of weighting, the tables discussed in this chapter give results with both unweighted and weighted figures, where these could be obtained.

A further complication was that all the L.E.A.s kept their records of pupil numbers by ages of pupils and not by numbers in each school form. In the case of authority "A" the records were based on ages at the start of the autumn term and those aged 16+ were taken to be sixth-form pupils; in the case of authorities "C" and "D" the records were based on ages at the start of the calendar year and those aged 17+ were taken to be sixth-form pupils. This factor introduces a further degree of approximation but should not greatly affect the computations.

In fact a perusal of Tables 7.1 and 7.2 below shows that the application of this system of weighting pupil numbers has rather little effect on the figures in question: since the denominator has increased, costs per pupil are shown to fall out by a rather small margin, varying from some 1% to 4% of the original mean value; the standard deviation falls and so usually does the coefficient of variation.

We can now turn to a consideration of the data presented in the Tables. These (in common with much of this thesis) were, of course, shown to the L.E.A.s concerned, who were invited to comment thereon. Alone of the four authorities, L.E.A. "B" expressed doubts about the use of their cost figures in this way: they felt that as a relatively small urban authority with only 21 secondary schools each of these had its own particular characteristics which prevented the drawing of valid comparisons. Clearly in their case homogeneous sub-groups of schools could not be formed, as they could with each of the other

L.E.A.s involved. The figures for L.E.A. "B" are therefore included primarily for comparative purposes.

Table 7.1 presents results of average cost calculations for complete groups of secondary or primary schools within each L.E.A. and Table 7.2 presents similar results for homogeneous sub-groups of secondary schools. It is apparent from both tables that the figures show wide variations: from Table 7.1, for complete groups of secondary schools the mean unit cost ranges from as low as £215[1] (L.E.A. "B", 1974/5) to as high as £463[1], (£442) (L.E.A. "A", 1976/7). These mean figures conceal wide variations in the unit costs of individual schools: for eight of the eleven groups of schools the highest cost school has a cost figure more than twice that of the lowest cost school, in seven of these cases it is three times as large and in three cases four times as large. Such wide variations appear surprising. Care is, of course, needed in dealing with such complete groups of secondary schools since any one such group may include quite heterogeneous types of schools. Table 7.2, therefore, gives results for homogeneous sub-groups of schools within each L.E.A. and, as would be expected, the cost variations within each such sub-group are smaller than those discussed above; however, there are still six sub-groups in which the maximum cost figure is more than twice the minimum and for the majority of the sub-groups the differential is of 50% or more. It must again be emphasised that each of these figures is itself an average over one whole school and must conceal much wider variations in the costs of educating pupils at different levels in the school or in different groups or taking different subjects.

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1. This discussion makes use of the unweighted figures, with the weighted figures following in parentheses where these were available.

TABLE 7.1 : TOTAL COSTS PER PUPIL - COMPLETE GROUPS OF SCHOOLS

Year	Local Education Authority	School Group	No. of schools	U or W	Mean (£)	Minimum (£)	Maximum (£)	Standard deviation (s)	Coefficient of variation (2)	Skewness (3)	Kurtosis (4)
1974/5	A	all secondary	80	U	310	150	597	65	20.9	1.197	4.078
				W	299	140	597	63	21.1	1.437	5.925
1975/6	A	all secondary	79	U	396	278	521	56	14.1	0.121	-0.667
				W	380	260	519	55	14.5	0.388	-0.015
1976/7	A	all secondary	81	U	463	326	1,372	145	31.3	4.278	20.798
				W	442	325	1,372	135	30.5	5.149	29.623
1974/5	B	all secondary	21	U	215	182	263	22	10.2	0.838	-0.288
1975/6	B	all secondary	21	U	239	205	329	27	11.3	1.939	3.698
1974/5	C	all secondary	87	U	294	216	651	64	21.8	2.461	9.978
				W	286	216	539	51	17.8	1.987	6.725
1975/6	C	all secondary	87	U	365	281	930	87	23.8	3.673	19.545
				W	354	281	718	64	18.1	2.757	11.659
1976/7	C	all secondary	89	U	418	307	1,276	120	28.7	4.586	27.997
				W	404	307	955	89	22.0	3.469	16.704
1974/5	D	all secondary	60	U	280	111	449	62	22.1	-0.022	0.537
				W	276	111	419	58	21.0	-0.193	0.506
1975/6	D	all secondary	63	U	347	164	591	76	21.9	0.681	1.074
				W	343	164	576	72	21.0	0.686	1.253
1976/7	D	all secondary	64	U	384	221	576	79	20.6	0.220	-0.250
				W	379	221	561	74	19.5	0.149	-0.098
1974/5	C	all primary	380	U	207	127	811	71	34.3	4.278	27.252
1975/6	C	all primary	378	U	259	110	788	78	30.1	3.086	14.594
1975/6	D	all primary	285	U	197	122	508	49	24.9	2.482	9.210

NOTES:

1. U or W = pupil numbers unweighted or weighted.
2. The coefficient of variation ($=\frac{\bar{x} \times 100}{s}$) enables a comparison to be made between the variability of the distributions for groups with differing means and standard deviations. It is expressed as a percentage; the larger the coefficient the greater the variability. See K.A. Yeomans: "Statistics for the Social Scientist", Vol. 1, section 3.7.3 (Penguin, 1968).
3. Skewness ($=\frac{\Sigma(x-\bar{x})^3}{ns^3}$) measures the degree of asymmetry in the polygon and is given since series which have identical means and standard deviations may have very different shapes and therefore patterns of skewness. Positive values indicate skewness towards lower cost figures, negative values indicate skewness towards higher costs. For a perfectly symmetrical distribution, the value used = 0. See K.A. Yeomans, op. cit., Vol. 2, section 3.9.1.
4. Kurtosis ($=\frac{\Sigma(x-x)^4}{ns^4} - 3$) measures the fourth moment around its mean divided by the fourth power of the standard deviation; this is used to indicate the amount of peakedness in a distribution, in non-mathematical language whether the graph looks very pointed with wide tails ("leptokurtic") or humped with short tails ("platykurtic"). Distributions with identical means, standard deviations and skewness may have quite different patterns of kurtosis. A "normal" distribution has a value of 0; any value greater than 0 indicates a leptokurtic distribution whilst any value less than 0 indicates a platykurtic distribution. If the value is close to 0, the distribution may be assumed to be approximately normal.

This is a clear pattern of significantly higher expenditure per pupil in grammar and technical schools than in secondary modern schools (L.E.A.s "A" and "C"), in upper schools than in high schools (L.E.A."C"), in comprehensive 11-16 schools than in middle schools (L.E.A. "D"), and in comprehensive 11-18 schools (even after introducing weighting) than in comprehensive 11-16 schools (L.E.A. "D"). In each of these cases the explanation for the trend noted is so obvious as to require no further comment; other patterns are less easy to explain, e.g. in L.E.A. "A" it would appear that expenditure per pupil in comprehensive schools overtook that in grammar schools in 1975/6 and subsequently forged further ahead.

The lowest minima shown in the Tables, £111 (111), £150 (140), and £182, all for 1974/5, and £164 (164) for 1975/6, all appear exceptionally low figures whilst at the other extreme unit costs of £1,372 (1372) and £1,276 (955) all appear extraordinarily high even for 1976/7.

Some indication of variability of unit costs within each group or sub-group of schools may be gained from the standard deviation but for comparative purposes a more useful measure is the coefficient of variation (see footnote 2 to Table 7.1). This shows, for example, in Table 7.2 that the grammar and technical schools in L.E.A. "A" manifest rather little variation and have fairly standardised unit costs, a pattern which remains valid over all the three years of the study. At the other extreme the same authority's comprehensive schools show variations in unit costs which lessen from 1974/5 to 1975/6 only to widen again from 1975/6 to 1976/7, but which are throughout much wider than those for the grammar schools. L.E.A. "D"'s middle schools show a steady trend over the three years towards less variation but the same cannot be said of the other sub-groups of

schools within the same authority.

The column headed "Skewness" (see footnote 3 to Table 7.1) shows nearly all positive values, many of them between zero and 1.0 but ranging up to a highest of 3.668: this means that there is a pattern of skewness towards lower cost figures which must be offset by a smaller number of much higher figures.

The "Kurtosis" column (see footnote 4 to Table 7.1) on the other hand shows approximately as many positive values as negative ones and few if any trends are discernible save perhaps for the comment that the values for L.E.A. "D" are consistently small, on average considerably smaller than those for the other authorities.

The figures for primary schools shown in the last three lines of Table 7.1 evidence, as expected, substantially lower levels of expenditure per pupil in primary schools than in secondary; these means would be even lower but for the fact that they are bolstered up by the very small rural primary schools which exist in both authorities and which are very expensive to run in per pupil terms. This accounts for the high maximum figures in each case: these are from some 2.5 to 4.0 times as high as the mean and up to some seven times as large as the minimum value. This causes the coefficient of variation to be large in each case; similarly both skewness and kurtosis show large positive values. The need for caution in connection with any attempt to compare figures for different L.E.A.s has already been stressed above. With the primary school figures shown in Table 7.1, this point needs to be stressed even more strongly since the figures for L.E.A. "D" were compiled on a quite different basis and do not include all items of current expenditure. No conclusions can be drawn, therefore, from the fact that the primary school figures for L.E.A. "D" look smaller than those for L.E.A. "C".

TABLE 7.2 : TOTAL COSTS PER PUPIL - SUB-GROUPS OF SCHOOLS

Year	Local Education Authority	School Group	No. of schools	U or W	Mean (£)	Minimum (£)	Maximum (£)	Standard Deviation	Coefficient of variation (2)	Skewness (3)	Kurtosis (4)
1974/5	A	Secondary Modern	35	U	285	206	597	65	22.8	3.477	13.689
1975/6	A	Secondary Modern	32	U	362	278	469	42	11.6	0.432	0.051
1976/7	A	Secondary Modern	32	U	410	326	557	50	12.2	0.921	0.960
1974/5	A	Grammar & Tech.	16	U	337	295	394	25	7.4	0.401	0.134
				W	304	273	355	20	6.6	0.846	0.724
1975/6	A	Grammar & Tech.	16	U	417	353	486	31	7.4	0.301	0.554
				W	378	316	437	28	7.4	-0.134	0.554
1976/7	A	Grammar & Tech.	16	U	449	384	587	45	10.0	1.963	3.570
				W	408	342	524	41	10.0	1.373	2.169
1974/5	A	Comprehensive	28	U	330	150	499	69	20.9	-0.191	0.819
				W	321	148	484	66	20.6	-0.55	0.855
1975/6	A	Comprehensive	30	U	420	287	521	63	15.0	-0.304	-0.883
				W	406	260	519	67	16.5	-0.232	-0.593
1976/7	A	Comprehensive	32	U	507	336	1,372	197	38.9	3.446	10.969
				W	489	325	1,372	197	40.3	3.668	12.005
1974/5	C	High	33	U	266	216	330	27	10.2	0.719	0.148
1975/6	C	High	34	U	320	282	411	29	9.1	1.014	1.061
1976/7	C	High	35	U	368	307	632	56	15.2	3.141	11.939
1974/5	C	Upper	14	U	363	321	500	44	12.1	2.462	4.758
				W	344	304	472	41	11.9	2.474	4.888
1975/6	C	Upper	14	U	434	386	644	64	14.7	3.135	6.949
				W	409	371	595	56	13.7	3.142	6.962
1976/7	C	Upper	15	U	493	430	791	89	18.1	3.074	6.884
				W	466	412	731	81	17.4	2.855	5.724
1974/5	C	Secondary Modern	26	U	262	219	311	23	8.8	0.267	-0.281
1975/6	C	Secondary Modern	25	U	333	281	445	32	9.6	1.919	4.306
1976/7	C	Secondary(11-16 yrs.)	22	U	384	319	472	40	10.4	0.597	-0.331
1974/5	C	Grammar	9	U	351	329	377	13	3.7	0.418	0.256
				W	319	305	339	12	3.8	0.309	-1.192
1975/6	C	Grammar	9	U	440	411	496	28	6.4	1.145	-0.211
				W	401	361	453	28	7.0	0.674	-0.422
1976/7	C	Secondary (11-18 yrs.)	10	U	482	378	553	45	9.3	0.095	-1.279
				W	435	372	498	34	7.8	-0.145	-0.500
1974/5	D	Middle(9-13 yrs.)	16	U	237	111	357	73	30.8	0.156	-0.957
1975/6	D	Middle(9-13 yrs.)	19	U	293	164	436	62	21.2	0.251	0.157
1976/7	D	Middle(9-13 yrs.)	20	U	309	221	423	56	18.1	0.567	-0.165
1974/5	D	Comprehensive (11-16 yrs.)	15	U	272	212	302	26	9.5	-0.700	-0.196
1975/6	D	Comprehensive (11-16 yrs.)	16	U	341	279	426	36	10.6	0.643	0.801
1976/7	D	Comprehensive (11-16 yrs.)	19	U	378	327	446	31	8.2	0.584	-0.134
1974/5	D	Comprehensive (11-18 yrs.)	21	U	320	238	449	55	17.2	0.658	-0.325
				W	311	238	419	46	14.8	0.704	-0.250
1975/6	D	Comprehensive (11-18 yrs.)	21	U	406	312	591	76	18.7	0.703	-0.227
				W	391	310	576	73	18.7	0.813	0.153
1976/7	D	Comprehensive (11-18 yrs.)	25	U	449	364	576	63	14.0	0.218	-1.111
				W	437	361	561	59	13.5	0.417	-0.900

See notes at foot of Table 1.

TABLE 7.3 : PERCENTAGE DIFFERENCES BETWEEN MEAN UNIT COSTS IN CONSECUTIVE YEARS

Local Education Authority	School group	Mean of 1974/5 (£)	Mean of 1975/6 (£)	% difference between means of 1974/5 and 1975/6	Means of 1976/7 (£)	% difference between means of 1975/6 and 1976/7
A	all secondary	310	396	27.6	463	16.9
B	all secondary	215	239	10.9	N/A	-
C	all secondary	294	365	24.3	418	14.4
D	all secondary	280	347	24.1	384	10.8
C	all primary	207	259	25.3	-	-
	SUB-GROUPS					
A	Secondary modern*	285	362	26.8	410	13.5
A	Grammar & technical	337	417	23.9	449	7.7
A	Comprehensive	330	420	27.1	507	20.9
C	Secondary modern	262	333	26.9	384	15.5
C	High	266	320	20.3	368	14.8
C	Grammar schools**	351	440	25.3	482	9.5
C	Upper	363	434	19.6	493	-
C	Middle (9-13)	237	293	23.6	309	5.4
D	Comprehensive(11-15)	272	341	25.4	378	10.9
D	Comprehensive(11-18)	320	406	26.9	449	10.6

* Secondary (11-16) schools in 1976/7
** Secondary (11-18) schools in 1976/7

The years in question were years with high rates of inflation and this emerges clearly from these tables. For example, if the means from Table 7.1 are grouped in years, they are:

1974/5 : 310 (299); 215: 294 (286): 280 (276)

1975/6 : 393 (380); 239; 365 (254); 347 (343)

1976/7 : 463 (442); 418 (404); 384 (379)

These and similar figures have been used to compile Table 7.3, which indicates the increases in expenditure per pupil for each of these groups and sub-groups of schools over the years studied. These rates of increase may be compared, albeit with reservations, with the price index of educational expenditure published by the Department of Education and Science[1]:

Price index (base year 1969/70=100)	% increase in price level from previous year
1974/5 : 190.5	
1975/6 : 227.8	19.58%
1976/7 : 253.1	11.11%

On this basis it would appear that from 1974/5 to 1975/6, with the exception of L.E.A. "B"'s schools, each of the groups and sub-groups of schools received increases in expenditure per pupil in excess of what was needed to compensate for inflation, so that expenditure per pupil increased in real terms. It would appear that L.E.A. "B"'s schools fell behind in the battle against inflation; in the case of L.E.A. "C"'s upper schools any improvement in real terms was so small as to be negligible. For 1975/6 to 1976/7 the pattern is more diverse with L.E.A. "D"'s schools as a whole apparently slightly losing out to inflation and some sub-groups of schools rather more so, particularly L.E.A. "D"'s middle schools. However, it must be stressed that the comments made in this paragraph are extremely tentative in that all price indices are known for their degree of approximation. The D.E.S.

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1. In Statistics of Education, Vol. 6, Finance and Awards, 19, Table A, page vi. See also the discussion in Chapter 4 above.

TABLE 7.4 : TEACHERS SALARIES ONLY - COMPLETE GROUPS OF SCHOOLS
(on unweighted basis)

Year	Local Education Authority	School group	No. of schools	Mean (£)	Minimum (£)	Maximum (£)	As % of total costs per pupil
1974/5	A	all secondary	80	179	38	349	57.7
1975/6	A	all secondary	79	223	183	327	56.3
1976/7	A	all secondary	81	246	191	539	53.1
1974/5	B	all secondary	21	147	123	183	68.4
1975/6	B	all secondary	21	146	125	206	61.1
1974/5	C	all secondary	87	188	94	454	63.9
1975/6	C	all secondary	87	234	180	631	64.1
1976/7	C	all secondary	89	261	189	840	62.4
1974/5	D	all secondary	60	177	67	291	63.2
1975/6	D	all secondary	63	213	101	353	61.4
1976/7	D	all secondary	64	237	125	349	61.7
1874/5	C	all primary	380	132	57	436	63.8
1975/6	C	all primary	378	168	69	532	64.9
1975/6	D	all primary	285	179	108	474	90.9

TABLE 7.5 : TEACHERS SALARIES ONLY - SUB-GROUPS OF SCHOOLS
(on unweighted basis)

Year	Local Education Authority	School group	No. of Schs.	Mean (£)	Minimum (£)	Maximum (£)	As % of total costs per pupil
1974/5	A	Secondary Modern	35	166	135	349	58.2
1975/6	A	Secondary Modern	32	205	183	240	56.6
1976/7	A	Secondary Modern	32	228	198	267	55.6
1974/5	A	Grammar & Technical	16	210	188	229	62.3
1975/6	A	Grammar & Technical	16	257	221	284	61.6
1976/7	A	Grammar & Technical	16	266	216	291	59.2
1974/5	A	Comprehensive	28	182	108	257	55.2
1975/6	A	Comprehensive	30	227	184	327	54.0
1976/7	A	Comprehensive	32	244	191	332	48.1
1974/5	C	High	33	165	137	201	62.0
1975/6	C	High	34	206	180	253	64.4
1976/7	C	High	35	228	189	309	61.9
1974/5	C	Upper	14	230	204	274	63.4
1975/6	C	Upper	14	279	240	373	55.3
1976/7	C	Upper	15	303	268	452	61.5
1974/5	C	Secondary Modern	26	166	94	193	63.4
1975/6	C	Secondary Modern	25	211	180	264	63.4
1976/7	C	Secondary(11-16)Yrs.)	22	242	194	304	63.0
1974/5	C	Grammar	9	231	217	242	65.8
1975/6	C	Grammar	9	279	267	288	63.4
1976/7	C	Secondary(11-18)Yrs.)	10	272	214	364	56.4
1974/5	D	Middle (9-13)	16	152	67	228	64.1
1975/6	D	Middle (9-13)	19	172	101	260	58.7
1976/7	D	Middle (9-13)	20	188	125	267	60.8
1974/5	D	Comprehensive (11-16)	15	166	131	185	61.0
1975/6	D	Comprehensive (11-16)	16	211	176	246	61.9
1976/7	D	Comprehensive (11-16)	19	231	196	275	61.1
1974/5	D	Comprehensive (11-18)	21	204	151	291	63.8
1975/6	D	Comprehensive (11-18)	21	255	201	353	62.8
1976/7	D	Comprehensive (11-18)	25	280	229	349	62.4

statistics quoted above are clearly national figures which may or may not mirror the situation in any one locality; further they represent an amalgam of recurrent and capital expenditure whereas our unit cost figures refer solely to recurrent expenditure. Finally the percentage differences indicated in Table 7.3 can only be approximations in that some schools changed their designations during these years and in a few cases it was not clear to which group they should belong. Any attempt to apply this same approach to individual schools would, of course, be fraught with even more difficulties than those indicated above.

Much the largest single item constituting recurrent expenditure in a school relates to teachers salaries and Tables 7.4 and 7.5 show details of this item for each group and sub-group of schools. These figures are shown exclusive of "on-costs" such as employers' contributions to national insurance and employers' share of pension contributions, so they do not reflect full salary costs to the L.E.A. (details of "on-costs" were not available in all cases). Table 7.5 shows that teachers' salaries as percentage of total costs vary from 48% to 66%. To some extent, although not uniformly so, the percentage is higher in grammar schools or upper schools, presumably reflecting the more highly-qualified and highly-paid staff and/or more favourable pupil/teacher ratios in such schools. Of total resources, L.E.A. "C" appears consistently to devote a greater proportion to teachers' salaries whilst L.E.A. "A" appears to do the reverse. Such mean figures again conceal wide variations among the figures for individual schools with the percentage in question rising to over 80% in some cases.

In view of the way teachers' salaries predominate within total costs, it seemed of interest to establish the patterns of (Pearson) correlation coefficients between teachers' salaries and other constituent items within total costs and these are presented in Tables 7.6 and 7.7. Those correlations which were not statistically significant have not been included as this seemed not a valid thing to do[1]; the level of significance of each of the coefficients shown is indicated by the asterisks. The coefficients relate to per pupil expenditures on an unweighted basis. It is immediately clear that there are many blank spaces in the table, indicating that the correlation coefficients in question are not significant but it is also clear that the great majority of the correlation coefficients shown are positive and are often high positive correlations at very high levels of significance. The meaning of this is quite simply that where a school spends highly, per pupil, on teachers' salaries, it also spends highly on the correlated item, and schools which spend at low levels on the former tend also to spend at low levels on the latter.

Much the strongest pattern of correlation occurs between teachers' salaries and non-teachers' salaries (i.e. salaries of other staff in the school): as Tables 7.6 and 7.7 indicate, these items are strongly positively correlated for nearly all groups and sub-groups of schools. The coefficients range up to over 0.92 (100 R^2 = 85%): the levels of significance vary but for six sub-groups of schools they exceed 1 per mille (=0.1%), which

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1. Although other writers do include such non-significant correlations, e.g. H.B. MILES, "Some Correlates of Academic Performance of Pupils in Secondary Schools", op. cit.

