SCHOOL EFFECTIVENESS IN SECONDARY EDUCATION IN ZIMBABWE: A MULTILEVEL ANALYSIS

by

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ABSTRACT

Survey data was collected in 1985 covering information on 3,400 Form IV students in Zimbabwe, their teachers, their classes and the 32 schools from which they were drawn - spread across six different schooltypes. This data is analysed using a multilevel regression programme to evaluate the effectiveness of different schools in terms of 'O' level results in English Language, English Literature and Mathematics. In Chapter One, the historical background to education in Zimbabwe is presented, together with an overview of the main policy changes since Independence. The study itself is situated in Chapter Two against the backdrop of a review of the literature and a discussion of the methodology which distinguishes this study as part of the third wave of research into school effectiveness. Chapter Three describes the study itself, the sample, the variables, and an overview of the schooltype differences. Chapter Four details the construction of the index variables at the student, the class and the school level. In Chapter Five the results of the progression of linear models are presented, substantiating the choice of 'final' models for each subject. Chapter Six presents an analysis of the different costs at different types of schools, and Chapter Seven draws the threads through the arguments presented in Chapters Two, Five and Six, presenting the implications for Zimbabwe of the study's findings as well as the implications for further research in this field. Whereas much of the literature on school effectiveness has assumed that family background influences on educational achievement operate differently in Third World countries relative to industrialised countries and that school-based factors predominate, this study demonstrates the inadequacy of the models on which such conclusions have been based and concludes that such a distinct pattern of educational achievement for the Third World may indeed be a fallacy.

Table of Contents

List of Tables and Figures

TABLES page

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Introduction

Unprecedented expansion has taken place in the educational system in Zimbabwe since Independence in 1980. A highly selective educational system has been transformed into a system catering for the masses of children previously denied an education. By 1985, when this study was carried out, primary enrolments had more than doubled their level before Independence, and secondary enrolments had risen to more than seven times their pre-Independence level. In order to finance such rapid development, the education vote more than quadrupled in this same period and local communities have been mobilised to build the nearly 3,000 additional primary and secondary schools which opened in the first five years of Independence.

Financial costs, however, whether in money terms or in kind, detail only a part of the picture. Other costs which relate more to the quality of education have also arisen such as in the increased numbers of untrained teachers staffing the schools - at secondary level, up from 3% in 1980 to some 45% in 1985 - an inevitable byproduct of the rapidity of the educational expansion. Changes in the teacher pupil ratios have been one means of accommodating the increased enrolments. As increasing pressures on the central government budget have limited further educational outlays, there have been other qualitative costs. Per capita grants made to schools by government have not kept up with the requirements for increased educational materials, particularly in the case of new schools, nor have they kept pace with an increasing rate of inflation. Despite the quadrupling of the education vote, real per capita expenditure by government has decreased in all but the private primary schools.

How have the pupils fared amidst such rapid changes in their schools? Extraordinarily, whereas in Great Britain a minority of secondary school pupils sat for 'O' levels[1], in Zimbabwe, all pupils, both before and after Independence, have been geared to sit these examinations. It is therefore remarkable that in absolute terms nearly five times the number of students passed five or more 'O' levels in 1985 than passed in 1979, though in comparative terms, there was an inevitable drop in the pass rate, once the system was opened up, to 13%, or one-fifth its world-high record of 63% in 1979. Another way of answering the same question, however, is to state how many more pupils did not pass five or more 'O' levels, given that the whole system is directed towards this goal. Here one has a much more depressing picture, for whereas in 1979, of those limited numbers selected to attend secondary school, fewer than 2,000 did not pass, in 1985, when the system was open to all to compete, more than 98,000 failed to make the grades. It must be asked how these pupils feel about their secondary school experiences, whether it was enough for them to have been afforded what in the past was a privilege, or whether they feel themselves to be failures.