TABLE 7.6 : CORRELATIONS WITH TEACHERS SALARIES : COMPLETE GROUPS OF SCHOOLS

Local Education Authority	Year	School Group	TS with NTS	TS with FF	TS with BP	TS with MS	TS with RR	TS with INS	TS with FL	TS with NPUP	TS with EQ	TS with NTEQ	TS with EX	TS with TCE	TS with AL	TS with RM	TS with CE
A	1974/5	Secondary	0.5700 *		-0.4382 *		0.2628 **		0.4565 *		-0.3482 *	0.2396 ***	0.2057 ***				
A	1975/6	Secondary									-0.1901 ***						
A	1976/7	Secondary	0.4683 *										0.2999 **		0.2860 **		
B	1974/5	Secondary	0.4938 ***							-0.4792 ***				0.6060 **			
B	1975/6	Secondary	0.6085 **											0.5183 **			
C	1974/5	Secondary															
C	1975/6	Secondary	0.7596 *	0.2949 **	0.2680 **	0.4734 *	0.3538 *		0.5295 *		0.3321 *		0.6638 *		0.3076 **	0.2839 **	
C	1976/7	Secondary	0.7510 *	0.2920 **	0.3051 **		0.2614 **		0.5513 *		0.4274 *		0.5060 *			0.4203 *	
D	1974/5	Secondary	0.6508 *	0.4091 *			0.4316 *		0.5286 *							0.2839 ***	0.3897 *
D	1975/6	Secondary	0.6007 *	0.2743 ***	-0.2227 ***	-0.3556 **	0.5219 *	0.2506 ***	0.2526 ***	0.3375 **							
D	1976/7	Secondary	0.6707 *				0.6356 *	0.2392 ***	0.4830 *	0.3961 *						0.2203 ***	

Significance Levels: * = 0.001
** = > 0.001 but ≤ 0.010
*** = > 0.010 but ≤ 0.050

Variables in Column headings:

TS = Teachers' salaries
NTS = Non-teacher salaries
FF = Fixtures and fittings
BP = Books and periodicals
MS = Materials
RR = Rent and rates
INS = Insurance
FL = Fuel and light
NPUP = Number of pupils
EQ = Teaching Equipment
NTEQ = Non-teaching equipment
EX = Establishment expenses
TCE = Total Capitation Expenditure
AL = Allowances (Capitation)
RM = Repairs and maintenance
CE = Cleaning Equipment

TABLE 7.7 : CORRELATIONS WITH TEACHERS SALARIES : SUB-GROUPS OF SCHOOLS

Local Education Authority	Year	School Group	TS with NTS	TS with FF	TS with BP	TS with MS	TS with RR	TS with NS	TS with FL	TS with NPUP	TS with EQ	TS with NTEQ	TS with EX	TS with AL	TS with RM	TS with CE
A	1974/5	Secondary Modern	0.9237 *						0.5368 *	-0.4423 **		0.6760 *	0.8186 *	0.3241 ***		
A	1975/6	Secondary Modern	0.4518 **													
A	1976/7	Secondary Modern	0.3372 ***						0.3455 ***	-0.3370 ***						
A	1974/5	Grammar & Tech.	0.4524 ***													
A	1975/6	Grammar & Tech.	0.4997 ***							-0.5052 ***		-0.6177 **				
A	1976/7	Grammar & Tech.														
A	1974/5	Comprehensive	0.6020 *				0.3482 ***		0.4249 ***		0.3408 ***	0.4372 **				
A	1975/6	Comprehensive											0.4399 **			
A	1976/7	Comprehensive				-0.3420 ***	0.3508 ***						0.3563 ***		0.4032 ***	
C	1974/5	High Schools	0.7839 *	-0.3211 ***	-0.3477 ***	-0.4262 **	0.5160 *		0.5239 *		-0.2974 ***		0.4460 **	-0.4718 **	0.4438 **	
C	1975/6	High Schools	0.6534 *				0.3982 ***		0.4731 **	-0.3631 ***						
C	1976/7	High Schools	0.7676 *		0.6743 *	0.6394 *			0.5989 *	-0.5028 *	0.6288 *		0.6359 *			
C	1974/5	Upper Schools	0.6843 **	0.4855 ***	0.5293 ***		0.7037 **			-0.7583 *	0.5996 ***				0.6497 **	
C	1975/6	Upper Schools	0.8382 *	0.8008 *		0.6226 *	0.7762 *		0.7060 **	-0.7173 **	0.5042 ***		0.8088 *	0.4572 ***	0.6226 **	
C	1976/7	Upper Schools	0.7378 *	0.5327 ***					0.8323 *							
C	1974/5	Secondary Modern	-0.4685 **		-0.6133 *	-0.6783 *			-0.5281 **		-0.6043 *		-0.5259 **	-0.7580 *	0.3470 ***	
C	1975/6	Secondary Modern	0.3854 ***	0.4305 ***			-0.4310 ***								0.4776 **	
C	1976/7	Secondary(11-16)	0.5109 **			0.3904 ***				-0.4877 ***						
C	1974/5	Grammar														
C	1975/6	Grammar														
C	1976/7	Secondary(11-18)	0.7803 **	0.7136 **					0.6154 ***	-0.5554 ***			0.6445 ***		0.9188 *	
D	1974/5	Middle (9-13)	0.5580 ***				0.6808 *									
D	1975/6	Middle (9-13)			-0.8979 ***	-0.5191 ***	0.6501 *	0.5926 **			-0.3960 ***					
D	1976/7	Middle (9-13)	0.5940 **				0.4566 ***	0.6206 **			-0.3799 ***				0.6362 *	
D	1974/5	Comprehensive (11-15)			0.5013 ***	0.4953 ***				-0.4449 ***						
D	1975/6	Comprehensive (11-15)	0.6717 **			0.5387 ***			0.4923 ***	-0.4268 ***	0.6490 **					
D	1976/7	Comprehensive (11-15)	0.5229 ***												0.5486 **	-0.4331 ***
D	1974/5	Comprehensive (11-18)	0.7077 *	0.5967 **					0.5493 **	-0.5227 **						0.5226 **
D	1975/6	Comprehensive (11-18)	0.7795 *	0.5756 **	0.5632 **				0.5795 **	-0.6089 **	0.6753 *					0.5216 **
D	1976/7	Comprehensive (11-18)	0.6807 *				0.4898 **	0.4471 ***	0.4882 **	-0.6752 *						

Significance Levels: * = 0.001
** = > 0.001 but ≤ 0.010
*** = > 0.010 but ≤ 0.050

Column headings: As shown on Table 7.6

is an exceptionally high level. The implication is clearly that where a school has a highly-qualified and highly-paid teaching staff and/or favourable pupil/teacher ratios, it also has a high level of support staff, and vice versa.

No other constituent item evidences such a strong and consistent pattern but expenditure per pupil on such items as fixtures and fittings, books and periodicals, rent and rates (reflecting size of building space and land area) and equipment, all tend to show positive association with expenditure per pupil on teachers' salaries, albeit with smaller coefficients and at lower levels of significance than the item of non-teachers' salaries discussed previously. For most of the other constituent items of expenditure, any pattern of correlation is weak or even non-existent. For the items specifically mentioned above, however, the implication is that where a school tends to spend more highly per pupil on teachers' salaries it tends to do likewise on these other items. It should perhaps be emphasised that such comments have nothing at all to do with the fact that, for example, grammar schools have always tended to be better staffed and better equipped than secondary modern schools: all of the comments regarding the correlation coefficients refer to patterns of association within homogeneous sub-groups of schools (in Table 7.7).

The results presented in this chapter vary considerably and are not easy to summarise. A major finding, however, is that within any one group of broadly comparable schools within any one L.E.A. in any one year, average cost per pupil usually differs greatly from one school to another; in a number of cases twice or three times as much per pupil is spent at one school as at another. From 1974/5 to 1975/6 the increase in expenditure levels in schools apparently generally exceeded the rate of

inflation and so expenditures rose in real terms but from 1975/6 to 1976/7 there were a number of sub-groups of schools where this did not happen. Teachers' salaries clearly dominate total costs although their percentage contribution to the latter was found to vary from 48% to 66% for different sub-groups of schools. Teachers' salaries were often quite strongly correlated with other items of expenditure, and particularly with non-teacher salaries, on a per pupil basis.

CHAPTER 8. ECONOMIES OF SIZE

Throughout much of economics there has for long been considerable interest in the concept of "economies of scale", the term referring to the achievement of increased quantities of a standard unit of output per standard units of input as size of plant, or firm, or industry, increases. In the literature on production functions, for example, much time and effort was devoted to the validity of relaxing the assumption of constant returns of scale in the original Cobb-Douglas formulation;[1] similarly, the standard cost curves used in the theory of the firm require costs per unit of output to decrease as output increases, either in the short-run or the long-run up to some minimum point beyond which they are assumed to increase. A considerable body of statistical evidence[2] for the existence of economies of scale has been accumulated for various industries, although rather less for long-run average costs per unit necessarily to increase to the right of the average cost curve.[3]

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1. See L. KLEIN, "Ain Introduction to Econometrics", (Prentice-Hall, 1962), or the shorter discussion in A.A. WALTERS, An Introduction to Econometrics (Macmillan, 1968).

2. For example, J. JOHNSTON, Statistical Cost Analysis (McGraw-Hill, 1960).

3. See for example A.W. STONIER and D.C. HAGUE: "A Textbook of Economic Theory" (Longman, 4th edition, 1972):

   ".... all this assumes that long-run cost curves are U-shaped. As has been explained, empirical investigations do not bear this out ..."

   or R.G. LIPSEY: "An Introduction to Positive Economics" (Weidenfeld and Nicolson, 2nd edition, 1966):

   "A satisfactory theory that predicts rising long-run costs is very difficult to develop. Furthermore, the empirical evidence for the existence of this phenomenon is rather shaky and the whole existence of rising long-run costs ... is thus open to question".

In the case of the education "industry" formally no such studies are possible since it is methodologically not feasible satisfactorily to standardise the unit of output in question, i.e. it is not at present satisfactorily possible to assess whether pupils at a larger school emerge with some extra and possibly unquantifiable ingredient or attribute, whether desirable or otherwise, as compared with pupils at a smaller school[1] (although some U.S. studies have made limited attempts to do so, as shown below). We may mention in passing that whereas previously emphasis was laid on the problems associated with larger schools, current thinking, including in the Department of Education and Science, tends to stress that pupils in such schools will often have more opportunities, better facilities, and a larger choice of optional subjects. Nevertheless, there is considerable interest in the question of how expenditures vary by size of school even in the absence of any reliable information regarding possible qualitative variations to outputs: to avoid confusion, the term "economies of size" seems preferable to "economies of scale". We shall thus be considering varying levels of expenditure per pupil in schools of different size at a particular time without any attempt to make inferences either regarding the growth path of any one school over time or regarding whether an authority could effect "economies" by merging smaller schools into larger units.

There seem to have been no previous studies in England and Wales of how expenditures vary with size of secondary school or with size of local education authority, and only tentative results for the way in which differing class sizes within a school affect costs, in the sense of average expenditure per pupil in the school:

1. The whole question of the assessment of educational outputs is discussed in Output Measurement and Education (C.I.P.F.A., 1974): broadly, the views expressed by the various contributors tended to stress the difficulties in the way of output measurement in education rather than pointing to any ready ways of overcoming these.

P.K. Pearson's finding of significant cost differentials for sixth-form teaching as compared with non-sixth-form teaching is largely based on the smaller teaching groups typically found in sixth-forms.[1]

A number of relevant studies have been carried out in the United States, all of them, in common with their U.K. counterparts, encountering difficulties in connection with the availability of the necessary data. A particular problem for U.S. researchers is that much statistical data is collected at the level of the school district and little at the level of individual schools and some studies have had to be content to look at economies of scale at the level of school district,[2] i.e. essentially comparing larger districts with smaller ones, which is clearly of rather little value in connection with the problem of size of school - for the United Kingdom it would be easy to examine whether the larger L.E.A.s spent less (or more) per pupil than the smaller ones, but to draw deductions in terms of economies of scale would seem to be rather meaningless. It can hardly be doubted that the closest analogy to the economist's "production unit"[3] is the school, although some of the U.S. studies harge argued otherwise. Diane Dawson's study[4] was conducted at L.E.A. level, although primarily because school-by-school data was not available.

When J. Riew[5] conducted his study of economies of scale in connection with senior high schools in Wisconsin, he avoided the above problem by selecting districts which contained only one high

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1. P.K. PEARSON, The Costs of Education in the United Kingdom (Council For Educational Technology, 1977). See also Appendix B which examines Diane Dawson's work relating to economies of scale at the L.E.A. level.
2. e.g. W.Z. HIRSCH, "Determinants of Public Education Expenditures", National Tax Journal, XIII, March, 1960.
3. See Chapter 3, page 3.1 and 3.2
4. See Appendix B.
5. J. RIEW, "Economies of Scale in High School Operation", Review of Economics and Statistics, Vol. 48, 1966.

school. In the absence of any satisfactory way of controlling for quality or output, the study excluded those schools with exceptionally high average teacher salaries, in other words using this "input" as an indirect proxy for "outputs". For the remaining 109 schools, the current operating costs of each school (including teachers' salaries, other salaries, other teaching costs, and building, fuel and maintenance costs) were shown to fall steadily as enrolment rose from 201-300 (average $531.9 per pupil) to 701-900 (average $374.3 per pupil) and for this range Riew concludes the

> "advantages of a larger school may be considered overwhelming"

thereafter costs rise, albeit unevenly to an average per pupil figure of $505.6 for the largest schools (1,601-2,400 enrolment), the rise being accompanied by an increase in the quantity and variety of advanced courses provided in the schools. Riew assumed a parabolic relationship between per pupil cost (X_1) and number of pupils (X_2) and calculated a regression equation of the form:

$$X_1 = 10.31 - \underset{(0.063)}{0.402X_2} + \underset{(0.000023)}{0.00012X_2^2} + \ldots$$

the standard errors of the coefficients being given in parentheses. By differentiating, costs are shown to be at a minimum at $X_2 = 1,675$.

The study by Cohn[1] covered 377 Iowa high school districts of which 372 contained only one high school: he regressed a measure of two-year gain in composite test scores against a number of input variables but obtained, to use his own words, disappointing results: many of the coefficients had such large standard errors as to be non-significant and the total R^2s were very low (0.05 and 0.06). Since a number of the input variables evidenced a high degree of positive intercorrelation, the econometric problem of multi collinearity existed but no allowance or adjustment was made for it: it is therefore not possible to have confidence in the values

1. E. COHN, "Economies of Scale in Iowa High School Operations", Journal of Human Resources, Vol.III, No. 4

of the coefficients estimated; nor can we ever assert a priori whether the bias induced is upwards or downwards.[1] Cohn's subsequent estimation of cost curves for the same schools attempted to include a variable representing school quality but found it to have

> "a weight which is not statistically different from zero".

The regression of per pupil costs (C) against, inter alia, average daily attendance (ADA) and $(ADA)^2$ showed that their coefficients were statistically significant but that the size of these depended heavily on which other variables were included in the equation. The resulting figure for "optimal school size" (= lowest per pupil cost point) varied from 1,500 to 2,200 pupils, but, as Cohn comments,

> "No account has been taken of the quality differences among the schools".

What is not clear is whether the cost curve eventually turns upwards: as the study concludes,

> "there may be no basis for specifying an upper limit to optimal school size ..."

A subsequent study by Cohn[2] of data for Pennsylvania schools could come to no significant findings for economies of scale.

A further study by Cohn and Hu[3] suggested that to consider the question of economies of scale at the level of individual schools might be misleading unless separate programmes or courses within schools were also considered. A study at such a further level of disaggregation, in which the school would be considered analogous to a multi-product firm, might be welcome but would be

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1. C.F. CHRIST, Econometric Models and Methods, p.388 (Wiley, 1966).
2. Reported in E. COHN et. al., Input-Output Analysis in Public Education (Ballinger Publishing Co., 1975).
3. E. COHN and TEH-WEI HU, "Economies of Scale, by Program, in Secondary Schools", Journal of Educational Administration, Vol. XI, No. 2, October, 1973.

fraught with difficulty; their view seems rather strange in view of the U.S. emphasis on studies at the level of the district which must surely be seen as even more anomalous. The authors studied costs of secondary schools in Michigan and although obtaining data for costs by programme gave rise to serious difficulties, they concluded that significant economies of scale existed, at varying levels, for most programmes but that significant diseconomies emerged only in certain limited cases.

The only previous study to consider in some detail the problems involved in specifying the function to be tested is that by C.M. Sabulao and G.A. Hickrod.[1] Their study, again at the level of school districts, looked at districts in the State of Illinois, some with elementary school grades (K-8), some with secondary grades (9-12) and some unitary (K-12). Regressing cost against size with no adjustment for output or quality, they found significant evidence of economies of scale among the smaller districts and diseconomies among the largest ones, the "optimum size" varying according to the type of district.

Osburn's study,[2] also, was at the level of school districts (in Missouri) but he makes no mention of the number of schools per district. Indeed, since he was not even able to obtain separate statistics for elementary and high schools, his districts could scarcely be termed a homogeneous group. The study covered current operating costs, including transportation of pupils. Multiple regression gave an equation of the form:

$$\text{Costs (per pupil)} = \underset{(0.0184)}{-0.0503\,ADA} + \underset{(0.00000339)}{0.00001121\,ADA^2} + \ldots$$

1. C.M. SABULAO and G.A. HICKROD, "Optimal Size of School Districts Related to Selected Costs", The Journal of Educational Administration, Vol. 9, No. 2, October, 1971.

2. D.D. OSBURN, "Economies of Size associated with Public High Schools", Review of Economics and Statistics, Vol. 52, 1970.

Differentiation gave a minimum of ADA=2,244, although Osburn comments that most of the "economies of scale" had been achieved by the time student numbers reached 1,500. The regression included other variables to relate to the socio-economic status of the district which were clearly inter-correlated: hence multi-collinearity, although not mentioned, must again have distorted the results.

Data collected for the "Quality Measurement Project" carried out in New York State were analysed by Kiesling[1] and his report included, inter alia, references to economies of scale. The study covered 97 school districts, no indication being given of the number of schools in each district, although it is clear that both grade and high schools were included. Anxiety about the need to control for education output or quality are perhaps eased by the findings that,

> "the expenditure-performance relationship for most populations is disappointingly weak" and
>
> "nowhere in the study is there a significantly positive relationship between size and performance".

No convincing evidence of economies of scale emerges even though, for each level of performance for which the results were standardised, the larger districts appear to spend more per pupil than the average for all districts.

Another study[2] of 107 school districts in large cities of the United States found expenditure per pupil to be significantly positively correlated with size of district.

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1. H.J. KIESLING, "Measuring a Local Government Service, A Study of School Districts in New York State", Review of Economics and Statistics, Vol. 49.

2. H.T. JAMES, J.A. KELLY and W.I. GARMS, Determinants of Educational Expenditures in Large Cities of the United States (U.S. Dept. of Health, Education and Welfare, Office of Education, Eric Report: Cooperative Research Project No. 2389; 1966).

One of the few United States studies to be conducted at the level of individual schools, by Burkhead, Fox and Holland,[1] dealt with variables many of which were as much sociological as economic. It reached the conclusion that

> "the major input and process variables show a slight U-shaped curve"

where the general sense of the text indicates that the horizontal axis envisaged must related to average level of income in the school area. Since the very low and very high income areas tended to have somewhat smaller schools than ones with income levels closer to the median, some, albeit rather tenuous, evidence emerges for economies of scale and a cost curve U-shaped with respect to size of school. A further word of caution is that this study covered only 39 schools (in Chicago). Economies of scale also at one point loomed large in the celebrated Hobson v. Hansen case[2] but were not in the end crucial to its outcome.

For the United Kingdom very little concrete information exists in connection with economies of scale in education. Cumming's pioneering study[3] found little in the way of clear evidence of economies of scale at the secondary school level; he did, however, find exceptionally high levels of expenditure in small primary schools, diminishing sharply as the size of school increased, at least up to a figure of some 80 pupils: thereafter no clear pattern was observable. It seems highly likely, however, that Scottish local education authority areas are particularly unsuitable for such a study: some authorities (e.g. Sutherland) had small, scattered,

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1. J. BURKHEAD, T. FOX and J. HOLLAND, Input and Output in Large City High Schools (Syracuse Univ. Press, 1967).
2. See the three articles by W.H. CLUNE, S. MICHELSON and D.M. O'NEILL et. al. in Journal of Human Resources, Vol. 7, No. 3, Summer, 1972.
3. C.E. CUMMING, Studies in Educational Costs (Scottish Academic Press, 1971).

school populations spread over huge geographical areas whilst the major towns, and especially Glasgow, often had large school populations within narrow geographical confines. If the small rural schools seemed exceptionally expensive to run, it must be borne in mind that,

(i) the practical alternative, i.e. bussing the children to another school, might be even more costly,

and (ii) the opportunity cost (i.e. possible alternative use) of the school buildings in question will often be extremely low and will sometimes be nil.

In the longer run the higher costs per pupil of running these schools will reflect in higher local authority rates for the locality, which should in turn affect decisions on where to live and work.

Sleeman[1] found a wide variation in per pupil expenditures between different authorities, from £77.1 to £174.7 per pupil, and presumably variations at the level of individual schools would be even greater. Expenditures were lowest in densely populated urban areas with their large pupil populations and typically larger-sized schools, and this in spite of the fact that the typically higher costs and land values in city centres would mean that identical levels of monetary expenditure would imply considerable inequality in the provision of real resources. This is evidence for economies of size only in the sense that providing education for scattered groups of children in small rural schools is clearly extremely expensive: in other respects the catchment areas are too disparate to enable meaningful conclusions to be drawn.

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1. J. SLEEMAN, "Educational Costs and Local Government Structure in Scotland", Scottish Journal of Political Economy, Vol. 12, 1965.

Other evidence is sketchy in the extreme: the study by Nash, Williams and Evans[1] of small rural schools in Wales produced cost figures for a sample of five small primary schools, showed them to be very expensive to run, and concluded

> "there is a prima facie case, therefore, that resources are being wasted".

It also quoted the Gittins Report[2] as confirming that substantial economies would be achieved if the very small schools could somehow be merged into larger units. Bleddyn Davies[3] asserted the case for "immense" economies of scale in local authority administration; Halsall,[4] Richardson[5] and Monks,[6] all referred to effects of school size on organisational and other problems but none had much to say, or produced any new evidence, on any possible relationship with costs. A brief paper by Barber[7] quoted cost figures for individual secondary schools in Oxford City but these give no evidence of economies of scale. Reference has already been made to the work of Diane Dawson which is considered in Appendix B.

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1. R. NASH, H. WILLIAMS and M. EVANS, "The One-Teacher School", British Journal of Educational Studies, Vol.24, No. 1, Feb., 1976.

2. Central Advisory Council for Education (Wales), Education in Rural Wales (H.M.S.O., 1960).

3. BLEDDYN DAVIES, Social Needs and Resources in Local Services (Michael Joseph, 1968).

4. E. HALSALL, The Comprehensive School (Pergamon, 1973).

5. E. RICHARDSON, Authority and Organization in the Secondary School (Macmillan, 1975).

6. T.G. MONKS, ed., Comprehensive Education in Action (N.F.E.R., 1970).

7. C. RENATE BARBER, Cost Effectiveness in Education (Oxford College of Technology, Social Science Research Unit, Occasional Paper No. 1, 1967).

Interest in the question of economies of scale in education has arisen in many other countries and Coombs and Hallak[1] give a good review of such literature. It is clear that much of the statistical evidence, especially for developing countries, is far from satisfactory and many of the results must be treated with caution. Often the most reliable results relate to some form or other of tertiary education. Nearer home, the same writers quote the Republic of Ireland's active programme of closing small schools in the 1960s but on account not so much of their costs, which were certainly high, as their poor quality.

All of the studies of economies of scale in education confine themselves to the current operating costs per pupil in schools, with the definition of the latter varying relatively little between them; for example, by the inclusion or exclusion of such items as transportation costs. They are therefore using a version of Average Cost in the sense of Chapter 3, diagram 11. The inclusion of capital costs in such studies has, however, always been regarded as extremely problematic: present payments for school buildings and other fixed investments embrace both servicing charges and repayment of principal and these will vary widely according to the age and type of building, what cost limits were in operation at the time of construction, prevailing rate of interest, whether the debt was borrowed at fixed or fluctuating interest rate, and over how long a period the debt is being amortised. All previous writers have concluded that to ascertain such outstanding debt charges for each of a particular sample of schools on any one date and thence to attempt to draw conclusions

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1. P.H. COOMBS and J. HALLAK, Managing Educational Costs (O.U.P., 1972).

relating to the question of economies of scale would be quite meaningless. Clearly as a school building becomes overcrowded the L.E.A. may have to either sanction a new building or extension (a long run solution), or provide temporary accommodation such as mobile classrooms (a short-run solution), and in each case there will be obvious implications for the pattern of costs. There is a close analogy here to the economist's capacity constraint problem, as in Chapter 3, diagrams 6 and 9.

Moreover, there is the overriding practical problem that it appears that no local education authority keeps records of the outstanding capital charges for individual schools, the general practice being to borrow in bulk. Indeed, authorities have indicated that if, as is usually the case, their total borrowing comprises a number of loans contracted at different dates and at varying rates of interest, they would have no way of apportioning some part of these to individual schools.

The inclusion of capital charges in a study of economies of size in schools is therefore not possible. Nevertheless, it can be said with confidence that economies of scale do operate at the capital level: for much of the post-war period the Department of Education and Science (or its predecessors) stipulated fixed cost ceilings for school buildings on the basis of a system of "cost places", to which a capital allowance per cost place was applied, the amount of the allowance being revised from time to time. The allocation of cost places for schools of different size, as listed by Norris[1], made it clear that there was an inbuilt scale effect, the ratio of cost places to number of pupils falling from 1.233 (for schools of 150) to 1.12 (for schools of 750) to 1.013

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1. W.K. NORRIS, A Report on Unit Costs in Secondary Schools (Acton Society Trust, mimeographed, Jan. 1969).

(for schools of 1,500). Whilst this fixed scale has given way to a more flexible system, the Department still expect[1] per pupil construction costs typically to be smaller for larger school size, the rationale being, as before, that communal facilities, such as a hall or a gymnasium, are less costly on a per pupil basis in larger schools.

Where, therefore, evidence for economies of size can be found from examination solely of current operating costs, the result must understate the total scale effect. Similarly, where a study based on current costs finds a "border-line" result, there must be a high probability that, in total, economies of size do exist.

In connection with the calculations to be made from the data a number of problems of a statistical nature arose and these are discussed in detail in Chapter 6.

The procedure discussed in Chapter 6, i.e. essentially the use of linear and multiple regression equations with "Total Costs" as the dependent variable, was applied initially to the complete group of secondary schools within each education authority, giving the results set out in Table 8.1. Subsequently the programmes were repeated with data for complete groups of primary schools (see Table 8.2) and for various sub-groups of secondary schools (see Table 8.3). It is evident that in each case the results of the standard F-tests are significant at the highest level tested (=0.5% or 5 per mille), a result which was only to be expected in view of the obvious positive correlation between total costs and size of school. In each case, the standard F-test results are higher for the linear equation than for the polynomials, the result being lowest for the polynomial including the cubed term,

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1. Private conversation with Department of Education and Science, Financial Services Division, March, 1978.

but even for the latter, all (in Tables 8.1 and 8.2) and most (in Table 8.3) are still significant at the highest level.

In themselves, these results do not enable us to assess the validity of including the term in N^2 and/or the term in N^3 and we therefore applied the Incremental F-test or t-test, as discussed in Chapter 6: for convenience the column headings in the tables refer to "t-test...." .

In view of the obvious connection between total costs and size of school, the linear case (columns 4 and 5 in Table 8.1) is, in itself, of relatively little interest, and is included primarily so that comparisons can be drawn with the polynomial regressions, in particular the differences in the levels of the results for the F-test and R^2. In each of the three columns headed R^2 in almost every line the value is higher than 0.8 and sometimes as high as 0.9, perhaps the majority lying within the range 0.85 to 0.88; this means that the equations are "explaining"[1] some 85-88% of the variations in Total Costs, which must be of considerable interest especially as there has been no attempt to include any variables to represent any aspects of the schools other than size.

With regard to the polynomial expressions, for the great majority of the lines in Table 8.1 statistical significance (at varying levels) is indicated either in column 7 or in column 12 and sometimes in both. In each case the highest level of significance indicated by the footnotes a to e shows which is the valid form of equation best fitting that data set. Further in many, although not all, of these cases, an "optimum size of school" is indicated in either column 9 or column 14. For L.E.A. "A" the equation

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1. From "100 R^2", the coefficient of determination. See also the note of caution in Chapter 6 about the meaning to be attached to the value of R^2 in these calculations.

in (N,N^2,N^3) is always the more significant but the indicated optimum sizes appear very low and would have to be treated with caution. For L.E.A. "B" the (N,N^2) form indicates an optimum size of around 1,200 pupils but the level of statistical significance is uncertain. For L.E.A. "C" the form in (N,N^2) is always significant but no minimum cost point emerges whilst L.E.A. "D"'s figures indicate minimum costs at around 980-990 pupils but no statistical significance for the addition of the term in N^2. (Throughout it seems more realistic to conceptualise a minimum range rather than a precise point). Where no minimum cost point is shown this simply means that one was not found to lie within the range of the data in question but might exist if, for example, some larger schools were included. With regard to column 14, a minimum cost level for a cubic equation is equivalent to differentiating, solving the quadratic, and selecting the root within the appropriate range. Columns 16 to 19 indicate the coefficients in the regression for whichever is the more valid form of the equation.

With Table 8.1 there is the obvious problem of whether it is valid to include in one calculation the whole of an L.E.A.'s secondary schools: in so far as the latter do not form an homogeneous group, we are not comparing like with like. This is why separate sub-groups of schools, on a broadly homogeneous basis, will be considered below in Table 8.3.

The format of Tables 8.2 and 8.3 is similar to that of Table 8.1. Table 8.2, for primary schools, shows much the strongest results in relation to economies of size of any of the data tested: as column 7 indicates, the t-test results for the polynomial in (N,N^2) are throughout significant at the highest level. It is evident that significant economies of scale are shown to operate in primary schools and continue throughout the entire range, no minimum

Table 8.1 : Economies of size : results for complete groups of secondary schools

Data set			For linear equation (in N)		For polynomial in (N,N^2)					For polynomial in (N,N^2,N^3)					Coefficients in regression equation			
L.E.A.	Year	No. of schools	F-test result	R^2	F-test result	t-test result for significance of coefficient of the term in N^2	R^2	At minimum average cost point (if any)		F-test result	t-test result for significance of coefficient of the term in N^2	R^2	At minimum average cost point (if any)		Intercept	N	N^2	N^3
								No. of pupils	Est.AC				No. of pupils	Est.AC				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
A	1974/5	80	380.0776	0.830	187.9203	0.1082	0.830	-	-	127.4732	1.9487b	0.834	518	291.49	49528.01812	77.98607809	0.2704595715	-0.0000827784
-A	1974/5	78	571.5109	0.883	282.8981	0.2119	0.883	-	-	195.4081	3.2739e	0.888	521	290.82	52510.92088	65.75006648	0.2837215642	-0.0000856984
A	1975/6	79	514.5338	0.870	260.2488	1.6461b	0.873	1,157.00	410.99	190.6135	7.4142e	0.884	584	371.70	148865.6677	-216.8912292	0.7065990036	-0.0002315474
A	1976/7	81	442.5380	0.849	222.5474	1.2358	0.851	1,048.70	441.64	167.0336	9.2021e	0.867	692	423.82	227464.1876	-357.009181	0.8312774053	-0.0002571136
B	1974/5	21	207.7369	0.916	108.6282	1.7139a	0.923	1,218.00	206.35	69.4729	0.2473	0.925	-	-	68489.22313	93.87331222	0.0461666212	-
B	1975/6	21	119.8463	0.863	57.5133	0.2036	0.865	1,200.00	234.72	37.0884	0.3557	0.867	-	-	3517.731515	235.5850682	-	-
C	1974/5	87	380.7674	0.818	210.6247	8.2052e	0.834	-	-	140.3337	0.7924	0.835	-	-	452709.375	1541.50595	0.931248557	-
C	1975/6	87	436.8083	0.837	248.2106	10.3478e	0.855	-	-	178.8507	6.6631e	0.868	- 746	- 339.98	76642.96716 221971.5807	165.4954077 -343.0680636	0.112172218 0.634682536	-0.0001580793385
C	1976/7	89	469.7597	0.844	275.3187	13.4818e	0.865	-	-	197.7018	6.6017e	0.875	-	-	86803.7877	195.3770645	0.11287345	-
D	1974/5	60	185.4436	0.762	91.3260	0.0967	0.762	-	-	59.8382	0.0160	0.762	-	-	-5947.320175	290.4464912	-	-
D	1975/6	63	273.2953	0.818	134.8115	0.1474	0.818	985.28	358.62	89.8980	0.8309	0.821	-	-	-13064.19333	371.7933333	-	-
D	1976/7	64	350.5425	0.850	174.9561	0.7550	0.852	988.37	406.39	118.5289	1.6939b	0.856	-	-	7485.505173	194.413837	0.4102929104	-0.0001981755

+ With two "exceptional" schools excluded.

"The coefficients indicated are for the linear case save where the polynomial(s) are clearly more significant".

Significance levels for t-test: a = 10%, b = 5%, c = 2.5%, d = 1%, e = 0.5%.

cost point (or "diseconomies" range) emerging. This is confirmed by the computerised plotter graphs which show smooth curves similar in shape to the arc ON' in Chapter 6, Diagram 2, with no turning point. We may have increased confidence in the results shown in Table 8.2 since not only are the significance levels so high passim, but the number of schools in each data set is very large. Further possible anxiety about the heterogeneity of certain groups of secondary schools need not apply at the primary level where schools tend to form a more homogeneous group, free of, for instance, academic streaming, variations in staying on rates or curricular patterns, or upheavals due to re-organisation plans.

Certainly the cost figures for the smallest primary schools show them to be extremely expensive to run in per pupil terms, as has already been seen in Chapter 7 and Table 8.2 suggests that even larger primary schools would be cheaper to run in per pupil terms. (There is, of course, no suggestion here that cost considerations alone should determine school size irrespective of other factors). On average the values of R^2 in Table 8.2 are even higher than those in Table 8.1: in the case of the last line in the Table, 94% of variation in costs is explained by size alone.

Table 8.3 shows the breakdown of the groups of secondary schools into more homogeneous sub-groups: the designation of the latter inevitably varies from one authority to another according to the secondary school circumstances obtaining. It must also be admitted that some subjective element in selecting the sub-groups is inescapable - the "comprehensive" umbrella, for example, sometimes covers some schools which manifest considerable differences of recent history, age-group, etc. Nevertheless, the sub-groups have been selected to be as homogeneous as possible, as their designation indicates. Where an occasional school

Table 8.2 : Economies of size : results for primary schools (complete groups)

Data set			For linear equation in (N)		For polynomial in (N, N^2)					For polynomial in (N, N^2)					Coefficients in regression equation			
L.E.A.	Year	No. of schools	F-test result	R^2	F-test result	t-test result for significance of coefficient of the term in N^2	R^2	At minimum average cost point (if any)		F-test result	t-test result for significance of coefficient of the term in N^2	R^2	At minimum average cost point (if any)		Intercept	N	N^2	N^3
								No. of pupils	Est.AC				No. of pupils	Est.AC				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
C	1974/5	380	1999.0397	0.841	1060.7215	20.3058e	0.849	-	-	705.3018	0.0134	0.849	-	-	1969.007757	207.42889	-0.084982444	
C	1975/6	378	2408.3545	0.865	1297.5304	28.0778e	0.874	-	-	862.8472	0.0606	0.874	-	-	1787.227614	267.3765741	-0.113131399	
C	1976/7	374	2256.5947	0.858	1204.0458	22.3884e	0.867	-	-	804.5556	1.6108e	0.867	-	-	3346.808309	290.3807672	-0.1173438549	
D	1975/6	285	3654.4135	0.932	2300.4879	38.3168e	0.940	-	-	1493.3562	8.7026e	0.941	-	-	(4877.048172	132.379359	0.102759193	
													276	177.97	(2729.557232	179.4891788	-0.0688919192	0.0002468836701

Significance levels for t-test: as on Table 8.1.

(about one or two in each authority) could not readily be fitted into any of the categories, it has been omitted: examples were a sixth-form college or, in one case, the only 11-18 comprehensive school in an authority.

It is not easy to categorise the results in Table 8.3 since they vary considerably; further, in most cases the number of schools in the group is smaller than would be desirable on statistical grounds. It would be unsafe, for example, to place much reliance on the result for the group of 9 schools. Middle schools evidence distinct size characteristics, as might be expected, since it has always been agreed that middle schools should typically be smaller in size than other secondary schools; they evidence much smaller "optimum sizes" and it is, of course, arguable whether middle schools should be included under secondary at all. For a number of other groups, the minimal cost size tends to lie within the range 700-1000 pupils with a total of seven separate groups having minimum cost points within the range 900-1000 pupils, although in just a few cases it is much larger. However, we see from the footnotes (a to e) to columns 8 and 13 that only just over half of the estimated polynomial equations are statistically significant (due essentially to the small number of schools in each group). In a number of cases statistical significance is indicated but no minimum cost point emerges: as before, this may be because it lies outside the range of the data in question.

Mention should be made of a number of problems which arose. Firstly, since the specification of the equation could take any one of a number of forms, and could well vary from one data set to another, some of the data sets were run through the computer with

TABLE 8.3 : Economies of Size - results for sub-groups of secondary schools

Data set				For linear equation (in N)		For polynomial in (N, N^2)					For polynomial in (N, N^2, N^3)					Coefficients in regression equation			
L.E.A	Type of School	Year	No. of Schools	F-test result	R^2	F-test result	t-test result for significance of coefficient of the term in N^2	R^2	At minimum average cost point (if any)		F-test result	t-test result for significance of coefficient of the term in N^3	R^2	At minimum average cost point (if any)		Intercept	N	N^2	N^3
									No. of pupils	Est.AC				No. of Pupils	Est AC				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)						
A	Grammar and Technical	1974/5	14	154.1608	0.917	72.6260	0.1751	0.918	-	-	66.0665	5.2674 e	0.943	967	326.12	-1154805.292	4721.208059	-5.385718845	0.0021464478
A	Secondary Modern	1974/5	35	217.2800	0.868	109.0174	0.9677	0.872	783.85	272.46	72.5152	0.8094	0.875			9475.495826	263.6510851		
A	Comprehensive	1974/5	28	53.2734	0.672	25.6860	0.0484	0.673	-	-	17.5579	1.0987	0.687			9537.623228	321.2288994		
+A	Comprehensive	1974/5	26	100.1264	0.807	48.3293	0.1362	0.808	-	-	35.0704	2.4517 c	0.827	878	313.85	372575.3593	-727.7231493	0.922956432	-0.0002505307
A	Grammar and Technical	1975/6	16	100.4728	0.878	51.4812	1.1822	0.888	-	-	42.6725	3.6967 e	0.914	918	396.92	-1188380.334	5235.955475	-6.312924158	0.0026708133
A	Secondary Modern	1975/6	32	236.6431	0.887	114.3784	0.0002	0.887	-	-	78.5243	1.6544 a	0.894	973	358.37	-163455.2434	1064.152789	-0.9328031816	0.0003906209
A	Comprehensive	1975/6	30	84.3448	0.751	46.4264	2.8713 e	0.775	-	-	33.6846	2.6222 d	0.795			-184841.9562	787.3775207	-0.1652345513	
A	Grammar and Technical	1976/7	16	56.5639	0.802	26.6039	0.1357	0.804	-	-	16.6175	0.1448	0.806			-16961.06036	470.8156607		
A	Secondary Modern	1976/7	32	196.7038	0.868	95.6657	0.1567	0.868	-	-	69.2732	3.0386 e	0.881	1017	399.48	-253528.3854	1525.66865	-1.479185345	0.0006066309
A	Comprehensive	1976/7	32	113.9620	0.792	55.4222	0.1419	0.793	-	-	40.8316	3.2086 e	0.814	811	462.38	247717.0271	-307.9648744	0.7695944326	-0.0002421139
C	High	1974/5	33	59.3624	0.657	28.7522	0.0195	0.657	-	-	18.6482	0.1224	0.659			-5671.384525	276.4865182		
C	Upper	1974/5	14	13.2117	0.524	8.4873	2.3151 c	0.607	1440.6	315.02	5.6462	0.5926	0.629			589893.6186	-503.9350422	0.284248449	
C	Secondary Modern	1974/5	26	340.1747	0.934	167.6663	0.6150	0.936	992.5	255.39	138.9069	6.1598 e	0.950	991	243.00	-73179.19719	728.1600767	-0.7556424972	0.000343683
C	Grammar	1974/5	9	306.4854	0.978	231.4502	4.4704 e	0.987	-	-	196.5865	2.6105 c	0.992			76929.58839	53.98215924	0.2728725799	
C	High	1975/6	34	57.4833	0.642	30.8668	2.1623 c	0.666	-	-	23.2012	3.2966 e	0.699	748	307.22	-423251.7101	2834.506014	-4.483830207	0.0024887497
*C	High	1975/6	33	189.4541	0.859	91.8005	0.0363	0.860	-	-	60.2662	0.4660	0.862			22255.09259	289.2901235		
C	Upper	1975/6	14	13.9960	0.538	8.5757	1.9949 b	0.609	1573.90	378.69	5.4238	0.2654	0.619			549043.3747	-318.9853291	0.221635011	
*C	Upper	1975/6	13	79.6404	0.879	50.2641	3.4135 e	0.910	1721.2	397.94	58.3279	7.6459 e	0.951	(		369492.4469	-31.40265637	0.1247241402	
														(1273	414.13	1278904.15	-2271.655515	1.852039069	-0.0004174547
C	Secondary Modern	1975/6	25	337.4606	0.936	214.7093	6.8038 e	0.951	919.16	315.20	165.7841	4.2620 e	0.959	(		133178.6011	25.41984348	0.1576322358	
														(1000	307.47	-118242.0571	1003.17504	-1.036455938	0.0004589953

Significance levels for t-test: as on Table 8.1

Table 8.3 (Cont'd)

Data set				For linear equation (in N)		For polynomial in N,N^2)					For polynomial in (N,N^2,N^3)					Coefficients in regression equation			
L.E.A.	Type of School	Year	No. of Schools	F-test result	R^2	F-test result	t-test result for significance of coefficient of the term in N^2	R^2	At minimum average cost point (if any)		F-test result	t-test result for significance of coefficient of the term in N^3	R^2	At minimum average cost point (if any)		Intercept	N	N^2	N^3
									No. of Pupils	Est.AC				No. of Pupils	Est.AC				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)						
*C	Secondary Modern	1975/6	24	462.1365	0.955	274.6283	4.9134 e	0.963	900.09	316.09	242.5759	7.5355 e	0.973	((1.000	308.33	98976.31007 -181131.5022	96.75280956 1181.577543	0.122176784 -1.198843417	0.0005067644
C	Grammar	1975/6	9	97.9512	0.933	43.1287	0.1534	0.935	624.43	444.55	24.5130	0.1078	0.936			-1156.333333	442.4047619		
C	High	1976/7	35	52.2002	0.613	31.2813	4.6263 e	0.662	-	-	27.0042	6.9051 e	0.723	((717	320.49	124189.2392 -157039.1663	-124.2475335 1887.387134	0.4061284812 -3.453069217	0.0021941196
*C	High	1976/7	34	244.6643	0.884	123.6150	1.1811	0.889	815.21	341.41	84.9086	1.7238 b	0.895	774	336.53	-4861.037503	640.9714766	-0.7626404712	0.0004876227
C	Upper	1976/7	14	13.9887	0.538	9.1434	2.5228 a	0.624	1658.4	404.46	5.5712	0.0335	0.626			554665.0459	-264.449375	0.2016698187	
*C	Upper	1976/7	13	78.2133	0.877	64.0735	7.0335 e	0.928	1765.4	426.80	73.8389	7.6863 e	0.961	(		414585.1713	-42.87322091	0.1330266605	
C	Secondary (11-16 yrs.)	1976/7	23	255.5947	0.915	109.7713	0.3994	0.917	1163.4	351.30	70.9821	0.3658	0.918	(1.317	446.75	978177.8175 30600.02022	-1513.14574 325.7633974	1.284443243	-0.0002735355
C	Secondary (11-18 yrs.)	1976/7	9	28.1843	0.801	121.0229	0.0093	0.801	-	-	6.9865	0.1567	0.807			121940.3896	224.6162928		
D	Middle	1974/5	17	7.5931	0.336	6.6538	4.1300 e	0.487	-	-	5.8123	2.6043 d	0.573			-155308.4601	1023.075609	-0.8871708992	
D	all non-Middle	1974/5	43	119.7836	0.745	58.5328	0.0519	0.745	1205.2	286.55	38.1722	0.0962	0.746			15829.08559	271.5522523		
D	11-16 Schools	1974/5	19	149.4430	0.898	70.7421	0.0850	0.898	-	-	44.3884	0.0532	0.899			31046.10108	210.3894879		
D	Schools with 6th forms	1974/5	24	56.3481	0.719	26.9067	0.0075	0.719	-	-	17.3289	0.2066	0.722			53184.2986	249.4488978		
D	Middle	1975/6	20	76.2468	0.809	38.7659	1.0544	0.820	-	-	24.7474	0.2285	0.823			15618.45238	251.4455782		
D	all non-Middle	1975/6	43	93.0255	0.694	45.8702	0.3010	0.696	-	-	29.8406	0.0227	0.697			30392.03578	331.3032368		
D	11-16 Schools	1975/6	19	254.6188	0.937	120.9128	0.1367	0.938	-	-	77.0866	0.2823	0.939			39.650.42503	270.8972845		
D	Schools with 6th forms	1975/6	24	22.8412	0.509	10.9199	0.0181	0.510	-	-	7.0931	0.2351	0.515			121751.1458	258.8541667		
D	Middle	1976/7	20	62.3701	0.776	33.1560	1.6589 a	0.795	-	-	22.5585	1.0742	0.809			-26073.52627	485.8484884	-0.2317782256	
D	all non-Middle	1976/7	44	156.3453	0.788	80.8857	1.9372 b	0.798	-	-	52.7884	0.1091	0.798			-47195.69942	582.286299	-0.1191154763	
D	11-16 Schools	1976/7	19	385.2919	0.958	181.6096	0.0250	0.958	-	-	113.9742	0.0593	0.958			18153.37079	348.3146067		
D	Schools with 6th forms	1976/7	25	37.6875	0.621	18.0749	0.0382	0.622	-	-	11.9782	0.5403	0.631			163452.7273	268.1818182		

* with one 'exceptional' school removed + with two 'exceptional' schools removed.

other, varying, specifications: the results always gave a worse fit to the estimated line (= a lower R^2) than those tabulated in Tables 8.1, 8.2, and 8.3. Reference has already been made to this point in Chapter 6.

Secondly, in the case of authority C, at an early stage in the calculations graphing of residuals on the basis suggested by Murphy[1] gave rise to suspicions of heteroscedasticity. To test for this, the statistics for the relevant data sets were divided into smallest and largest groups for the Goldfield/Quandt test and the ratio of the two sets of "Unexplained Variations" compared with the tabulated F-ratio; for each of the three years the results were positive. Upon reference back to the L.E.A. concerned it transpired that at least some of the large and uneven variations in the residuals emanated from errors in recording some of the data and, with the further co-operation of the authority, amended figures were obtained and these have been used in the tables included in this chapter.[2]

In the case of C, 1974/5, however, in view of the much larger F-test result from the Goldfield/Quandt test ($\frac{5166.115}{764.881} = 6.754$ against tabulated 1%F (32,32) = 2.2772), no such simple solution existed[3]: the alteration of one or two schools' figures in the

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1. JAMES L. MURPHY, Introductory Econometrics, p.301 (R.D. Irwin, 1973).

2. Although the Goldfield/Quandt test is an intuitively satisfying procedure it is cumbersome and timely to calculate and does not seem to be included in any of the standard computer software packages. Further there is an undoubted subjective element involved in choosing the three separate sub-groups for the test, as mentioned in Chapter 6: there must at least be the suspicion that one could vary the composition of those three sub-groups until one obtains the desired result. See J.L. MURPHY, op. cit.

3. JAMES L. MURPHY, op. cit., pp.302-7 (although his calculations in the text are incorrect, as mentioned in Chapter 6).

data would not reduce the F-ratio below the level for significance; after removal of two schools with the largest residuals it fell only to 3.49. The data was therefore "transformed" following the method described in Murphy:[1] after division into groups with reasonably homogeneous residuals, all variables in each group were divided by the standard error of the residuals for that group. Whilst this method removes the problem of heteroscedasticity, interpretation of the results obtained is not easy since these are extremely volatile if the groups are drawn in slightly different ways, as mentioned previously. The result obtained, that the optimal cost size occurs as low as some 465 pupils, seems open to doubt.

For L.E.A. "C"'s secondary modern schools (n=25), the plot of residuals from the Degree 2 regression (as in Murphy) looks as though there is again serious heteroscedasticity.

The Goldfield/Quandt test, using separate regressions for each of the groups of (i) the 10 smallest schools and (ii) the 10 largest schools, gave a ratio of sums of residuals of

$$\frac{528.499}{111.195} = 4.7529$$

which is significant at the 2½% level ($F_{(9,9)} = 4.03$), although not at the 1% level.