Education does not consist solely of the number of passes at 'O' level, despite what may seem sometimes to be an inordinate preoccupation with examination results. There is no need to rehearse what is now well-worn territory concerning the "diploma disease" (Dore, 1976). However, it should nonetheless be of interest, particularly in view of the demand made by employers for secondary school certificates and in the absence of a different orientation provided by government, the extent to which different types of schools with different student bodies, different teachers and different facilities, have different effects on their pupils. In other words, what

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[1] Of course this is before the introduction of the GCSE.

really matters to secondary school achievement, if one is to judge schools by their examination results? This is the purpose of this study, to try and disentangle some of the different influences on secondary school pupils which make for better or worse 'O' level grades in English and Mathematics. In addition, from the perspective of educational policymakers, by analysing the costs attached to different educational inputs, different scenarios will be capable of being measured, not only in terms of their educational value, but also in terms of their drain on costly resources.

Chapter One provides an historical background to education in Zimbabwe so that one can appreciate the changes that have been brought about since Independence as well as understand what has remained constant. If one is aware of the constraints on different policies - whether because of the connotations of the past or inherited structures - it is possible to put forward realistic scenarios. Chapter Two situates this study against a review of previous research into similar topics and against a background of different methodologies employed. In Chapter Three a full description of the study is presented, from sampling technique to a description of the variables investigated, to a description of the differences between schooltypes which one is trying to analyse. Chapter Four details the construction of the index variables which were created to collapse the many significant variables which otherwise could not be fitted to the models eventually employed in the analysis. Chapter Five describes model by model, for each of the subjects, the stages through which the analysis progressed. Chapter Six presents an analysis of the different costs at different types of schools, as a counterpoint to the tapestry which has been woven in the previous two chapters concerning the different influences on educational achievement. Finally, Chapter Seven summarises the results of the study and draws out the policy implications for Zimbabwe and for further research into school effectiveness in Third World countries.

CHAPTER ONE

The Background to Contemporary Zimbabwean Education

The achievement of Independence in 1980 transformed the political structures in the country previously known as Rhodesia. No newly independent country, however, begins its existence with a clean slate. Although many economic, social and political changes have already been wrought by the new government, the legacy of the past has not entirely disappeared, whether manifest in structures still undergoing transformation or in the predispositions of some groups of the people toward any changes which are brought about. For instance, it is much easier to expand an existing system of education than it is to radically transform one. Despite certain innovations and changes of emphasis, Zimbabwe's secondary schools are still very recognisable in terms of their 'Rhodesian' and British origins. The major change that has been brought about since Independence has been the phenomenally expanded coverage of the system. Between 1979, the year before Independence, and 1985, the year in which this study was carried out, primary school enrolments increased 2.7 times and secondary school enrolments 7.5 times. Whereas about a quarter of those completing primary school went on to secondary school before Independence, by 1985 some 84% of those in Grade 7 proceeded to Form I. The high percentage pass rates before Independence were a reflection of this strict selection into secondary education. In 1979 63% of those students sitting Cambridge 'O' levels passed in at least five subjects whereas in 1985, the pass rate was 13%, or one-fifth its level before Independence. The much lower pass rates since Independence are often interpreted as an indication of falling standards, but it must be pointed out that the absolute numbers of students passing five or more subjects at 'O' level has risen tremendously. By 1985 the numbers passing were five times their level in 1979.[1]

This chapter will explore the main themes of the history of formal education in Zimbabwe in order to provide a background to the description of the educational changes made since Independence and also in order to be better placed to evaluate the issue which underlies this investigation, the practical conflict for educational policymakers between the quantity and the quality of education.

Early Formal Education

Formal education in Zimbabwe had its beginnings with the first Christian missionaries who established themselves in the country in 1859. The London Missionary Society which opened the first mission station in that year was followed by a myriad of other missionary societies from Europe and the United States. This predated the establishment of formal control over the territory by the British South Africa Company in 1890 but was continued apace with sizeable land grants being made to the different missionary bodies by the settler regime. Between 1890 and 1923 when the settlers were granted internal self-government, the missions had almost exclusive responsibility for African education. The regime's interest in African education was limited to the regulations it wished to apply to the mission schools and did not entail the provision of non-denominational, government schools. Indeed, the relinquishing of such responsibility in terms of the establishment of schools for Africans was nearly total until