A correction for heteroscedasticity was therefore carried out (even though it was not necessary at the 1% significance level). Following the method described previously, the 25 schools were divided into sub-groups and all variables in each group were

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1. As the printed F-tables do not give precise figures for (32,32) degrees of freedom, these values had to be calculated from the formula:

$$1.1513 \log F_P = \frac{\lambda P\sqrt{h+\lambda}}{h} - \left(\frac{1}{V_1 - 1} - \frac{1}{V_2 - 1}\right)\left(\lambda + \frac{5}{6}\right)$$

See D.V. LINDLEY and J.C.P. MILLER, Cambridge Elementary Statistical Tables (C.U.P., 1961).

divided by the standard error of the residuals for that group, to produce "transformed data". Subsequent regression with the transformed data showed that, whilst the problem of heteroscedasticity had been overcome, in the regression equation in N, N^2, the t-test result on the coefficient of the term on N^2 was t=1.1104, a non-significant result. This result seemed invalid in view of the U-shaped AC curve mentioned above and it has not been included in Table 8.3. Further examination of the original data revealed that one school (with NPUP = 501, TC = £226,657, AC = £445) had exceptionally high Average Costs and had a residual from the estimated regression line with absolute value more than twice as large as any other school. No other school in the "M" group had Average Costs in excess of £381. This school was therefore excluded and the regression re-run, whereupon the polynomial in N and N^2 proved to be still significant at the 5% level on the incremental F-test for the addition of the term in N^2 (F= 4.913) against the tabulated $F_{1,22} = 4.30$ (but not at the 2½% level, $F_{1,22} = 5.79$). For the Goldfield/Quandt test to check for heteroscedasticity separate regressions on the 10 smallest and 10 largest schools produced summed and squared residuals of 111,195 and 238,972, i.e. an F ratio of 2.149, which is clearly not significant even at the 5% level ($F_{9,9} = 3.18$). Hence, the problem of heteroscedasticity has been overcome by the exclusion of the one school with exceptionally high costs.

Subsequently a spot check for heteroscedasticity was carried out on certain of the other data and the Goldfield/Quandt test proved not significant.

The validity of testing for, and attempting to remove the incidence of, heteroscedasticity in this way seems clear but it is undeniable that some subjective element is involved, as mentioned above.

As is shown in Chapter 6 (page 6.14) if any heteroscedasticity remains it will not bias the results but will mean that we do not have the "best" or most efficient estimators possible. In other words in this chapter we may be understating the effects of economies of size.

To summarise briefly the results discussed in this chapter is not easy but the following points do emerge:

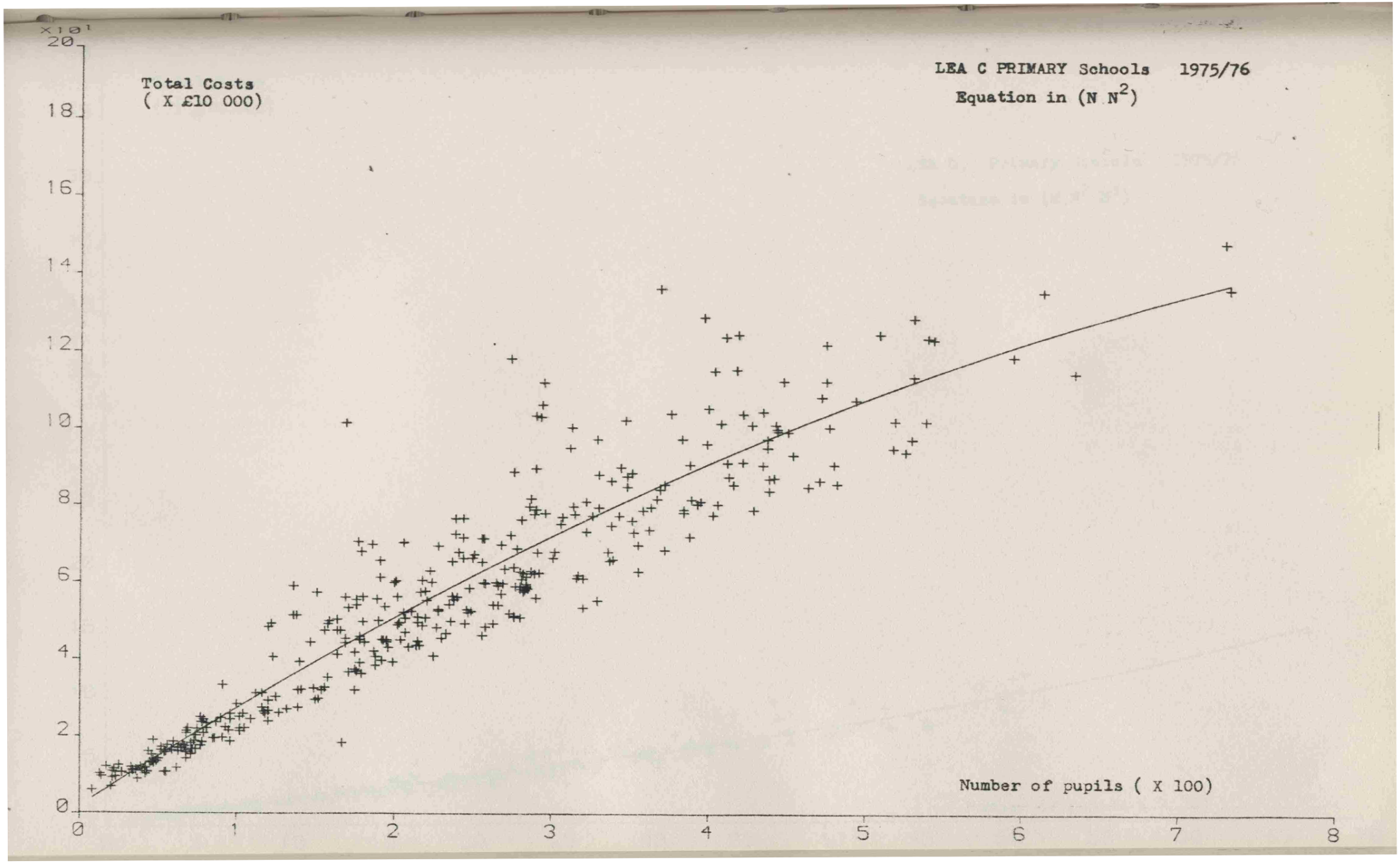
(i) There is very clear evidence for economies of size in primary schools with the largest schools having the lowest per pupil average costs; no minimum point emerges;

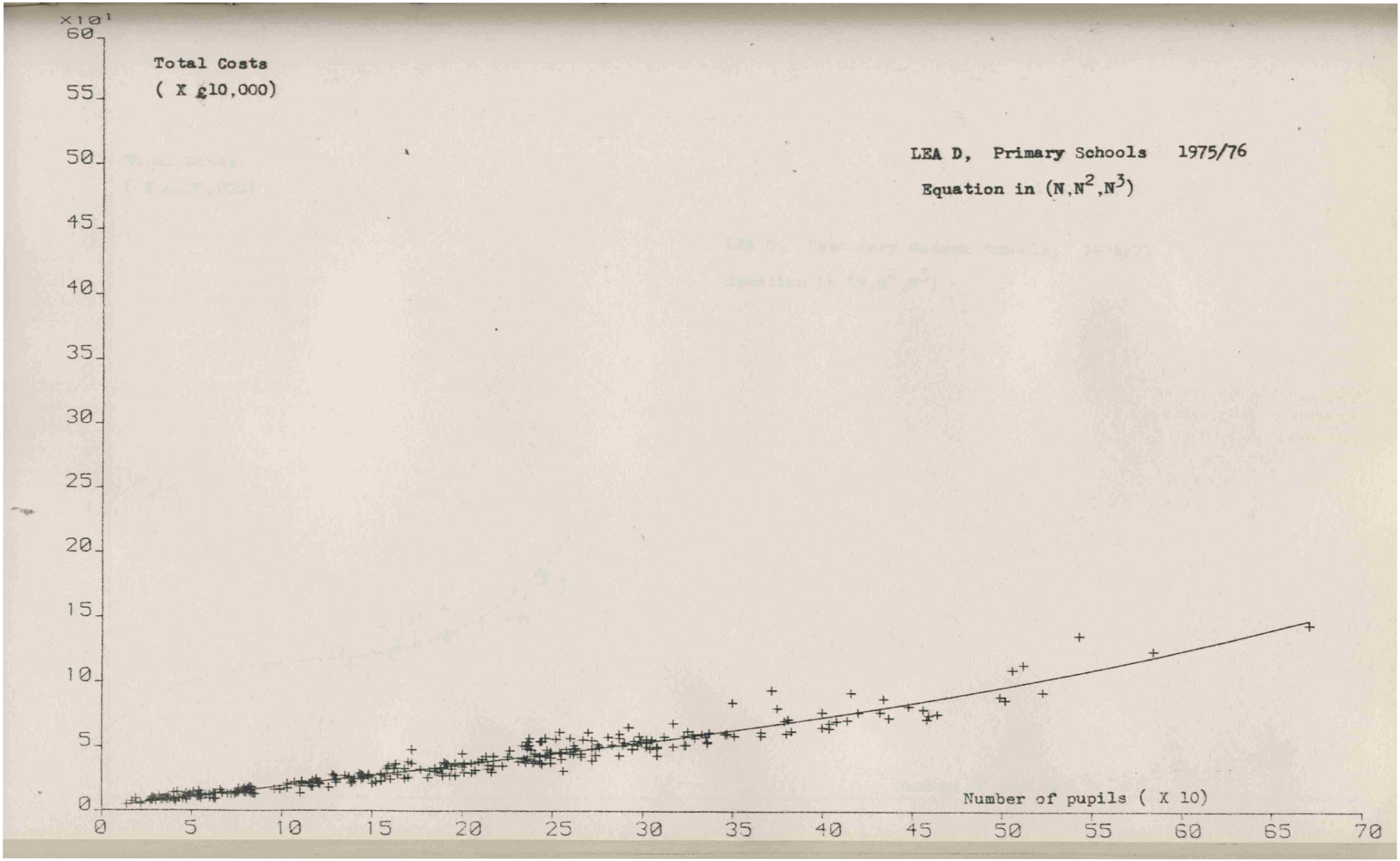
(ii) When secondary schools within each L.E.A. are viewed as complete groups there is usually (but not always) quite strong evidence of economies of size but the evidence for "optimum size" is not clear;

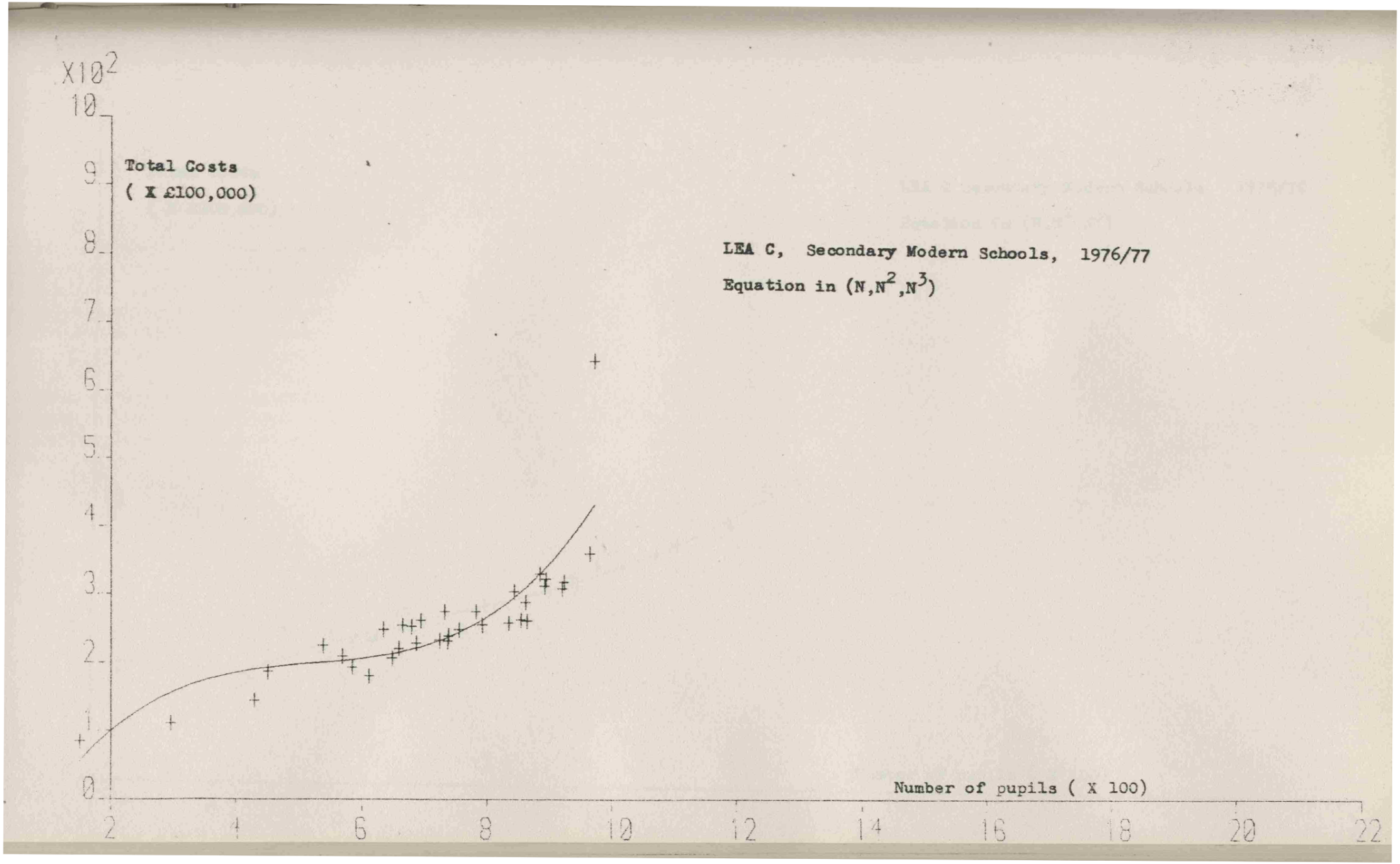
(iii) When secondary schools are divided into (relatively) homogeneous sub-groups, some of these groups provide clear evidence of economies of size and minimum cost sizes but others do not. From some of the smaller groups it is difficult to draw any valid conclusions;

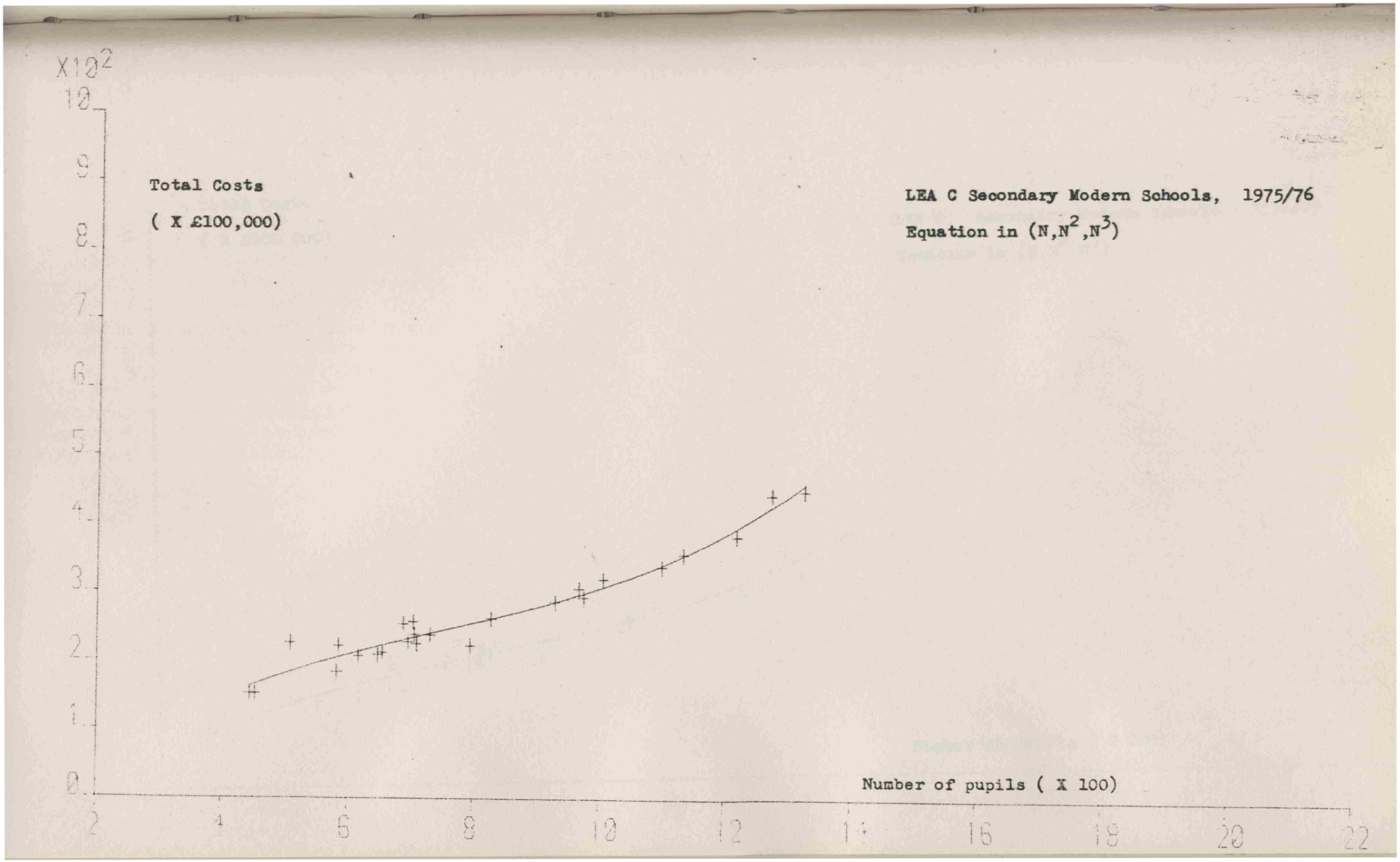
(iv) Any reference to these results should not divert attention from the various problems, mentioned above, involved in doing such calculations.

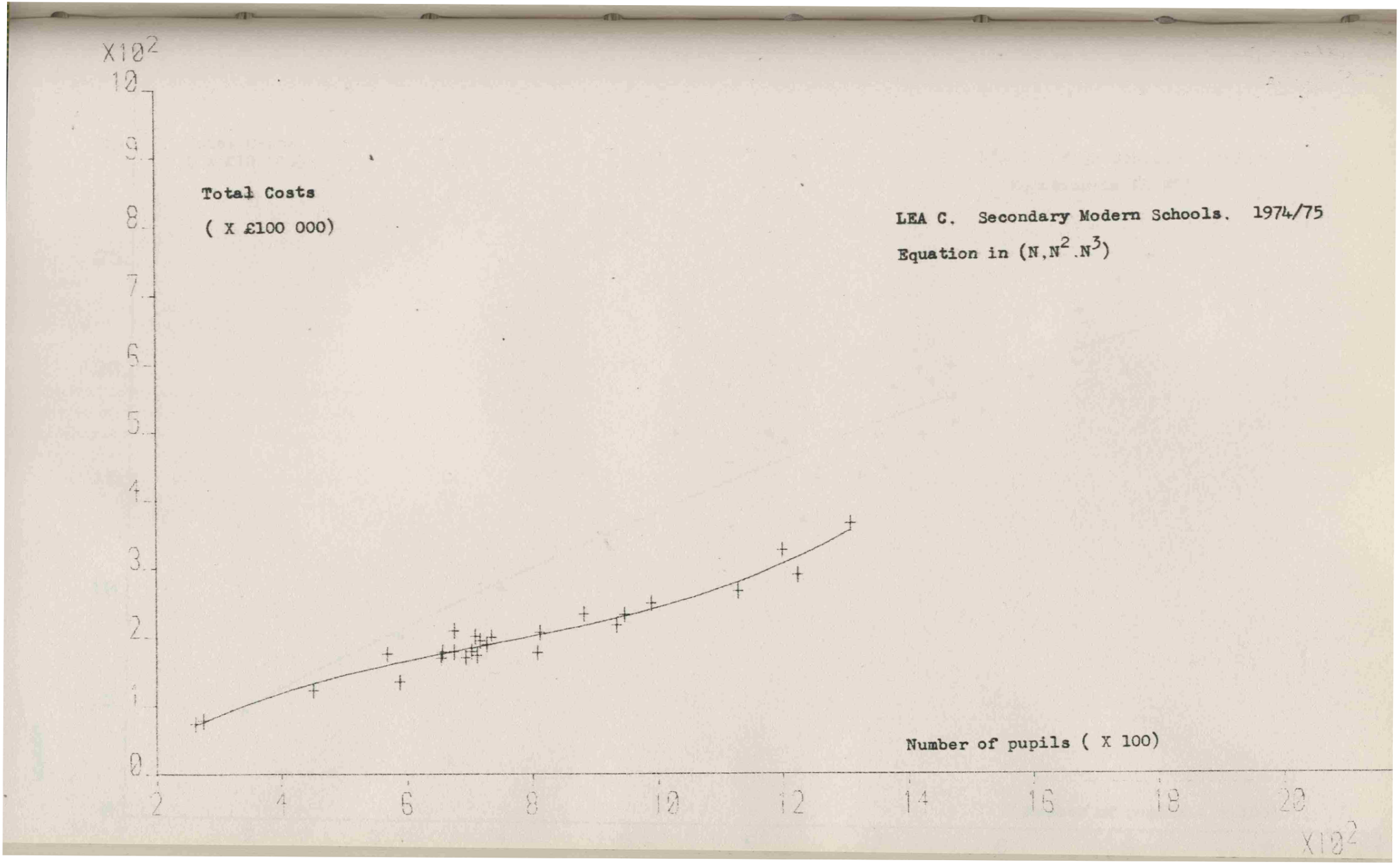
Computerised plotter graphs are appended for a selection of groups or sub-groups of schools.

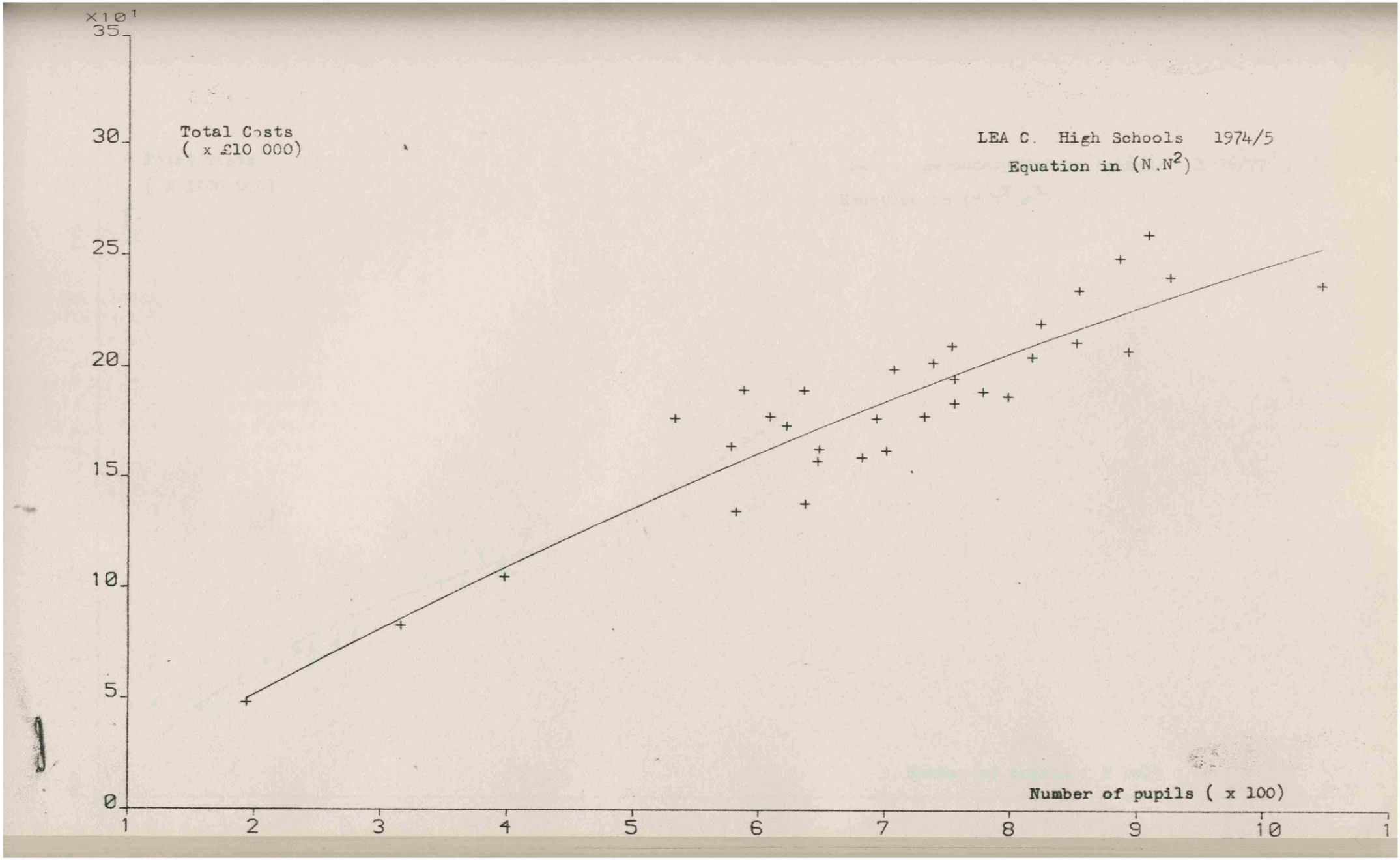

LEA C PRIMARY Schools 1975/76
Equation in (N N²)
Total Costs
(X £10 000)
x10¹
20
18
16
14
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7
8
Number of pupils (X 100)

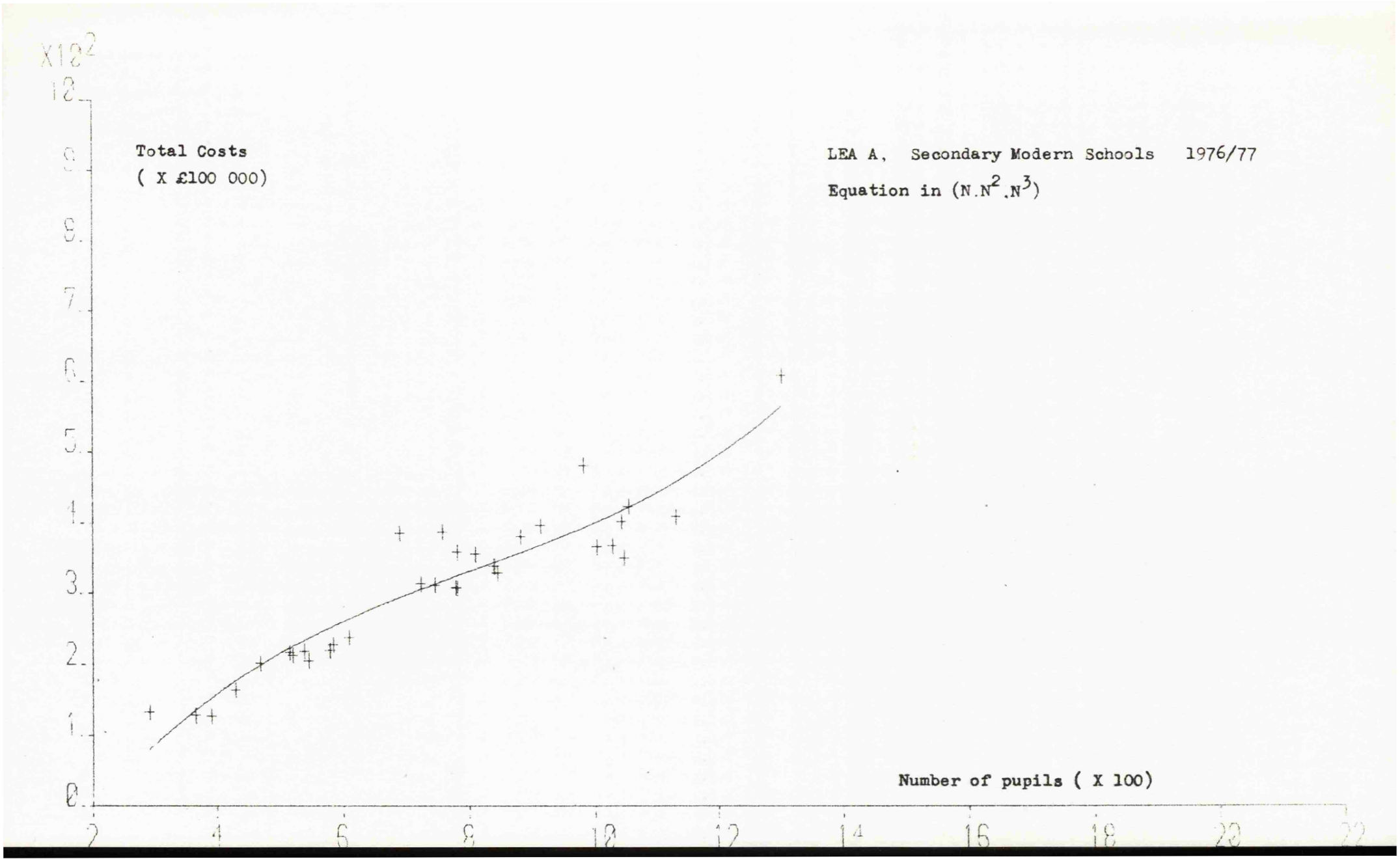

x10¹
60
55
50
45
40
35
30
25
20
15
10
5
0
Total Costs
(X £10,000)
LEA D, Primary Schools 1975/76
Equation in (N,N²,N³)
Number of pupils (X 10)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70


X10²
10
9
8
7
6
5
4
3
2
1
0
Total Costs
(X £100,000)
LEA C, Secondary Modern Schools, 1976/77
Equation in (N,N²,N³)
Number of pupils (X 100)
2
4
6
8
10
12
14
16
18
20
22


X10²
10
9
8
7
6
5
4
3
2
1
0
Total Costs
(X £100,000)
LEA C Secondary Modern Schools, 1975/76
Equation in (N,N²,N³)
Number of pupils (X 100)
2
4
6
8
10
12
14
16
18
20
22


X10²
10
9
8
7
6
5
4
3
2
1
0
Total Costs
(X £100 000)
LEA C. Secondary Modern Schools. 1974/75
Equation in (N,N².N³)
Number of pupils (X 100)
2
4
6
8
10
12
14
16
18
20
X10²


x10¹
35
30
25
20
15
10
5
0
Total Costs
(x £10 000)
LEA C. High Schools 1974/5
Equation in (N.N²)
Number of pupils (x 100)
1
2
3
4
5
6
7
8
9
10


X10²
12
9
8
7
6
5
4
3
2
1
0
Total Costs
(X £100 000)
LEA A, Secondary Modern Schools 1976/77
Equation in (N.N².N³)
Number of pupils (X 100)
2
4
6
8
10
12
14
16
18
20
22

CHAPTER 9. NIGERIAN SCHOOL DATA

As was mentioned in Chapter 1, the research discussed in this thesis was brought to the attention[1] of the International Institute for Educational Planning (I.I.E.P.), a branch of UNESCO. As a result I was invited by I.I.E.P. to visit Nigeria in May 1979 to collect and prepare case study material relating to school costs in Nigeria, and again in July 1979 to present the results to a training course for educational planners and administrators from a number of African countries, and subsequently to visit Indonesia in September 1979 to lecture on this and other material to a similar course held in Jakarta. During both visits to Nigeria I was attached, as a UNESCO consultant, to the Department of Educational Management, University of Ibadan.

The intention of this research was to collect detailed statistics in connection with expenditures and cost-related variables for each of a sample of some thirty primary schools and some twenty secondary schools, located in both urban and rural areas in two separate states of Nigeria. Separate questionnaires were administered to the head teacher of each school and to each individual member of the teaching staff. The former included global details relating to the school such as number of pupils and available buildings and facilities in addition to outline details and salary for each member of staff. The latter, completed by individual teachers, gave details of qualifications, experience, and salary, in addition to a detailed breakdown of his or her teaching timetable. In addition, each school was visited either by myself or by Dr. Pandit, UNESCO expert in the Department of

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1. Via Ms. Maureen Woodhall, who is widely acknowledged as one of the leading authorities in this field. I am most grateful to Ms. Woodhall for the introduction.

educational management, University of Ibadan[1], or by representatives from the Ministries of Education in the two states, Bendel and Ogun. It was thus possible to assemble quite detailed and reliable statistics for each school. These school-by-school results, and their implications, are discussed in Case Study 2 below[2]. Case Study 1 relates[2] to area-by-area school expenditure statistics for Bendel State which became available to me, rather by chance, in the offices of the Bendel State Ministry of Education.

CASE STUDY 1 : Variations in Educational Expenditure by Local Government Area in Bendel State, Nigeria

1. INTRODUCTION

The statistics used in this case study were collected in Bendel State in May 1979[3]. They serve to give a picture of certain aspects of the State's education system, with particular reference to patterns of educational expenditure and resource availability. The figures in each of Tables 9.1, 9.2, 9.4 and 9.5 are given for each of the 19 Local Government Areas in Bendel State; they thus enable certain area-by-area comparisons to be drawn but they do not contain information relating to individual schools. Table 9.3 relates to each of the 25 new secondary schools established in the State during the 1977/78 financial year.

This case study will attempt to:

(i) examine the figures to see what conclusions can be drawn;
(ii) discuss how satisfactory and/or reliable the various statistics are liable to be and what adjustments to them, if any, appear necessary and/or desirable.

1. Whose assistance throughout was invaluable; without Dr. Pandit's enthusiastic and energetic co-operation the studies could not have been completed.

2. Copyright of these two case studies belongs to I.I.E.P. (UNESCO) who will be publishing them separately. I am grateful to I.I.E.P. (UNESCO) for permission to include them in this thesis.

3. My grateful thanks are due to Mr. E.M. Obadan, Head of the National Policy on Education division of the Ministry of Education of Bendel State without whose assistance this case study could not have been written. I alone am responsible for any conclusions drawn and/or errors made, in the usual way.

In all the tables, the figures relate solely to recurrent expenditure, no information on capital expenditure being available. No information was available as to the extent to which Bendel State might be taken to be typical of other States in Nigeria, in respect of either (i) or (ii) above. It would, therefore, seem desirable that similar studies should be carried out in other States in Nigeria, so that comparisons can be drawn. A major problem with utilising the figures for secondary schools is that pupils are free to go to schools in other areas so the figures do not indicate participation rates for each area.

Of the 19 Local Government Areas in Bendel State, 18 are predominantly rural areas whilst one, OREDO, centres on the State capital, Benin City, which has a population of nearly 250,000 out of a total of nearly 3.7 m. for the State. Much smaller but still important towns are Warri and Sapele and the remainder of the population is widely scattered in small townships and villages. The more remote parts of the State remain without such amenities such as electricity, regular water supply, modern sanitation, or adequate housing and the level of educational participation has, not surprisingly, been low. Certainly many adults would be unable to read or write. However, the State authorities believe that close to 100% of all children now receive at least a minimum of primary schooling, and at least a framework of secondary schooling exists in each of the 19 areas.

2. PRIMARY SCHOOLS

Table 9.1 relates to primary schools in each area. For this and all the other tables, the figures should be read in conjunction with the Notes, which indicate a number of methodological problems. From Table 9.1 we see immediately that the size of the primary school system varies greatly from one area to another, the extremes being Bomadi and Oredo; the former, which is the smallest of all the 19 areas and is located at the extreme southern edge of the State, has only 21 primary schools, 271 teachers and 6,754 pupils, whereas Oredo,

the highly urbanised area containing Benin itself, has approximately five times as many schools, seven times as many teachers and some fourteen times as many pupils. Similarly the latter area is responsible for some fifteen times as much expenditure as the former. Educationally speaking, therefore, the areas can scarcely be termed homogeneous.

Columns 3, 4 and 5 in Table 9.1 lead on to the calculations given in column 6, showing estimated annual teachers' salaries and this gives some indication of the disparity of educational provision, Oredo having teachers who, on average, are easily the most highly paid in the State; they earn apiece approaching three times as much as those in Orhionmwon and more than twice as much each as those in five other areas. The disparity between the single urban area and the 18 rural areas becomes clear if we note that on average teachers in Oredo earn well over half as much again as those in the next nearest area, which is Warri and which itself contains the second largest town in the State. The national salary scales for the public service, including teachers, are subdivided into 17 levels with between 3 and 7 steps in each. For teachers initial appointments (and subsequent promotions), depend crucially on educational qualifications and thereafter they progress step by step each year up to the maximum for whichever level they are on. Thus Oredo has a far more highly qualified and/or experienced teaching force than any of the other areas and the implications for the level of educational achievement by their pupils are obvious. At the other extreme, in Orhionmwon, the great majority of primary school teachers must be unqualified.

Column 9, showing annual teachers' salaries per pupil, might be expected to give results similar to those discussed above but

TABLE 9.1 : PRIMARY SCHOOLS - BENDEL STATE, NIGERIA, BY LOCAL GOVERNMENT AREAS

1	2	3	4	5	6	7	8	9	10	11	12	13
Local Govt. Area	Chief Town	Total Monthly Salaries to Teachers (N)	Teachers Salaries for Nominal Year (Col.3X12) (N)	Number of Teachers	Av. Ann. Teachers Salaries (Col.4/ Co.5) (N)	Estimated Ann. Recurrent Expend.(= Col.4X100/ 97.4) (N)	Number of Pupils Enrolled 1977/78	Ann. Teach. Salaries per pupil(= Col.4/ Col.8) (N)	No. of Schools	Est. Recurrent Expend. per pupil (N)	Pupil/ Teacher Ratio (=Col.8/ Col.5)	No. of Pupils per Schoo
Agbazilo	Ubiaja	170,786	2,049,432	1,316	1,557.3	2,104,139	42,094	48.7	84	49.9	31.9	501
Akoko-Edo	Igarra	116,962	1,403,544	878	1,598.6	1,441,010	25,686	54.6	53	56.1	29.3	485
Aniocha	O/Uku	181,783	2,181,396	1,818	1,199.9	2,239,626	37,508	58.2	77	59.7	20.6	487
Bomadi	Bomadi	28,915	346,980	271	1,280.4	356,242	6,754	51.4	21	52.7	24.9	322
Burutu	Burutu	44,185	530,220	343	1,545.8	544,374	12,293	43.1	42	44.3	35.8	293
Ethiope	Ororekpe	215,844	2,590,128	1,832	1,413.8	2,659,269	55,414	46.7	128	48.0	30.2	433
Etsako	Auchi	153,007	1,836,084	1,291	1,422.2	1,885,096	45,201	40.6	92	41.7	35.0	491
Ika	Agbor	224,748	2,696,976	1,783	1,512.6	2,768,969	53,687	50.2	93	51.6	30.1	577
Isoko	Oleh	158,257	1,899,084	1,780	1,066.9	1,949,778	31,951	59.4	54	61.0	17.9	592
Ndokwa	Kwale	213,850	2,566,200	1,924	1,333.8	2,634,702	52,311	49.1	107	50.4	27.2	489
Okpe	Sapele	92,657	1,111,884	687	1,618.5	1,141,565	24,099	46.1	34	47.4	35.1	709
Okpebho	Ekpoma	185,097	2,221,164	1,407	1,578.7	2,280,456	44,573	49.8	100	51.2	31.7	446
Oredo	Benin	427,713	5,132,556	1,929	2,660.7	5,269,565	96,028	53.4	108	54.9	49.8	889
Orhionmwon	Abudu	137,870	1,654,440	1,672	989.5	1,698,603	47,475	34.8	163	35.8	28.4	291
Oshimili	Asaba	91,440	1,097,280	650	1,688.1	1,126,570	20,473	53.6	40	55.0	31.5	512
Ovia	Iguobazuwa	158,211	1,898,532	1,652	1,149.2	1,949,211	37,408	50.7	136	52.1	22.6	275
Owan	Afuze	108,190	1,298,280	1,072	1,211.1	1,332,936	25,707	50.5	66	51.8	24.0	390
Ughelli	Ughelli	170,800	2,049,600	1,465	1,399.0	2,104,312	46,839	43.7	107	44.9	32.0	438
Warri	Warri	130,233	1,562,796	920	1,698.7	1,604,513	37,883	41.2	90	42.3	41.2	421
Total		3,010,548	36,126,576	24,690	1,463.2	37,090,940	743,374	48.6	1,595	49.9	30.1	466

NOTES:
1. Some of the totals shown may not correspond exactly to the sum of the items in the columns in question, due to rounding.
2. The figures for the Oredo area include one H.M. Institute and those for Owan include one College of Physical Education. No separate details were available for either.
3. The monthly teachers salaries shown in Column 3 relate to Feb. 1978, the samedate as the figures for column 5.
4. The figures in column 4 obviously correspond neither to any one financial year nor to the calendar year and in some ways are therefore unsatisfactory. They are the closest indication of annual salary totals that could be obtained.
5. Figures in column 5 compiled from Feb. 1978 salary vouchers; they therefore ignore fluctuations during the year but reflect the position near the end of the financial year.
6. Separate figures for the 7 months period Sept. 1976 to March 1977 showed Teachers' salaries paid as 17,678,862 and other bills paid (for school materials, textbooks, etc.) as 466,557, i.e. teachers' salaries = 97.4% of recurrent expenditure. This percentage seems high, is for an earlier period, and we cannot be sure that all items of recurrent expenditure are included, (for example, there is no specific reference of salaries of non-teaching personnel although these tend to be quite rare in primary schools), but this was the only estimate available and has therefore been used in compiling column 7. Some degree of approximation obviously needs to be allowed for.
7. Separate figures for the period April 1977 to March 1978 showed that of the total expenditure of 38,615,116, the State Ministry of Education recovered 38,553,662 from the Federal Government. On this basis 99.8% of the expenditure was met by the Federal Government, Bendel State having to fund the remaining 0.2%.
8. The figures indicated in Notes 5 and 6 suggest that over time primary school expenditure was rising as follows:

	Teachers Salaries	Other Recurrent Expenditure	Total
Sept. 77 to March 78	24,413,346*	671,205**	25,084,551
Sept. 76 to March 77	17,678,862	466,557	18,145,419
Increase	6,734,484	204,648	6,939,132
As %	38%	44%	38%

These figures may be compared with those for secondary schools given in Table 9.4

* From month-by-month figures which were available.
** Assuming that all the year's allowance on books, materials, etc., is used up during these seven months, which I was assured is the case.

in fact we find that Oredo has no overwhelming superiority and ranks only fifth; the reason for this is to be found in column 11 which shows that Oredo has a very inferior pupil-teacher ratio, much the worst in the State. Any visitor to primary schools in Benin City must be struck by the fact that, despite all having double shifts (which are much less common in all other areas), nearly every teaching room in every school appears uncomfortably overfilled with very large numbers of children, as if the existing school buildings are quite inadequate to cope with the advent of Universal Primary Education. Whether the cause for this state of affairs lies in a higher take-up rate for primary schooling in Benin City than elsewhere, or in continued drift of population from rural to urban areas, or in higher birth rates or lower child mortality rates in the town, or some combination of all these we have no way of knowing. It does, however, seem clear that the inferior pupil-teacher ratio results from the lack of rooms: no more teachers can be employed if there are no rooms for them to teach in. Currently the situation is almost certainly continuing to deteriorate, as U.P.E. classes move up through the schools and as new school buildings are erected only extremely slowly. Short of some quite drastic solution, such as introducing treble shifts in schools (which would, of course, be extremely expensive), it is difficult to see how the situation can be improved in the short term. All other areas have far more advantageous pupil-teacher ratios: apart from Warri (41.2), none other reaches 36 and the low of 17.9 in Isoko (a remote area with no large towns, in the extreme south-east of the State) is quite remarkable. In these areas, of course, the much more favourable pupil-teacher ratios have to be offset against the much less well qualified and less experienced teachers noted previously.

TABLE 9.2 : SECONDARY SCHOOLS - BENDEL STATE, NIGERIA, BY LOCAL GOVERNMENT AREAS, Financial Year 1977/78 (Sums actually paid)

1	2	3	4	5	6	7	8	9	10	11	12	13
Local Govt. Area	Chief Town	Personal Emoluments (N)	Other Charges (N)	Leave Transport Grant (N)	Total (=Cols.3+4+5) (N)	No. of Staff	Av.Ann. Salary per Staff (=Col6/ Col.7) (N)	No. of Pupils	No. of Schools	Staff Salaries per Pupil (= Col.6/ Col.9) (N)	Pupil/ Staff ratio (=Col.9/ Col.7)	No. of Pupils per School (=Col.9/ Col. 10)
	State Board											
	Benin City Tech. Div. S.B.E. (= Technical Colleges)	673,750	673,110	15,820	1,362,680	298	4,573					
		902,220	-	39,000	941,220	481	1,957					
Agbazilo	Ubiaja	569,940	55,860	39,510	665,310	298	2,233	3,455	7	192.6	11.6	493.6
Akoko-edo	Igarra	484,120	63,620	34,120	581,860	263	2,212	3,445	6	168.9	13.1	574.2
Aniocha	Ogwashi-Uku	993,680	61,600	66,450	1,121,730	572	1,961	7,212	9	155.5	12.6	801.3
Bomadi	Bomadi	201,220	46,000	13,470	260,690	150	1,738	1,870	3	139.4	12.5	623.3
Burutu	Burutu	174,650	48,000	12,570	235,220	121	1,944	2,152	5	109.3	17.8	430.4
Ethiope	Orerekpe	1,185,920	63,050	80,820	1,329,790	644	2,065	7,757	15	171.4	12.0	517.1
Etsako	Auchi	810,720	65,750	58,370	834,840	432	1,932	4,683	8	178.3	10.8	585.4
Ika	Agbor	986,170	74,000	65,550	1,125,720	490	2,297	5,637	10	199.7	11.5	563.7
Isoko	Oleh	746,830	44,900	52,080	843,810	439	1,922	5,102	9	165.4	11.6	566.8
Ndokwa	Kwale	945,810	77,750	66,450	1,090,010	604	1,805	6,766	11	161.1	11.2	615.1
Okpe	Sapele	795,180	52,000	56,570	903,750	360	2,510	5,487	8	164.7	15.2	685.9
Okpebho	Ekpoma	470,500	61,700	34,120	566,320	263	2,153	3,560	7	159.1	13.5	508.6
Oredo	Benin City	2,910,410	79,100	260,420	3,249,930	1,426	2,279	11,846	14	274.3	8.3	846.1
Orhionmwon	Abudu	843,190	69,500	56,570	969,260	508	1,908	8,107	11	119.6	16.0	737.0
Oshimili	Asaba	816,140	57,100	58,370	931,610	432	2,157	7,097	9	131.3	16.4	788.5
Ovia	Iguobazuwa	696,320	50,000	44,000	790,320	454	1,741	5,637	8	140.2	12.4	704.6
Owan	Afuze	580,080	75,000	36,820	691,900	332	2,084	4,720	7	146.6	14.2	674.3
Ughelli	Ughelli	1,253,670	65,000	89,800	1,408,470	770	1,829	8,047	13	175.0	10.4	619.0
Warri	Warri	609,600	50,400	43,100	703,100	337	2,086	4,331	7	162.3	12.8	618.7
TOTAL		17,650,120	1,833,440	1,223,980	20,707,540	9,674	2,141	106,911	167	193.7	11.0	640.2
					TOTALS excluding first two lines							
					18,403,640	8,895	2,069			172.1	12.0	

NOTES:

1. Re. column 3, these figures are believed to include both teachers and other school staff. No breakdown between the two categories was possible.
2. Re. column 4, "Other Charges" relates to additions to staff salaries. Therefore, total salaries under all heads are as shown in column 6.
3. Re. column 7, the figure shown for each Area is the monthly average for the whole financial year.