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[1] This can be compared with a figure of 10% of the relevant population (aged 17) in the United Kingdom gaining five or more passes at 'O' level (Great Britain, Dept. of Education and Science, Statistical Bulletin, Educational Statistics for the UK, 1/85).

the 1940s, for before then, the state had opened only two schools for Africans. In contrast, educational provision for the European population was such that in 1930 it was even possible to make it compulsory for European children between the ages of 7 and 15 to attend school.[2]

From its inception, settler society viewed African education as something quite distinct from European education. Entirely separate administrations existed for European and African education, and with rare exceptions, schools were entirely segregated. There was no notion of fostering the assimilation of Africans into European society by means of the school system. As the Chief Commissioner for Mashonaland wrote in 1909, "the policy should be to develop the native's natural proclivities first, <u>on lines least likely to lead to any risk of clashing with Europeans.</u>'[3] Fear of the encroachment of their privileged positions was to be ruled out by the settlers from the start. Early education ordinances required 'native' schools to include industrial training in their curriculum, and the two government schools that were established before the 1940s were geared specifically towards agricultural and industrial training. That different roles were to be assumed by Africans and Europeans in every social, economic or political setting was a fundamental principle whose application extended far beyond education. Legislation in the 1930s in the form of the Land Apportionment Act and the Industrial Conciliation Act formalised whatever was left unsaid in terms of the separate paths which Africans would be

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[2] The designations 'African' or 'European' have become increasingly absurd with time. Children born and brought up in Africa are still called 'Europeans'. But then, Americans have also been classified as 'Europeans' in Zimbabwe! 'European', of course, is a euphemism for white.

[3] <u>Report of Chief Native Commissioner, Mashonaland, 1909</u>, p.2, quoted in (Atkinson, 1972), p.93.

allowed to follow, where they could live and farm and what jobs they could undertake.

On the other hand, the state undertook a great deal of responsibility for European education, establishing alongside the mission schools, secular, government-controlled schools. Whilst the issue of compulsory education for Europeans had long been debated, because of the financial requirements of free tuition, the final decision to implement such a policy was put off until 1930. The importance of a cohesive European minority and the undesirability of class distinctions within this minority (such as that associated with the stigma of inability to pay tuition fees) was not lost on some of the early settlers.[4]

Separate provision was made for the Coloured and Asian populations, which were lumped together, receiving second-rate schooling relative to the European population and, in terms of facilities, literally some of their cast-offs.[5] Schooling was made compulsory for this population group in 1938, but only where 'suitable' schools were found within a 3-mile radius of the pupil's home.

The growth in the number of African primary schools before the 1940s paralleled the restrictiveness or leniency of the settler regime with respect to the grants made available to these schools, meagre though they were. By 1930 there were over 1400 schools, but, on average, the settler regime was still paying only 9s per pupil per year (Dorsey, 1975, p.43). Grants made to European schools, by contrast, had included

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[4] Southern Rhodesia: Legislative Council Debates, 1916, pp. 382-403, referenced in (Atkinson, 1972), p.53.

[5] Atkinson refers to the handing down of used desks to a Coloured school so that a European school could purchase new ones (Atkinson, 1972, p.63).

half the salary costs and half the equipment costs from as early as 1899, and later the added introduction of maintenance grants of between £12 and £15 per pupil for children attending boarding schools.

Internal Self-Government and Federal Rule: 1927-1965

Positive intervention and planning for African education really only started after the granting of internal self-government, with the establishment of the Department of Native Education in 1927, superseded by the Department of Native Development two years later. As the very purpose of African education was seen as different from that of European education, intended to be 'appropriate' for the restricted roles which the African population were to be allowed to play, it shouldn't be surprising to note that the structures of the educational systems of the respective population groups were also different. European education consisted of 7 years primary school followed by 4 years secondary education, whereas African education consisted of 8 years primary school, at least in theory, for few had the opportunity to go beyond the first five years, and fewer to reach the eighth year.