Column 11 is largely self-explanatory and follows directly from column 9; column 13 gives an indication of size of school and shows that Oredo contains some extremely large primary schools, whereas those in Orhionmwon are typically quite small. Oredo's average number of pupils, 889, has to be contrasted with the fact that only one other area, Okpe, a smaller area centering on the town of Sapele, has a figure in excess of 600. Further, it must be stressed that in Oredo the morning shift of pupils and the afternoon shift of pupils are treated in all respects as two distinct schools, with separate staff, etc., even though they use the same buildings. Thus some school buildings in Oredo house around 2,000 children in the course of a day. This is in contrast to the other areas where usually both morning and afternoon shifts, if they exist at all, are regarded as a single school under one head teacher, although obviously with two sets of staff.

3. SECONDARY SCHOOLS

Table 9.2 relates to secondary schools and is partly on similar lines to Table 9.1. Total income to all staff including teachers in secondary schools is given in column 6 (the sum of columns 3, 4 and 5) and from this and columns 7 and 10 we find disparities in size of system similar to those noted from Table 9.1. Thus whereas Bomadi has only 3 secondary schools, 1870 pupils, and is responsible for paying only £235,220 in teachers salaries, Oredo has 14 schools with 11,846 pupils and disburses nigh on £3,250,000, i.e. 13 times as much. We see immediately that secondary schooling is much less developed throughout the State than primary schooling, the State overall having only 167 secondary schools to compare with its 1,595 primary schools. From column 8 it is apparent that average salaries per member of

staff in secondary schools varied relatively much less than did those of teachers in primary schools, the range from the low of 1,738 (Bomadi) to the high of 2,510, being a percentage difference of only some 44%, and this despite: (i) the much smaller numbers of schools in each area, so that the average salary figures would be more subject to random fluctuations, and (ii) the greater range of salary levels to be found among secondary school teachers with at the top some quite highly paid staff. These factors need, however, to be offset against (a) the fact that non-teachers are included in the figures in Table 9.3 and their salaries are standard throughout the State (this point also makes meaningful analysis of the figures more difficult); (b) that secondary schools employ fewer unqualified teachers than primary schools; and (c) that the great majority of secondary school teachers are to be found within salary levels 5 to 8, i.e. reasonably close together. Oredo's outstanding supremacy in respect of primary school salaries is not repeated for secondary schools: with an average of 2,279 it ranks only third and its figure is very close to those for many other areas. Overall secondary school staff (including teachers) on average receive about one third as much again as do primary school teachers, so that the differential between primary teachers and secondary teachers must be even greater than this. A final comment relates to the officials in the State Board of Education who are shown to receive salaries some two-and-a-half times those paid on average to secondary school teachers or three times those paid to primary school teachers.

From column 11, we see that once staff salaries are expressed per pupil, the supremacy of the Oredo area does reassert itself in that its figure is some two-and-a-half times that for Orhionmwon (the lowest), 60% above the average for all areas, and 37% over

the second ranking area, Ika. From column 12 it is apparent that the major cause lies in the variations in the pupil/teacher ratio, Oredo having a ratio which is much the most favourable in the whole State, some 50% better than the state average, more than twice as favourable as that in Burutu and approximately twice as favourable as those in Oshimili and Orhionmwon and over 25% better than the second ranking area, Ughelli. Thus the situation in primary schools, where Oredo's very high salaries per teacher were not reflected in high costs per pupil because of its very poor pupil-teacher ratio, is almost the mirror image of that in secondary schools where in spite of having staff whose average pay is not exceptionally high, Oredo does have very high staff salaries per pupil on account of its extremely favourable pupil-teacher ratio.

As with primary, Oredo has on average the largest secondary schools, as is seen in column 13, although here again the differentials are less marked. On average secondary schools in the State, as measured by number of pupils, are nearly half as large again as primary schools. With only 167 schools, and with a secondary school population only one-seventh of the size of the primary school population, there is clearly a great deal of room for the future development of secondary education in the state.

The major defects with the expenditure figures given in Table 9.2 are, of course, that (i) they include both teachers and other staff salaries, and (ii) they exclude other recurrent expenditure such as cost of materials (paper, pens, chalk, books, etc.) purchases, or boarding costs. This point will be referred to below in connection with Table 9.5.

4. NEW SCHOOLS (SECONDARY)

Table 9.3 gives certain figures for new secondary schools, on a school-by-school basis and to some extent indicates the extent of

TABLE 9.3: SECONDARY SCHOOLS - BENDEL STATE, NIGERIA - Personal Emoluments Paid to New Schools, October 1977 to March 1978

1	2	3	4	5
School Number	(For March 1978)			
	No. of Staff	Monthly Total	Annual Total (=Col. 4 x 12)	Av.Ann. Salary per staff (=Col.5/ Col.3)
1	12	1,660	19,920	1,660
2	17	1,940	23,280	1,369
3	7	440	5,280	754
4	28	3,310	39,720	1,418
5	19	1,510	18,120	954
6	17	2,410	28,920	1,701
7	18	1,590	19,080	1,060
8	13	1,520	18,240	1,403
9	19	1,820	21,840	1,149
10	14	2,860	34,320	2,451
11	16	2,330	27,960	1,748
12	-	-		
13	21	2,350	28,200	1,343
14	14	2,160	25,920	1,851
15	9	1,310	15,720	1,747
16	14	1,050	12,600	900
17	19	2,080	24,960	1,314
18	18	1,770	21,240	1,180
19	14	1,900	22,800	1,628
20	16	2,530	30,360	1,897
21	17	1,610	19,320	1,136
22	9	1,770	21,240	2,360
23	18	2,020	24,240	1,347
24	18	2,510	30,120	1,673
25	17	2,520	30,240	1,779
TOTAL	384	46,970	563,640	1,468

NOTES:

1. The figures for March, 1978, have been extracted because (i) these represent the fullest expansion to the end-of-financial-year position, and, (ii) these provide the most useful indicators for future planning. The monthly figures over October 1977 to February 1978 were also available: these showed a gradual build up towards the March 1978 figures.
2. The last 5 institutions shown, being Technical Colleges, would be expected to show salary levels different from those applying in secondary schools.
3. Re. column 5 the same caveats apply to this method of arriving at an annual total as were indicated in Table 9.1, Note 4.
4. The figures include both teaching and non-teaching staff, no division between these two categories being possible.

development by the end of the 1977/78 financial year of those schools newly established during that financial year. Thus we see that 25 new schools were established, an increase of some 18% on the previous 142 schools;

none of the new schools was established in Benin City.

We also see that the staff in these new schools were on average paid markedly less than the average shown in Table 9.2. However, such comparisons are unlikely to be very fruitful since:

(i) once again we have no distinction between teachers and non-teachers,

and

(ii) new schools would be expected at least partly to recruit young teachers at generally lower salaries than established teachers.

Nor are school-by-school comparisons likely to be very fruitful since the schools are at various stages of development. One I visited was evidently lacking many basic facilities.

On balance, therefore, the usefulness of Table 9.3 is rather limited.

5. RATE OF EXPANSION (SECONDARY)

Table 9.4 shows again for all staff (both teachers and non-teachers) in secondary schools the rate of expansion, in terms of both number of staff and total pay, over the period May 1977 to May 1978. Its usefulness must depend on assumptions that the same rate of growth will continue, and perhaps even increase, over future time periods. On that basis any school system which expands its labour force, including teachers, by 13% per year will grow steadily if the requisite new buildings are also provided but it seems at least possible that an even greater rate of growth will be needed to cope with the rapid expansion of secondary schooling predicted from 1982 onwards. Detailed area-by-area comparisons would be misleading because of the way many pupils,

TABLE 9.4 SECONDARY SCHOOLS - BENDEL STATE, NIGERIA - SALARY INCREASES, 1977 to 1978

← Increase over 12 months period →

LOCAL GOVT. AREAS (areas same order as before)	@ May 1978		@ May 1977		% increase in Total Pay	% Increase in staff
	Total pay for month (incl. Other Charges)	No. of Staff	Total Pay	No. of Staff		
State Board	75,444	348	52,120	270	45	29
Techn. Colleges (=S.B.E.)	86,060	578	69,990	472	23	22
Agbazilo	57,910	362	55,220	294	5	23
Akoko-Edo	56,320	347	38,780	268	45	29
Aniocha	96,930	637	82,020	526	18	21
Bomadi	19,460	145	16,050	148	21	- 2
Burutu	19,990	155	12,020	101	66	53
Ethiope	117,560	713	92,300	593	27	20
Etsako	78,460	491	73,200	455	7	8
Ika	59,950	519	53,260	407	13	28
Isoko	77,770	515	57,440	415	35	24
Ndokwa	68,690	398	65,400	550	5	-27
Okpe	73,758	402	61,860	362	19	11
Okpebho	48,310	344	37,630	207	28	66
Oredo	256,368	1,511	233,830	1,355	10	11
Orhionmwon	84,120	566	69,560	517	21	9
Oshimili	81,590	484	79,080	412	3	17
Ovia	68,700	473	56,640	457	21	4
Owan	57,210	382	42,690	338	34	13
Ughelli	110,950	678	103,890	709	7	- 4
Warri	63,750	379	58,270	366	9	4
TOTAL	1,659,300	10,427	1,411,250	9,222	18	13

perhaps a majority, go to secondary schools outside their own areas, as mentioned previously. The accuracy of some of the figures must also be open to question or at least to require further investigation: for example, it is not easy to see how the number of school staff in the Ndokwa area can have declined by 27% during the course of the twelve-month period.

The financial implications of salaries continuing to grow at 18% per year are obvious.

6. EDUCATIONAL EXPENDITURE PER POPULATION

Finally, Table 9.5 expresses the expenditure statistics used in Tables 9.1 and 9.2 in relation to the latest population estimates for the areas. From other sources it is known that in secondary schools teachers' salaries comprise some 70% of total recurrent costs. Therefore, column 5 shows $(\frac{100}{70})$X teachers' salaries and column 6 gives estimates of total recurrent educational expenditure. It is clear that known educational expenditure per head of population is quite low, averaging less than ₦ 20 per year. Oredo's high of ₦40is over seven times the figure for Bomadi and is over 60% higher than the figure for the second ranking area, Aniocha. The differentials are of approximately the same relative order of magnitude for each of primary and secondary considered separately: for each, expenditure per head of population in Oredo is over twice the average for the whole State, whilst for each Bomadi ranks 19th out of the 19 States.

All the figures in question will have to rise substantially over the next few years if the hoped-for expansion of the education system is to take place.

7. CONCLUSIONS

This case study did not commence from any theoretical or ideal basis. It set out to examine certain statistics which happened to become available, to see how useful these might be. A number of

TABLE 9.5: BENDEL STATE, NIGERIA - School Expenditure per head of population

Local Govt. Area	Estimated Population (1977)	Est. Recurrent Expend. for Primary Schools per Population	100 of 70 Salaries for Sec. Schools per Population	Est. All known school Expend. per Pop. (=Col. 4 and Col. 5)
Agbazilo	195,391	10.8	4.86	15.66
Akoko-Edo	159,200	9.0	5.22	14.22
Aniocha	149,033	15.0	10.75	25.75
Bomadi	127,881	2.8	2.91	5.71
Burutu	107,904	5.0	3.11	8.11
Ethiope	336,081	7.9	5.65	13.55
Etsako	191,766	9.8	6.22	16.02
Ika	206,657	13.4	7.78	21.18
Isoko	190,378	10.2	6.33	16.53
Ndokwa	242,493	10.9	6.42	17.32
Okpe	154,067	7.4	8.38	15.78
Okpebho	189,038	12.1	4.28	16.38
Oredo	243,280	21.7	19.08	40.78
Orhionmwon	251,767	6.7	5.50	12.20
Oshimili	122,071	9.2	10.90	20.10
Ovia	174,901	11.1	6.46	17.56
Owan	128,932	10.3	7.67	17.97
Ughelli	243,939	8.6	8.25	16.85
Warri	235,851	6.8	4.26	11.06
TOTAL	3,650,630	10.2	8.10	18.30
		If 1st 2 lines of Tab.9.2 excluded		
			7.20	17.40

apparently interesting conclusions emerged but in many cases these were seen to require further clarification and/or elucidation. Overall, Tables 9.1 and 9.2 proved very much more useful and interesting than Tables 9.3, 9.4 and 9.5. Educationally speaking, marked disparities were found between the one urban area and the rural areas. The education system in Bendel State is clearly expanding and changing rapidly at the present time and it is evident that large increases in expenditure will be required each year for the foreseeable future. This will impose a considerable financial strain on Nigeria in its present state of economic and political development. Even so, inequalities, such as those considered in this case study, are likely to persist. The authorities will clearly have to keep under review such questions as how to attract teachers (and especially better-qualified teachers) to rural areas, the implications of the continued drift of population into towns, and the connection between the development of education and the provision of other basic facilities.

CASE STUDY 2 : COST AND OTHER STATISTICS FOR SCHOOLS IN BENDEL AND OGUN STATES OF NIGERIA

The statistics discussed in this case study were collected in the Bendel and Ogun States of Nigeria in May 1979 and relate to selected primary and secondary schools in each State for the 1978/79 school year. The information has been extracted from detailed questionnaires completed by the head teachers and members of the teaching staff of each school, supplemented by visits to many of the schools. Many of the schools did not keep records of

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I alone remain responsible for any errors or omissions.

financial expenditure on any standard or systematic basis and in some cases adjustments had to be made to the figures to ensure that the comparisons were made on as standardised a basis as possible. Where particular difficulties exist in connection with certain of the figures these will be discussed in more detail below. All of the figures relate to recurrent expenditure, no statistics relating to capital expenditure being available.

PRIMARY SCHOOLS

Tables 9.6, 9.7 and 9.8 relate to primary schools in the three areas. Table 9.6 gives basic indicators showing size of school and of expenditure, from which it is apparent that the schools vary widely, from No. 30 with, in column 3, only 38 pupils, to No. 19 with some fifty times as many. On average schools in the Oredo area are clearly larger than those in the other three areas. Some schools apparently have more classes than teachers and others more teachers than classes. Column 6, giving average salary per teacher, shows in some cases rather small variations from school to school but it is apparent that school No. 19 has an exceptionally well-qualified and far more experienced teaching staff, backed up by more non-teaching staff than any other school (their salaries account for most of the exceptionally large figure of ₦ 29,100 in column 7); small wonder that this school, a private institution, has high prestige and long waiting lists. As the footnote to the table indicates, particular caution is needed in connection with column 7 since few of the schools kept accurate records of such items of expenditure as purchases of materials and supplies or repairs and maintenance, whilst expenditure on non-teaching staff salaries varied widely, as indicated; such expenditure, as shown, is not large, comprising in total only some 7% of total recurrent expenditure, yet it may serve to distort some inter-school

TABLE 9.6 : PRIMARY SCHOOLS - EXPENDITURE TOTALS.

1	2	3	4	5	6	7	8
School No	No. of classes	Total Enrolment 1978/79	No. of teachers	Total teachers salaries (N)	Average salary per teacher (N) (=Col.5/ Col. 4).	Other expend. (N)	Total expend. (N) (=Col. 5 + Col. 7)
(A) BENDEL STATE, OWAN Local Government Area							
1	25	988	31	54,902	1,771	1,828	56,730
2	17	590	24	44,672	1,861	2,683	47,355
3	16	583	19	31,084	1,636	164	32,248
4	13	423	10	17,070	1,707	205	17,275
5	26	1,005	28	46,045	1,644	125	46,170
6	18	534	20	31,264	1,563	202	31,466
7	10	357	13	22,029	1,695	3,199	25,228
8	17	530	20	33,008	1,650	60	33,068
9	11	351	10	17,224	1,722	60	17,284
10	18	632	18	32,872	1,826	183	33,055
TOTAL	171	5,993	193	330,170	1,711	8,709	338,879
(B) BENDEL STATE, OREDO Local Government Area							
11	32	2,080	32	52,920	1,655	7,522	60,442
12	25	1,123	40	77,122	1,929	5,985	83,107
13	27	1,263	40	75,240	1,881	3,052	78,292
14	28	1,347	44	76,991	1,750	9,822	86,813
TOTAL	112	5,813	156	282,273	1,809	26,381	308,654
(C) OGUN STATE, ABEOKUTA Urban Area							
15	10	328	11	21,502	1,955	56	21,558
16	15	592	17	32,806	1,930	279	33,085
17	20	700	24	43,234	1,801	3,916	47,150
18	16	524	18	33,282	1,849	134	33,416
19	34	1,822	44	117,832	2,678	29,100	146,932
20	20	788	22	37,330	1,697	0	37,330
21	26	852	28	42,530	1,519	0	42,530
22	22	854	24	44,112	1,838	550	44,662
23	12	396	13	23,658	1,820	0	23,658
24	11	470	12	23,629	1,969	0	23,629
TOTAL	186	7,326	213	419,915	1,971	34,035	453,950
(D) OGUN STATE, Rural Area							
25	6	137	5	7,398	1,480	0	7,398
26	6	120	6	8,858	1,476	0	8,858
27	6	147	5	7,674	1,535	304	7,978
28	10	268	11	20,190	1,835	0	20,190
29	6	86	4	6,504	1,626	615	7,119
30	6	38	3	6,294	2,098	0	6,294
31	16	408	16	27,012	1,688	0	27,012
TOTAL	56	1,204	50	83,930	1,679	919	84,849
OVERALL TOTAL	525	20,336	612	1,116,288	1,824	70,044	1,186,332

NOTES:

1. Column 4 includes head teacher.
2. Column 5 includes additional payments such as Leave Transport Grant but excludes imputed rent for free or subsidised housing.
3. Figures in column 7 are usually estimates and are only approximately correct, as the schools kept no precise records. The schools in Owan, and most schools in Abeokuta, had no non-teaching staff whereas the schools in Oredo had 2 or 3 such staff per school.

comparisons.

Table 9.7, giving expenditure ratios for the same schools, shows, in column 2, that total expenditure per pupil varied from the high of ₦ 80.3 for school No. 2 to the low of ₦ 29.1 for school N_o. 11, with the overall average of ₦ 58.3 per pupil. The averages for both the Abeokuta areas were higher than those for either of the two Bendel State areas but on the whole the variations around the overall total of ₦ 58.3 are smaller than might have been anticipated. The typically small schools in the Abeokuta rural area are clearly expensive to run on a per pupil basis. In this connection it is of interest to attempt to assess the effect of possible inaccuracies in column 7 of Table 9.6, discussed above: schools No. 6, 8, 15 and 18, for example, all have expenditure per pupil at a level above the overall average even though, in each case, their entry in column 7 is minimal relative to the figure for teachers' salaries in column 5. With other schools, however, some caution is necessary, particularly so in the case of those schools which recorded "other expenditure" of ₦ 0: these entries must be open to suspicion and if inaccurate would have affected those in column 2 of Table 9.7. The large item of ₦ 29,100 for school No. 19, in contrast, has been discussed above. It is apparent that even if this "other expenditure" of ₦ 29,100 were removed from school No. 19, that school would still have expenditure per pupil at a level close to the overall total and certainly well above that of many other schools. On balance, therefore, we can say that the variations in expenditure per pupil are attributable far more to the (very much larger) teacher's salary element, than to the recorded variations in "other expenditure". Column 2 of Table 9.7 needs to be read in conjunction with both column 6 of Table 9.6, showing average salary per teacher, discussed above, and column 8 of table 9.7, showing pupil/teacher ratio. Thus the

TABLE 9.7 : PRIMARY SCHOOLS - EXPENDITURE RATIOS

1	2	3	4	5	6	7	8
School No.	Total expend. per pupil (N)	Total expend. per class (N)	No. of periods taught	Total expend. per period taught (N)	Average No. of pupils per class	Average expend. per pupil period (N)	Pupil/ teacher ratio (=Col.3/ Col. 4
(A) BENDEL STATE, OWAN Local Government Area							
1	57.4	2,269	39,000	1.45	39.5	0.04	31.9
2	80.3	2,786	26,520	1.79	34.7	0.05	24.6
3	53.6	1,953	24,960	1.25	36.4	0.03	30.7
4	40.8	1,329	20,280	0.85	32.5	0.03	42.3
5	45.9	1,776	40,560	1.14	38.7	0.03	35.9
6	58.9	1,748	28.080	1.12	29.7	0.04	26.7
7	70.7	2,523	15,600	1.62	35.7	0.04	27.5
8	62.4	1,945	26,520	1.25	31.1	0.04	26.5
9	49.2	1,571	17,160	1.01	31.9	0.03	35.1
10	52.3	1,836	28,080	1.18	35.1	0.03	35.1
TOTAL	56.5	1,982	266,760	1.27	35.0	0.04	31.0
(B) BENDEL STATE, OREDO Local Government Area							
11	29.1	1,889	49,920	1.21	65.0	0.02	65.0
12	74.0	3,324	39,000	2.13	44.9	0.05	28.1
13	61.9	2,900	42,120	1.86	46.8	0.04	31.6
14	64.5	3,100	43,680	1.99	48.1	0.04	30.6
TOTAL	53.1	2,756	174,720	1.77	51.9	0.03	37.3
(C) OGUN STATE, ABEOKUTA Urban Area							
15	65.7	2,156	15,600	1.38	32.8	0.04	29.8
16	55.9	2,206	23,400	1.41	39.5	0.04	34.8
17	67.4	2,358	31,200	1.51	35.0	0.04	29.2
18	63.8	2,089	24,960	1.34	32.8	0.04	29.1
19	80.6	4,322	53,040	2.77	53.6	0.05	41.4
20	47.4	1,867	31,200	1.20	39.4	0.03	35.8
21	49.9	1,636	40,560	1.05	32.8	0.03	30.4
22	52.3	2,030	34,320	1.30	38.8	0.03	35.6
23	59.7	1,972	18,720	1.26	33.0	0.04	30.5
24	50.3	2,148	17,160	1.38	42.7	0.03	39.2
TOTAL	62.0	2,441	290,160	1.56	39.4	0.04	34.4
(D) OGUN STATE, Rural Area							
25	54.0	1,233	9,360	0.79	22.8	0.03	27.4
26	73.8	1,476	9,360	0.95	20.0	0.05	20.0
27	54.3	1,330	9,360	0.85	24.5	0.03	29.4
28	75.3	2,019	15,600	1.29	26.8	0.05	24.4
29	82.8	1,187	9,360	0.76	14.3	0.05	21.5
30	165.6	1,049	9,360	0.67	6.3	0.11	12.7
31	66.2	1,688	24,960	1.08	25.5	0.04	24.1
TOTAL	70.5	1,515	87,360	0.97	21.5	0.05	24.1
OVERALL TOTAL	58.3	2,260	819,000	1.45	38.7	0.04	33.2

NOTE: Data collected by me and included in earlier and incomplete draft versions of Tables 9.6 and 9.7 has been used by Dr. H. Pandit in his paper "Case Studies on Unit Costs of Education...", (unpublished).

highest figure of expenditure per pupil, N 80.3 for school No. 2, stems not so much from a highly paid teaching staff (their salary level is in fact close to the overall average) but rather more from the school's exceptionally favourable pupil/teacher ratio. School No. 6 has teachers who on average are paid less than those in most other schools but its favourable pupil/teacher ratio still gives it a level of expenditure per pupil which is above the overall average. Schools Nos. 11 (lowest expenditure per pupil) and 4 (second lowest) on the other hand have both poor pupil/teacher ratios and staff on relatively low salary levels. In other cases the one offsets the other and we may postulate schools in effect making a "choice" between having a larger number of more lowly paid teachers or vice versa.

The remaining columns in Table 9.7 are self-explanatory and partly follow on from the previous remarks. Columns 3 and 5 give variations relatively rather wider than those in column 2, the figures for school No. 19, for example, being over three times those for school No. 4. The remainder of the figures in Table 9.7 are largely self-explanatory; there is obviously room for discussion as to the usefulness of column 7 since the variations, expressed to two decimal places, appear small. The wide variations in pupil/teacher ratios recorded in column 8 can be left to speak for themselves save that it is not without interest that the most highly urbanised area, Oredo, has overall the worst pupil/teacher ratio heavily influenced by one exceptionally overcrowsed school, school No. 11. To a visitor to Oredo primary schools it would appear that the immediate problem is not so much lack of teachers as lack of classrooms. Despite using all rooms for two shifts per day many more are still needed to cope with the influx of pupils over the last two years since the introduction of universal primary education; additional teachers cannot be employed if there are no rooms for them to teach in. Similarly

it is of interest that the two rural areas have the most favourable pupil/teacher ratios, the reason for this obviously lying in the small class sizes in those schools.

Table 9.8 shows educational qualifications and other details relating to the teaching staff in the small primary schools. For both the Owan and Oredo areas it is apparent that all the schools have a young teaching staff with a high degree of mobility, the average length of service in the school being around 3 years. (Such details were not available for Abeokuta schools.) Columns 6 and 7 relate to teachers who have never progressed beyond basic school leaving examinations, columns 10 and 11 relate to those who have attempted the normal teaching training qualification but failed (CTR = Certificate of Teaching Referred) and columns 12 and 13 relate to those awaiting the result ("A/R") of such an attempt. Thus the total of those who are not yet qualified to teach = 133 (22%) + 66 (11%) + 32 (5%), i.e., nearly 40 per cent of all teachers. A further 1% of the staff have only attained TC3, the lowest level of teaching certificate. At the other end of the scale 46 staff, or 8% of the total, had progressed to some form of higher studies in education usually the Advanced Certificate of Education (ACE) and nearly all of these were head teachers or deputy head teachers. It would seem that any teacher obtaining such a qualification thereafter has a high probability of being promoted to that level. It would be interesting to know whether the ratio of unqualified to qualified teachers is improving or worsening year by year but regrettably this information was not available. These details of teacher qualifications need to be read in conjunction with the figures given in Table 9.6. Thus a high percentage of unqualified staff, as in school No. 6, must at least partly explain the very low salary per teacher in that school; on the other hand this school has an extremely favourable pupil/teacher ratio.

TABLE 9.8 : PRIMARY SCHOOLS - TEACHERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
School No.	Pupil/ Teacher Ratio	No. of Teachers	Average Age (Years)	Average length of service in the School(yrs)	← Qualifications → Below TC3 WASC/SLC)	(=HSc/	TC3		TC2CTR		TC2A/R		TC2		Above TC2) (=TC1/ACE)	
					No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
(A) BENDEL STATE, OWAN Local Government Area																
1	31.9	31	32.5	2.2	11	35	0	0	2	6	2	6	14	45	2	6
2	24.6	24	29.1	2.2	5	21	1	4	2	8	0	0	15	63	1	4
3	30.7	19	29.8	1.8	6	32	1	5	4	21	1	5	6	32	1	5
4	42.3	10	29.2	2.0	4	40	1	10	0	0	1	10	4	40	0	0
5	35.9	28	32.2	2.2	4	14	0	0	7	25	4	14	11	39	2	7
6	26.7	20	26.3	2.3	10	50	0	0	2	10	1	5	6	30	1	5
7	27.5	13	32.0	2.7	5	38	0	0	2	15	0	0	5	38	1	8
8	26.5	20	39.3	3.4	9	45	0	0	0	0	3	15	6	30	2	10
9	35.1	10	30.4	3.1	4	40	0	0	1	10	0	0	5	50	0	0
10	35.1	18	32.9	2.7	6	33	0	0	2	11	1	6	7	39	2	11
TOTAL	31.0	193	31.5	2.4	64	33	3	2	22	11	13	7	79	41	12	6
(B) BENDEL STATE, OREDO Local Government Area																
11	65.0	32	36.8	4.2	3	9	0	0	1	4	0	0	22	69	1	3
12	28.1	40	34.0	3.8	1	3	1	3	4	10	1	3	25	62	8	20
13	31.6	40	29.2	3.0	4	10	1	3	8	20	0	0	16	40	5	13
14	30.6	38	-	-	4	11	0	0	6	6	16	0	23	61	5	13
TOTAL	37.3	150	-	-	12	8	2	1	19	13	1	1	86	57	19	13
(C) OGUN STATE, ABEOKUTA Urban Area																
15	29.8	11	-	-	1	9	0	0	1	9	1	9	6	55	2	18
16	34.8	17	-	-	2	12	0	0	4	24	0	0	11	65	0	0
17	29.2	24	-	-	7	29	0	0	3	13	3	13	9	38	2	8
18	29.1	18	-	-	3	17	0	0	3	17	0	0	11	61	1	6
19	41.4	44	-	-	5	11	2	5	0	0	0	0	33	75	4	9
20	35.8	22	-	-	6	27	0	0	3	14	2	9	9	41	2	9
21	30.4	28	-	-	10	36	0	0	0	0	3	11	13	46	2	7
22	35.6	23	-	-	2	9	0	0	3	13	3	13	14	61	1	4
23	30.5	13	-	-	2	15	0	0	1	8	1	8	8	62	1	8
24	39.2	12	-	-	1	8	0	0	2	17	0	0	9	75	0	0
TOTAL	34.4	212	-	-	39	18	2	1	20	9	13	6	123	58	15	7
(D) OGUN STATE, Rural Area																
25	27.4	5	-	-	4	80	0	0	0	0	0	0	1	20	0	0
26	20.0	6	-	-	3	50	0	0	0	0	1	17	2	33	0	0
27	29.4	5	-	-	3	60	0	0	1	20	0	0	1	20	0	0
28	24.4	11	-	-	3	27	1	9	1	9	0	0	6	55	0	0
29	21.5	4	-	-	1	25	0	0	0	0	2	50	1	25	0	0
30	12.7	3	-	-	0	0	0	0	0	0	1	33	2	67	0	0
31	25.5	16	-	-	4	25	0	0	3	19	1	6	8	50	0	0
TOTAL	24.1	50	-	-	18	36	1	2	5	10	5	10	21	42	0	0
OVERALL TOTAL	33.2	605	-	-	133	22	8	1	66	11	32	5	309	51	46	8

NOTE: For column 5, part years were counted as whole years for ease of computation, therefore, the figures somewhat overstate the actual length of service in the school.

All this is in marked contrast to the situation of school No. 11.

Tables 9.9, 9.10 and 9.11 relate to secondary schools and are partly on the same lines as the tables for primary schools discussed above; a notable difference, however, related to the fact that secondary schools have a substantial boarding component which inevitably has a considerable effect on the pattern of expenditure. Table 9.9 presents totals for expenditure and other items whereas Table 9.10 differentiates between educational expenditure ratios and boarding expenditure ratios. A comparison of column 3 of Table 9.6 and column 10 of Table 9.7 indicates that the proportion of boarders in each school varies considerably: schools Nos. 15 and 18 are entirely for day pupils, school No. 2 has some 40% boarders whereas school No. 7 is around 90% boarding. As the totals at the foot of columns 8, 9 and 10 of Table 9.6 indicate, around 40% of all expenditure relates to boarding and this will lead to significant variations in expenditure patterns in the schools. In some schools, Nos. 1, 2 and 11, boarding expenditure actually exceeded educational expenditure. In this connection the footnote to Table 9.9 needs to be emphasised. As far as could be ascertained, the recent expansion of secondary schools has taken place largely via taking in extra day pupils, the number of boarding places remaining more or less constant and thus gradually declining in percentage terms. The basic components of boarding expenditure are recovered from parents via fees and the implications of expanding secondary education on the day side are obvious not only in the much cheaper provision of such school places but also on the inclination of parents to take up secondary school places if, being day places, these incur no fees.

TABLE 9.9 : SECONDARY SCHOOLS - EXPENDITURE TOTALS

1	2	3	4	5	6	7	8	9	10
School No.	No. of classes	Total Enrol. 1978/9	No. of teachers	Total teachers salaries (N)	Average Salary per teacher (N)	Other Educ. Expend. (N)	Total Educ. Expend. (N)	Boarding Expend. (N)	Total all Expend. (N)
(A) BENDEL STATE, OWAN Local Government Area									
1	6	252	9	20,824	2,314	10,306	31,130	47,508	78,638
2	20	1,076	32	73,008	2,282	23,183	96,191	107,508	203,699
3	12	564	20	61,000	3,050	27,597	88,597	73,680	162,277
4	20	837	29	79,768	2,751	39,321	119,089	80,300	199,389
5	18	679	20	56,413	2,821	22,782	79,195	71,903	151,098
TOTAL	76	3,408	110	291,013	2,646	123,189	414,202	380,899	795,101
(B) BENDEL STATE, OREDO Local Government Area									
6	15	695	41	161,322	3,841	41,785	203,107	100,532	303,639
7	28	1,045	60	215,447	3,591	183,875	399,322	221,308	620,630
8	15	624	30	117,099	3,903	90,497	207,596	73,548	281,144
9	23	922	46	188,329	4,094	56,281	244,610	178,019	422,629
10	20	1,000	38	112,656	2,965	41,579	154,235	98,921	253,156
11	20	767	32	100,748	3,148	32,889	133,637	140,577	274,214
12	25	1,314	45	178,785	3,973	41,762	220,547	81,627	302,174
TOTAL	146	6,513	292	1,074,386	3,678	488,668	1,563,054	894,532	2,457,586
(C) OGUN STATE, ABEOKUTA Urban Area									
13	13	507	16	41,654	2,603	19,739	61,393	50,385	111,778
14	13	479	20	59,894	2,995	13,809	73,703	28,035	101,738
15	15	611	15	53,640	3,576	9,326	62,966	0	62,966
16	29	1,147	35	182,043	5,201	20,837	202,880	28,569	231,449
17	21	932	23	93,030	4,045	23,050	116,080	30,973	147,053
18	13	586	19	35,359	1,861	18,024	53,383	0	53,383
** 19	20	979	33	101,082	3,063	38,116	139,198	77,848	217,046
20	16	742	25	89,520	3,581	28,436	117,956	41,622	159,578
21	12	578	20	42,014	2,101	19,580	61,594	0	61,594
22	16	536	24	79,022	3,293	35,637	114,659	48,242	162,901
TOTAL	168	7,097	230	777,258	3,379	226,554	1,003,812	305,674	1,309,486
(D) OGUN STATE, Rural Area									
* 23	12	547	20	53,114	2,656	12,069	65,183	66,530	131,713
TOTAL	12	547	20	53,114	2,656	12,069	65,183	66,530	131,713
OVERALL TOTAL	1,102	17,565	652	2,195,771	3,368	850,480	3,046,251	1,647,635	4,693,886

NOTES:

1. *Non-teachers' salaries not given.
2. Column 7 includes (i) expenditure on teaching materials, and (ii) 60% of salaries of non-teaching staff. Column 9 includes (i) expenditure on boarding materials and (ii) 40% of salaries of non-teaching staff. Column 7 therefore includes all expenditure that would be incurred in running a day school and is not limited to specific instructional costs. The 60%/40% division of salaries of non-teaching staff is an approximation based on more detailed figures supplied by 3 schools. All teachers' salaries have been included under educational expenditure, even where they devote some time to boarding activities. Boarding expenditure includes feeding costs of around N 0,90 per student per day, which is reimbursed to the school by the parents.
3. ** This school had 10 part-time teachers. In the absence of any further information, these have been counted as the equivalent of 5 part-time teachers.

Table 9.9 shows that, as with primary schools, average salary per teacher is highest in the Abeokuta urban area and this area also contains the widest variations, the figure for school No. 16, for example, being almost treble that for school No. 18. There appears to be a tendency for the largest schools to have the more highly paid staffs, perhaps reflecting the fact that the largest and oldest-established schools would have high reputations and would be able to attract the more experienced and more highly qualified teachers. Table 9.10 shows, in column 2, that educational expenditure per pupil varies by as much as a factor of four, with much higher expenditure levels in the most highly urbanised area, Oredo, at least partly due to its very favourable pupil/teacher ratio, as shown in column 9. Column 3 shows that boarding expenditure per pupil varied relatively very much less, largely because the rate of feeding per pupil per day is fairly standardised. In contrast to the comparable column for primary schools, column 8 of Table 9.10 shows that when educational expenditure is expressed per pupil-period the variations remain wide, the highest exceeding the lowest by more than a factor of four. The positive correlation between column 7, average number of pupils per class, and column 9, pupil/teacher ratio, is obvious but perhaps not as direct as might be thought: for example, school No. 9 has a more favourable pupil/teacher ratio than school No. 11 but has on average more pupils per class. The explanation must lie in the average group size and/or range or optional subjects offered. On the whole the schools with the smallest boarding components have the lowest educational expenditure per pupil in spite of the fact that in such schools 100% of the salaries of non-teaching staff have necessarily been allocated to the educational expenditure heading.

TABLE 9.10 : SECONDARY SCHOOLS - EXPENDITURE RATIOS

1	2	3	4	5	6	7	8	9	10
School No.	Educ. Expend. per pupil (N)	Boarding expend. per boarder (N)	Educ. expend. per class (N)	No. of periods taught per year.	Educ. expend. per period taught (N)	Average no. of pupils per class	Average educ. expend. per pupil period (N)	Pupil/ teacher ratio	No. of boarders
(A) BENDEL STATE, OWAN Local Government Area									
1	123.5	279.5	5,188	9,360	3.33	42.0	0.08	28.0	170
2	89.4	268.8	4,810	31,200	3.08	53.8	0.06	33.6	400
3	157.1	216.1	7,383	18,720	4.73	47.0	0.10	28.2	341
4	142.3	250.9	5,955	31,200	3.82	41.9	0.09	28.9	320
5	116.7	205.4	4,400	28,080	2.82	37.7	0.07	33.9	350
TOTAL	121.5	240.9	5,450	118,560	3.49	44.8	0.08	30.9	1,581
(B) BENDEL STATE, OREDO Local Government Area									
6	292.2	218.5	13,540	23,400	8.70	46.3	0.19	17.0	460
7	382.1	247.0	14,262	43,680	9.14	37.3	0.25	17.4	896
8	332.7	272.4	13,840	23,400	8.87	41.6	0.21	20.8	270
9	265.3	240.6	10,635	35,880	6.82	40.1	0.17	20.0	740
10	154.2	205.7	7,712	31,200	4.94	50.0	0.10	26.3	481
11	174.2	319.5	6,682	31,200	4.28	38.3	0.11	24.0	440
12	167.8	177.5	8,822	39,000	5.65	52.6	0.11	29.2	460
TOTAL	240.0	238.7	10,706	227,760	6.86	44.6	0.15	22.3	3,747
(C) OGUN STATE, ABEOKUTA Urban Area									
13	121.1	314.9	4,723	20,280	3.03	39.0	0.08	31.7	160
14	153.9	257.2	5,669	20,280	3.63	36.8	0.10	24.0	109
15	103.1	0	4,198	23,400	2.69	40.7	0.07	40.7	0
16	176.9	317.4	6,996	45,240	4.48	39.6	0.11	32.8	90
17	124.5	279.0	5,528	32,760	3.54	44.4	0.08	40.5	111
18	91.1	0	4,106	20,280	2.63	45.1	0.06	30.8	0
19	142.2	249.5	6,960	31,200	4.46	49.0	0.09	29.7	312
20	159.0	275.6	7,372	24,960	4.73	46.4	0.10	29.7	151
21	106.6	0	5,133	18,720	3.29	48.2	0.07	28.9	0
22	213.9	227.6	7,166	24,960	4.59	33.5	0.14	22.3	212
TOTAL	141.4	267.0	5,975	262,080	3.83	42.2	0.09	30.9	1,145
(D) OGUN STATE, Rural Area									
*23	119.2	221.8	5,432	18,720	3.48	45.6	0.08	27.4	300
TOTAL	119.2	221.8	5,432	18,720	3.48	45.6	0.08	27.4	300
OVERALL TOTAL	173.4	243.3	7,578	627,120	4.86	43.7	0.11	26.9	6,773

* Non-teachers' salaries not given.

TABLE 9.11 : SECONDARY SCHOOLS - TEACHERS

School No.	Pupil/ Teacher ratio	No. of teachers all/ completed questionn.		Aver. age	Aver. length of service	Below TC3		TC3		TC2 A/R and TC2 CTR		TC2		Above TC2 Non-Grad.		Graduate	
						No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
(A) BENDEL STATE, OWAN Local Government Area																	
1	28.0	9	9	26.1	1.3	2	22	0	0	0	0	3	33	3	33	1	11
2	33.6	32	12	28.2	1.5	6	50	1	8	0	0	4	33	0	0	1	8
3	28.2	20	17	30.9	2.3	5	29	0	0	1	6	2	12	4	23	4	23
4	28.9	29	27	26.8	2.0	9	33	0	0	0	0	3	11	5	19	7	26
5	33.9	20	19	30.4	2.0	8	42	0	0	0	0	3	16	4	21	4	21
TOTAL	30.9	110	84	28.6	1.9	30	36	1	1	1	1	15	18	16	19	17	20
(B) BENDEL STATE, OREDO Local Government Area																	
6	17.0	42	25	32.5	4.1	4	16	0	0	0	0	3	12	5	20	13	52
7	17.4	60	17	31.5	2.1	3	18	1	6	0	0	4	23	1	6	8	47
8	20.8	30	30	32.4	2.9	4	13	1	3	0	0	3	10	12	40	10	33
9	20.0	46	21	32.3	2.7	0	0	0	0	0	0	4	19	2	10	15	71
10	26.3	38	31	28.0	2.0	5	16	0	0	0	0	7	23	5	16	14	45
11	24.0	32	16	35.1	2.6	4	25	0	0	0	0	2	13	3	19	7	44
12	29.2	45	29	38.6	3.8	1	3	0	0	0	0	3	10	14	48	11	38
TOTAL	22.3	293	169	32.8	2.9	21	12	2	1	0	0	26	15	42	25	78	46
(C) OGUN STATE, ABEOKUTA Urban Area																	
13	31.7	16	16	26.6	1.3	5	31	0	0	1	6	3	19	1	6	6	38
14	24.0	20	20	30.5	1.8	3	15	1	5	0	0	3	15	9	45	4	20
15	40.7	15	15	32.3	1.5	4	27	0	0	0	0	2	13	3	20	6	40
16	32.8	35	22	34.3	1.9	2	9	0	0	0	0	1	5	5	23	14	64
17	40.5	23	11	33.6	1.3	1	9	0	0	0	0	1	9	4	36	3	27
18	30.8	19	18	27.6	1.7	8	44	1	6	0	0	7	39	2	11	0	0
19	29.7	33	19	32.2	1.9	3	16	3	16	0	0	1	5	4	21	8	42
20	29.7	25	25	30.6	2.0	2	8	3	12	0	0	1	4	6	24	12	48
21	28.9	20	13	29.8	3.3	0	0	0	0	1	8	8	62	4	31	0	0
22	22.3	24	21	33.6	1.9	3	14	4	19	0	0	3	14	3	14	8	38
TOTAL	30.9	230	180	31.2	1.9	31	17	12	7	2	1	30	17	41	23	61	34
(D) OGUN STATE, Rural Area																	
23	27.4	20	19	28.4	1.1	5	26	3	16	0	0	1	5	2	11	8	42
TOTAL	27.4	20	19	28.4	1.1	5	26	3	16	0	0	1	5	2	11	8	42
OVERALL TOTAL	26.9	653	452	31.2	2.2	87	19	18	4	3	1	72	16	101	22	164	36

Table 9.11 for secondary schools is on similar lines to Table 3 for primary schools save that the teacher qualification columns have been re-arranged to show the strength of graduates on the staff of each school: the schools in the Oredo area are clearly more advantageously staffed in this regard and it is evident that those high prestige schools with a high proportion of boarders also have a high percentage of graduate staff. The contrary is also generally true, although not in the case of school No. 15. Secondary schools overall have relatively far fewer unqualified staff (only 19 + 1% = 20%) than primary schools and 58% of their teachers have qualifications above the basic TC 2 level. The comments made earlier about primary school teachers' average age and length of service must largely be repeated in the case of secondary school teachers.

It would, of course, be invidious to attempt to draw too many comparisons between the data discussed in the two Nigerian case studies reproduced above and the U.K. data on which the whole of the remainder of this thesis was focussed: whereas the former country is still very far from achieving the immediate objective of ensuring that each child receives at least a minimum of primary schooling, the latter has had a compulsory system of education for over a hundred years. Although Nigeria may be one of the more prosperous of the developing countries it still lacks many of the basic elements of social infrastructure and economic development to which progress in education must closely relate and although the U.K.'s economy has currently many apparently deep-rooted problems it cannot be doubted that it is still one of the richer countries in the world with an average standard of living far in excess of that in Nigeria.

The estimated levels of unit (= per pupil) expenditures on education (as distinct from Boarding) are shown by the Nigerian data to be for primary schools: Naira 49.9(= £41.60) (case study 1), or Naira 58.3 (= £48.60) (case study 2); and for secondary schools: Naira 172.1 (= £143.40) (case study 1) or Naira 173.4 (= £144.50) (case study 2). Clearly, therefore, from comparison with the figures used throughout the remainder of this thesis there is a much greater divergence between the Nigerian and U.K. levels of expenditure per pupil in the case of primary schools than in the case of secondary schools.

The two case studies also serve to demonstrate how interesting and meaningful conclusions can be drawn from detailed cost and cost-related statistics collected at the level of individual schools. Such a process, as outlined above, is both time-consuming and expensive but, as indicated in Chapter 1, it seems likely to be one of the most significant ways in which educational cost analysis at the micro level will continue. Further reference to this question will be made in Chapter 10 when possible future lines of research in the U.K. are being considered.

Finally, reference may be made to the fact that work is still progressing on the further analysis of cost factors within some of the Nigerian schools with a view to establishing which (if any) components of expenditure may be isolated as being the most important determinants of expenditure variations. This approach includes sub-dividing teachers' salaries (much the most important item within current costs) by reference to a breakdown of teachers' timetables. Work on these lines has been pioneered by Mr. C. Tibi of I.I.E.P. (UNESCO) with data from a number of countries where school cost studies have taken place at the micro level.

CHAPTER 10. CONCLUSIONS AND LIMITATIONS

As was explicitly stated in Chapter 1, it was never the intention that all, or even many, of the outstanding questions of interest relating to school costs or expenditures would be answered in this study. It is hoped, however, that some of the lines of enquiry pursued in this thesis have thrown further light on various aspects of school costs and that a useful contribution has been made to the literature on this subject. In view of the nature of this field of study and its complexity and its apparent neglect by scholars - witness the small number of relevant previous writings in this country in contrast to, for example, the huge volume of material on each of the psychology of education and the sociology of education - it is perhaps inevitable that in some ways this study raises more questions than it answers. Each avenue explored appears to call for further detailed investigation and if there is one overall conclusion that predominates it must relate to the overwhelming need for very much more research into the whole field of school costs or expenditures. It is hoped that the present thesis may stimulate such further enquiries. It is also very much to be hoped that both the Department of Education and Science and the Local Education Authorities will agree on the need for, and desirability of, such further research, for their interest and co-operation would be essential to the success of such work.

The main conclusions in this thesis may be listed as:

(Chapter 2) The wide diversity but nevertheless relative paucity of relevant previous studies in the same field. No major previous study in England or Wales has been able to look at the costs of individual schools.

(Chapter 3) The conceptual difficulties inherent in the use of the term "costs".

(Chapter 4) Trends in national expenditure on education from 1965 to 1977 show quite different tendencies in the earlier of these years in contrast to the later ones. The harsher economic climate of the years post-1971 was reflected in much slower rates of increase of expenditure per pupil in real terms in schools. Education expenditure as a percentage of Gross National Product may have ceased to rise and within the total there were almost identical rates of increase for the primary and secondary sectors. Salaries of non-teachers and establishment expenses were found to be increasing more rapidly than any other items. The period saw significant shifts in relative unit expenditures, with universities faring particularly badly.

(Chapter 5) The CIPFA statistics, despite their shortcomings, were used to show wide variations in the levels of expenditure per pupil by the different LEAs with, overall, County Councils having appreciably higher levels of expenditure per pupil than Metropolitan Districts; London authorities have higher levels still but for rather different reasons. Correlations were found with a number of other variables for the areas but the pattern of these varied from one group of LEAs to another. Those authorities figuring highly (or lowly) in rank order for any one variable tended to do likewise for at least a number of other variables as well.

(Chapter 6) Statistical problems relating to the research gave rise to the clear probability that the findings of a number of other research studies, particularly in connection with economies of scale, had been biassed or inaccurate because of the statistical methodology used; great care had been needed to avoid similar problems in the course of the present study.

(Chapter 7) The data collected in the four LEAs showed a very wide range of average expenditure per pupil amongst homogeneous sub-groups of schools within any one LEA, sometimes up to a factor of two or three, with some groups having much wider variations than others. Whereas from 1974/5 to 1975/6 the increases in expenditure levels clearly exceeded the rate of inflation, for 1975/6 to 1976/7 the picture was much more complex and a number of groups of schools saw their expenditure per pupil fall in real terms. Teachers' salaries, which dominated total recurrent expenditure, were often quite highly correlated with other items of expenditure, and particularly with non-teacher salaries, on a per pupil basis.

(Chapter 8) The data from the four LEAs indicated very clear and continuing evidence of economies of size in the case of primary schools. In the case of secondary schools the findings were more mixed and were complicated by the fact that some sub-groups of schools were too small for us to have confidence in the results. Nevertheless, there was considerable evidence of economies of size from a number of the sub-groups, at varying levels of statistical significance.

Where an "optimum size of school" (on cost grounds alone) was indicated, this was frequently within the range 800-1,000 pupils, but for some groups such an optimum size did not appear.

(Chapter 9) Data collected by the writer in Nigeria was included, primarily for comparative purposes. Apart from the even wider range of statistics for expenditure per pupil, in apparently comparable schools, than those found above for the U.K., perhaps the main point of interest lay in the extremely low levels of expenditure compared to those in developed countries.

There are a number of obvious limitations to what it has been possible to achieve. The lack of any links herein between costs and some measure of school "outputs" has already been referred to at some length. It is also evident that in view of the size of the project and the large number of individual schools for which data became available, it has not been possible for the researcher to visit schools individually. Had it been possible to do so, some of the data might have required amendment to allow for various contingencies. These might have related, for example, to the existence of a community college in the school, the joint use of certain buildings or facilities, the temporary absence of a member of staff either in the sense that a teacher (or non-teacher) who had resigned had not yet been replaced or in the sense that a member of staff was temporarily sick (although still on full salary) and a temporary replacement had to be employed.

Many other such adjustments can be postulated and in their absence the data used can be criticised but it appeared that the

overall effects on the data collected would be relatively small. For one researcher working on his own, save for some clerical and computing assistance, it has inevitably taken some considerable time to organise, prepare and carry out this research, with the result that some of the data already appears no longer up-to-date. There is no suggestion that the four LEAs who co-operated with this research necessarily present a random cross-section of the 88 English (or 104 English and Welsh) LEAs and it would, therefore, be highly desirable to replicate such research in other authorities. At present, however, by no means all LEAs are prepared to co-operate with such a research project.

The particular problems of doing such a study during years of exceptionally high inflation have also been referred to at some length.

The need for further research into school costs and expenditure has already been referred to. In particular it would seem highly desirable that one follow-up of the present study should take the form of a more detailed investigation into a much smaller sample of schools, with a view to:

(i) analysing in more detail why levels of expenditure per pupil vary so widely and what links, if any, can be established between such variations and other facets of the schools, notably curricular patterns, and

(ii) endeavouring to ascertain what are the factors which in practice determine the distribution of the total level of expenditure over the various aspects of the life of the school.

Such a detailed study would inevitably involve visits to the individual schools involved and co-operation on the part of the teaching staff in those schools; it would, therefore, not be costless, with respect to either money or time, but it would seem highly desirable if we are to extend further our analysis of school costs at the micro level.

As was emphasised at some length in Chapter 2, many studies of this nature will be required if ever the U.K. literature on the costs of schools is to approach in size and complexity the similar literature which already exists in the U.S.A. Such research would seem to be highly relevant to the many critical decisions that will have to be taken in connection with the financing of schools in Britain during the 1980s.

APPENDIX A : THE BURNHAM SALARY SCALE SCHEME

Throughout this thesis it is apparent that the major single determinant of recurrent costs in schools lies in the salaries paid to teachers, this item far exceeding any other item of recurrent costs. Teachers' salaries are determined in accordance with a complex scheme administered by the "Burnham Primary and Secondary Committee" and known conventionally as the Burnham salary scales. This scheme commenced in 1920 and has changed substantially in the ensuing sixty years[1].

The basic principle underlying the scheme[2] is that each pupil in a school shall count a certain number of units on the following scale:[3]

"For each pupil under 14 years of age ... count 2 units

" " " aged 14 and under 15 ... " 3 "

" " " aged 15 and under 16 ... " 4 "

" " " aged 16 and under 17 ... " 6 "

" " " aged 17 and over ... " 8 "

The unit total thus determined for each school is translated into a "points score range", and a "Group" figure as shown in the following table:[4]

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1. For details of the historical development of the scheme, see F. CONWAY: "Pay Structures for School Teachers", Educational Studies, June 1978, and an (anonymous) article, "Burnham Negotiations", Education, 15.9.1972.

2. Full details are given in Department of Education and Science, Scales of Salaries for Teachers in Primary and Secondary Schools, England and Wales, 1977 (HMSO, 1977).

3. Ibid., Appendix II, Part A.

4. Ibid., Annex A to Appendix II.

TABLE A.1: BURNHAM SALARY SCHEME : POINTS SCORES

Unit Total or Review Average	Points Score Range	Highest Scale for Teachers below Deputy Head Teacher	Group of School for Head and Deputy Head Teacher purposes
(1)	(2)	(3)	(4)
up to 100	0 - 1	2	1
101 - 200	0 - 1	2	2
201 - 300	0 - 2	2	3
301 - 400 401 - 500	1 - 3 2 - 6	2	4
501 - 600 601 - 700	3 - 8 5 - 11	2	5
701 - 800 801 - 900 901 - 1000	7 - 13 9 - 15 10 - 17	3	6
1001 - 1100 1101 - 1200 1201 - 1300	11 - 21 13 - 23 14 - 26	3	7
1301 - 1400 1401 - 1600 1601 - 1800	15 - 28 17 - 33 21 - 37	4	8
1801 - 2000 2001 - 2200 2201 - 2400	25 - 40 30 - 44 35 - 49	4	9
2401 - 2700 2701 - 3000 3001 - 3300	41 - 55 47 - 60 52 - 65	4*	10
3301 - 3700 3701 - 4100 4101 - 4600	57 - 74 62 - 79 68 - 83	4*	11
4601 - 5100 5101 - 5600 5601 - 6000	75 - 90 81 - 96 88 - 103	4*	12
6001 - 6100 6101 - 6600 6601 - 7100 7101 - 7600	88 - 103 94 - 109 101 - 116 108 - 123	4*	13
Over 76000	Proportionately	4*	14

* Including Senior Teachers

The "Group" figure is used to calculate the salaries of the Head teacher and deputy head teacher(s), which are listed in separate scales, with four or five incremental points each, for each Group. The "points score range" is used to determine the number of teachers the school is permitted to have on each of the salary scales above the basic scale 1, as follows:[1]

"each	teacher	on	scale	2	...	...	shall count	1 point
"	"	"	"	3	...	...	" "	2 points
"	"	"	"	4 (including Senior Teachers)			" "	3 points"

Thus a school whose "unit total", assessed from the numbers of pupils in the school and their respective ages as indicated above, amounted to 1400 might have a "points score" of, say, 21 in which case it could choose to have, for example, 21 members of its staff on scale 2, or 7 members of its staff on scale 4, or, more likely, some combination of all three scales such as 9 on scale 2 (= 9 points) plus 3 on scale 3 (= 6 points) plus 2 on scale 4 (= 6 points).

It will be noticed that Annex A to Appendix II of the DES document only specifies a "points score range" and leaves to each LEA freedom to decide whether to allocate schools to an actual points score at the lower or upper end of the range or, again more likely, some intermediate position (such freedom, of course, being relative in that each LEA will be subject to pressures from such bodies as the teachers' unions and, more recently, will have to operate within the framework of tight financial control by the central government). It is also true

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1. Ibid., Appendix II.

that each LEA can exercise its discretion in deciding whether to allow those schools with a "unit total" of over 2400 to designate as Senior Teachers, as indicated in the footnote to the above table, the following number of teachers:

"in Group 10 ... ... up to 3 teachers

in Group 11 or 12 ... up to 4 teachers

in Group 13 or 14 ... up to 5 teachers"[1]

Such Senior Teachers are paid according to a separate salary scale, higher than that for scale 4, but only count for the same number of points (3) as scale 4 teachers. LEAs also retain the very important freedom to decide on the pupil/teacher ratio to be applicable to their schools and thus to determine the total number of teachers to be employed in each school: after the numbers of teachers on the various higher salary scales have been determined, on the basis indicated above, the remainder will be placed on scale 1.

There are also many other aspects of the Burnham salary scheme which are not considered here, such as increments on scale 1 for various qualifications (up to five increments in the case of a newly-qualified "good honours" graduate with teacher training), additions to the scales for London Area payments, or salaries in re-organised or special schools. Whilst all such points will seem important and relevant to the staff concerned, they do not materially affect the remainder of this appendix.

In view of the interest in costs per pupil in schools of different size, it seemed relevant to consider whether there might be some inbuilt or hidden component of the Burnham scheme which

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1. Ibid., Part II, para. 4(a).

would result in different figures for "teachers salary per pupil" for schools of different size. Therefore Table A.2 shows calculations of teachers salary costs for schools with 750, 1000, 1250 and 1500 pupils respectively. Inevitably the unit totals, points score, and salary costs of actual schools will vary quite widely to reflect various aspects of the circumstances of those schools and no suggestion is being made here that any actual school will necessarily conform to these figures. Nevertheless, they ought to demonstrate the broad workings of the Burnham scheme.

In order to make such hypothetical calculations, it is necessary to make a number of assumptions, which are as follows:

(i) that each school conforms as nearly as possible to the national average pupil/teacher ratio for secondary schools of 17.0;

(ii) that within each school the number of pupils at each of ages 11, 12, 13, 14 and 15 is approximately the same;

(iii) that each school conforms as nearly as possible to the staying-on rates for pupils above the statutory leaving age, i.e. approximately 25% for age 16 and approximately 25% for ages 17 and 18 considered together;

(iv) that each member of staff is at the mid-point of his/her respective salary scale;

(v) that the LEA has placed the school at approximately the mid-point of its "points score range";

TABLE A.2: HYPOTHETICAL BURNHAM CALCULATIONS

	SCHOOL A			SCHOOL B			SCHOOL C			SCHOOL D			SCHOOL E		
Total no. of pupils:	750			1000			1250								
Total no. of staff:	44			59			74								
Age of Pupils	**No. of Pupils**		**Unit Total**	**No. of Pupils**		**Unit Total**	**No. of Pupils**		**Unit Total**	**No. of Pupils**		**Unit Total**	**No. of Pupils**		**Unit Total**
under 14:	408		816	546		1092	681		1362	819		1638	954		1908
14:	136		408	182		546	227		681	273		819	318		954
15:	136		544	182		728	227		908	273		1092	318		1272
16:	35		210	45		270	58		348	68		408	80		480
17:	35		280	45		360	57		456	67		536	80		640
Totals:	748		2258	1000		2996	1250		3755	1500		4493	1750		5254
Points score range:	35-49			47-60			62-79			68-83			81-96		
Mid-point:	42			54			71			76			89		
	Points	**No.**	**£**	**Points**	**No.**	**£**	**Points**	**No.**	**£**	**Points**	**No.**	**£**	**Points**	**No.**	**£**
Head :	-	1 (Group 9)	7281	-	1 (Group 10)	7767	-	1 (Group 11)	8256	-	1 (Group 11)	8256	-	1 (Group 12)	8856
Deputy Heads :	-	3 (£5676)	17028	-	3 (£5988)	17964	-	3 (£6300)	18900	-	3 (£6300)	18900	-	3 (£6612)	19836
Senior Teachers(£5100):	-	-	-	6	2	10200	9	3	15300	9	3	15300	9	3	15300
Scale 4 (£4734) :	12	4	18936	9	3	14202	12	4	18936	12	4	18936	15	5	23670
Scale 3 (£4056) :	14	7	28392	20	10	40560	26	13	52728	28	14	56784	32	16	64896
Scale 2 (£3357) :	16	16	53712	19	19	63783	24	24	80568	27	27	90639	33	33	110781
Scale 1 (£2883) :	-	13	37479	-	21	60543	-	26	74958	-	36	103788	-	42	121086
Totals :	42	44	£162828	54	59	£215019	71	74	£269646	76	88	£312603	89	103	£364425
	+ 748 = £217.68			+ 1000 = £215.02			+ 1250 = £215.72			+ 1500 = £208.40			+ 1750 = £208.24		

(vi) that each school decides to divide up its available points so that it has approximately twice as many teachers on scale 2 as on scale 3 and approximately twic as many on scale 3 as on scale 4 (including Senior Teacher)[1];

(vii) that the LEA has exercised its discretion to appoint Senior Teachers and in each case has authorised one fewer than the maximum number permitted for a school in that Group;

(viii) that the LEA has appointed the second deputy head teacher permitted by the regulations in each school in Group 9 or higher (para.6(b) of the regulations);

(ix) that each school is mixed and therefore qualifies for a "second master or mistress", remunerated as a third deputy head (para.5 of the regulations);

(x) that it is impossible to make, for comparative purposes, such a calculation for a school with fewer than 750 pupils in view of the difficulty of forming viable sixth form groups if assumption (iii) above is adhered to.

An enthusiast for deducing trends from any set of statistics might conclude from Table A.2 that the calculations provide some evidence of economies of scale in respect of the operation of the Burnham salary scheme in schools of different sizes, in that salary costs per pupil appear to fall as school size increases, albeit unevenly in that the figure for School C is higher than that for School B and thus does not conform to the general trend. In fact,

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1. Of two head teachers who read this Appendix in draft form, one considered (vi) to be a reasonable assumption but the other considered that relatively more would be placed on the higher scales than (vi) assumes.

however, the variations in the figures (from £217.68 for School A to £208.24 for School E) are quite small; they are in fact so small as to be insignificant when compared with the very much larger variations from school to school discussed elsewhere in this thesis. In practice, the figures for any actual school would be influenced by such considerations as at which incremental points teachers are on their salary scales, how well qualified academically are the staff in the school, whether any members of staff have protected salaries from previous appointments, and whether the school has a pupil/teacher ratio marginally better or worse than the average for all schools.

From the calculations in this appendix, therefore, we can only conclude that no meaningful evidence for either economies of scale or diseconomies of scale can be shown to arise from the working of the Burnham salary scheme as such.

The assumptions made above seem fair and reasonable but it must of course be recognised that in practice wide variations will be found in the application of the Burnham scheme. A number of the points assumed above relate to placements at the mid-points of scales or points ranges whereas in practice few if any schools would find themselves in just that position. Nor is it clear that the actual figures relating to any one school would necessarily be an accurate guide to underlying influences: there might, for example, have been pressure, whether explicit or implicit, on pupils to stay on at school in order to improve the school's points score, the latter may be affected by local employment or unemployment trends, one or more members of staff may be on protected salaries for a variety of reasons, or the past history of the school may have affected its present situation in some quite particular ways. Further there is the question of whether we are comparing like with like; typically

the large school is able to make available, for example, a much greater range of optional subjects to sixth-form pupils and in this case the resulting expenditure figures reflect not just the level of costs but also the provision of a different level of educational service.

The calculations shown above appeared to run counter to the conclusions of a booklet[1] recently published by the Secondary Heads Association, the relevant section of which reads as follows:

> "Local authorities properly set up large schools to provide facilities and equipment as economically as possible, and to provide a wide range of curriculum possibilities without wasteful expenditure on staff. However the changes of the points system in the last few years have meant that economies have gone much further than they should.
>
> Here are some examples in one large authority:
>
> 1. 4 schools in groups 9 and 10 have 165-175 pupils per senior member of staff (senior teacher and above).
> 3 schools in groups 12 and 13 have 291-323 pupils per senior member of staff.
>
> 2. The 4 schools have 10.4-12% of their staff rated at senior teacher and above.
> The 3 schools have 5.6-6% of their staff similarly rated.
>
> A general count was done of points in all secondary schools in the authority. The points available for promotion vary from 1.7 per member of staff in the smaller schools to 0.9 in one of the very largest and the group 12s and above have an average 1.2 to 1.3. This means that it is much harder for a member of staff to gain promotion in a larger school.
>
> If the points system were made more equitable for the larger school staff would feel less resentful even though many of the seniors would still have greater responsibilities for their salary than in a smaller school (e.g. most Heads of English are on a scale IV whether they have a department of three or ten). This is to some extent counterbalanced in teachers' minds by the extra stimulus and greater opportunities for development within a large staff.

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1. Big and Beautiful, Views on the size of schools, Secondary Heads Association, London, 1979. The booklet is the work of a panel of authors, the section in question being written by Mr. Ken Lambert, Headmaster of Great Barr School, Birmingham.

> We hope that these matters can be looked at by the Burnham Committee so that teachers in the larger schools can be fairly treated. The economies of scale mentioned in the first paragraph would continue to be a positive advantage."

The author of this section, Mr. K. Lambert, kindly wrote to me, following an enquiry I addressed to him, to the effect that he did not consider that our calculations conflicted - rather that his findings strongly reflected the differential positions actually found in schools and the discretion L.E.A.s have, and exercise, regarding a number of the points mentioned previously.[1]

A survey of schools conducted by the National Union of Teachers found very wide variations in the practices of L.E.A.s in the matter of allocating schools to the maximum, minimum, or some mid-point, of the respective points ranges "without any obvious reasons".[2]

There are many other aspects of the Burnham scheme which have received attention in recent years but which cannot be dealt with here. The most prominent of these have been the salary differentials between teachers on different scales or with differing educational qualifications, the differing promotion prospects of teachers in different types of school, the lower adverage salaries of women teachers, and relationships with other professions. All these points were discussed in the Houghton Report[3] which, quite apart from its much-publicised award of large salary increases to teachers, recommended that such questions as the points system, the distribution of unit total ranges, relationship with school size, and the working of discretionary increases, should be kept under constant review.

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1. I am also grateful to Miss F.M. Kirkby, Headmistress of Rutherford School, Newcastle-upon-Tyne, who read this Appendix in draft form and commented on this point.
2. Reported in Education, September 22, 1972.
3. Committee of Inquiry on Teachers Pay (Houghton Committee) Report, 1974. Many articles in Education, before and since 1974, have discussed all these points.

APPENDIX B : THE LAYFIELD COMMITTEE EVIDENCE

One of the most interesting recent attempts to analyse local authority expenditure on education was published in one of the volumes of evidence commissioned by and submitted to the Layfield Committee on Local Government Finance and is of considerable relevance to the subject dealt with in this thesis.[1] Section I of the paper related broadly to all local government expenditure and considered:

> "whether recent research could be of assistance to the Committee in assessing the adequacy of existing grant distribution formulae and in making recommendations for improvement"

and Section II, which was more specific to education, contained:

> "a summary of the results of our investigation into variations in local authority expenditure per pupil in schools".

The paper quotes the following variations in expenditure per pupil in schools for 1975/76:

	Primary	Secondary
Range	£158.39 - £284.38	£249.43 - £402.10
National average	£194.76	£297.07
Standard deviation	£21.76	£29.12

but from the figures discussed elsewhere in the present thesis, it will be obvious that these figures must relate to variations between the averages for whole LEA areas and not to variations

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1. "Commissioned Work by Diane A. Dawson, Department of Political Economy, University of Glasgow: 'Determinants of Local Authority Expenditure'", published in Appendix 7 to Report of the Layfield Committee on Local Government Finance (HMSO, 1977).

between individual schools; as Ms. Dawson has subsequently made clear, data relating to individual schools were not available to her.[1]

Ms. Dawson calculated, for each LEA, and for each of the primary and secondary sectors, the individual items in the following equation, in order to highlight how the particular variables affected the total level of expenditure:

$$\text{Expenditure per pupil} = \left[\begin{pmatrix}\text{teachers salaries}\\(\%\text{ above nat.av.T.S.})\end{pmatrix} \times \begin{pmatrix}\text{pupil/teacher ratio}\\(\%\text{ above nat.av.P.T.R.})\end{pmatrix}\right] \times \begin{matrix}(0.67)\\(\text{nat. teachers salaries as\% of nat. total expend.})\end{matrix} + \begin{pmatrix}\text{other expenditure}\\\text{as \% of nat.av.o.e.}\end{pmatrix} \begin{pmatrix}(0.33)\\\text{nat. other expend. as \%}\\\text{of nat. total expend.}\end{pmatrix}$$

This approach is on the same lines as that developed by Mr. C. Tibi and referred to briefly in Chapter 9 (last page), although in the latter case the calculations refer to individual schools. Ms. Dawson found small primary schools to have higher than average teachers' salaries per pupil, due both to more favourable pupil/teacher ratios and to having typically older teachers, and lower than average "expenditure on non-teaching activities". (In the case of very small schools, the salary of the head teacher would figure prominently in the calculations, as Cumming[2] found). The author would clearly have wished to have more detailed information on a number of matters as when she commented:

> "it is not at all clear what factors are responsible for some authorities making more generous provision for special needs than others"

or, in reference to a survey of local authorities:

> "the one clear result of that survey was the complete lack of uniformity in provision for the educationally deprived".

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1. In a private letter to me dated 3.4.1979. I am most grateful to Ms. Dawson for her assistance.

2. Op. cit.

For secondary schools multiple regression analysis was able to "explain" 59% of the expenditure variations (again on an inter-LEA basis) with the major predicators being: % of secondary schools that are middle schools, % of pupils in secondary modern schools, provision for special need, and the course of study of older pupils. The effect of the last three named is fairly obvious (although, as the author in effect stresses, the aetiological reasoning is by no means clear) but it was surprising that the percentage of middle schools that are middle deemed secondary had a significant negative coefficient.

School size was not a significant determinant of expenditure but it must again be recalled that data relating to individual schools was not available. The problem noted previously of not comparing like with like in schools of different size must also apply here. Further the appendix to the paper describes in detail the variables used for size, "IDXSSPRI" for primary schools and "IDXSSSEC" for secondary schools, as follows:

" $\sum_{i=1}^{9}$ % of pupils in schools of size i $\left[\frac{\text{teachers per pupil for schools of size i in England and Wales}}{\text{teachers per pupil in England and Wales, all schools}}\right]$

IDXSSPRI (or IDXSSSEC) = 1 for an authority with a distribution of pupils by school size identical to that for England and Wales as a whole. The index increases in value for authorities with proportionately more pupils in small schools"

However, it is clear that this index depends crucially on variations in the pupil/teacher ratio and in effect camouflages the effect of size per se. In order to focus solely on size, presumably we would wish the pupil/teacher ratio to stay constant

but in this case the term in the squared bracket would always equal 1. Now say we had the following hypothetical figures for two authorities:

LEA \ i	1	2	3	4	5	6	7	8	9
Authority A	0	5	5	5	5	20	20	20	20
Authority B	20	20	20	20	5	5	5	5	0

For each authority the index = 1 yet the distribution of pupils by school size is clearly very different; whilst the above figures are over-simplified, the same point would apply with more realistic ones. Ms. Dawson has subsequently explained to me[1] that the Department of Education and Science "expected size to affect expenditure primarily via the pupil/teacher ratio" but it is not at all clear how this hypothesis could be used at LEA level. It is well known, for example, that schools in the south-east of England tend to have more favourable pupil/teacher ratios than those in the north-east or north-west; yet there is no evidence that they typically have smaller (or larger) schools. As the author has written to me:

> "You must remember that I did not have expenditure data on a school by school basis (which is required to test for economies of scale). It would be perfectly possible for there to be economies of scale but insufficient actual variation to pick it up on a local authority basis ... the kind of exercise I undertook will tell us nothing about the presence or absence of economies of scale <u>per se</u> ... it seems to me that the only way to generate insights into how and why the costs of <u>schools</u> differ is to undertake the research on a school by school basis as you are doing ... if more work on the economics of schools in the UK had been available, my study would have taken a very different form...".

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1. In letter, op. cit.

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