Although the institutions for planning African education had been created by the 1930s, it was not until the next decade that they were fully utilised. In the 1940s African primary enrolments doubled, reaching some 238,000 by 1950 and government expenditure on African education rose to seven times the level it had been in 1940. Thereafter, although the state's involvement in African education expanded greatly, the disparities between the two educational systems did not diminish. Whereas the average government expenditure per African pupil was some 13s in 1940, hardly higher than ten years previously, by 1950 the figure had increased more than threefold to an average annual expenditure per pupil of £2 4s 2d. This change was due mainly to the switch from paying merely per capita grants to the schools to subsidising teachers' salaries, as had long ago been done in the case of the European sector. Furthermore, after 1942 teachers had to be 'approved' by the Department of Native Development in order for the schools in which they taught to qualify for this subsidy. Legislation was also introduced in that year to enable government to establish its own primary schools in urban areas, a major step towards assuming the responsibility for African education it had been loath to undertake.

The 1940s was a period of increased urbanisation and industrialisation in Rhodesia. Manufacturing industry required a more formally trained African labour force while Africans, themselves, saw the value of higher levels of education. In particular, the shortage of European teachers during the Second World War brought about the necessity of training Africans for these positions and teacher training was stepped up during this period. In 1953 with the newly created Federation of Rhodesia and Nyasaland, European education became the responsibility of the federal government while African education remained with the different territorial governments, so enabling Southern Rhodesia to build upon this first decade of its newly interventionist role.

In the 1950s economic growth accelerated further, affording a continued expansion in the provision of African education, doubling yet again the numbers enrolled to some 505,000 students by 1960. However, the Kerr Commission, which was appointed to study African education at the beginning of this period, disclosed the details of the state of neglect of African education. With nearly three-quarters of the teachers untrained and many schools not covering even the minimal five years of primary education thought to be the basic requirement for literacy, not to mention the inadequate provision of schools and the high wastage rates as well as the bottleneck for upper-primary advancement, there was much ground on which the Commission could make its recommendations. These included a plan to expand teacher training, extend the coverage of primary education to the stipulated five years and increase the number of places in upper primary schools.[4] Following the Commission's report, a Unified African Teaching Service was established in 1956 which sought to make teachers' salaries and conditions of service uniform in government and mission schools. In 1961 this was taken further and salary scales, irrespective of race, were brought together across the teaching service, dependent on status and qualifications alone.

During the period of the Federation, the university was established and correspondent with the specialisation on offer, European schools replaced the Cambridge Secondary Certificate examinations with the subject-specific General Certificate of Education examinations. The African secondary schools, however, continued to offer the Cambridge examinations, further distinguishing them from the separate European school system.

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[4] African primary schools were meant to cover an eight year programme. In addition to ensuring that a minimum of five years was covered, the aim was to increase the number of schools offering the full eight years of primary education, including the 'upper' primary grades of 6-8.

UDI until Independence: 1965–1979

A further inquiry into education, the Judges Commission, was conducted towards the end of the period of the Federation and formed the basis of much of what was to be carried out in African education after independence from Britain was unilaterally (and illegally) declared by the white minority government in 1965. The Judges Report recommended that local authorities should take over the major responsibility for running primary schools. This idea was adopted and put into force when it was legislated that no new primary schools would be established after 1968 unless local government took responsibility. While a tradition of local, community involvement in education was thus nurtured, this move also fitted in neatly with the minority government's reluctance to shoulder responsibility for the provision of African education.

The localization of private schools was accompanied by increased financial burdens imposed upon the local authorities. Whereas earlier the full amount of the teachers' salaries had been paid by government, local communities had to finance 10% of this amount after 1969, in addition to the tuition fees already being paid by parents for the sundry schooling costs. By 1971 the missions had relinquished control over the majority of their primary schools, which had been the main source of African primary education in the rural areas, in large part because under government plans the independence of their schools - which they demanded as a *sine qua non* for their continued involvement - could only be maintained at exorbitant cost.

The 1969 Census painted the real picture of the state of African education, as it had been, and as it was developing. In 1969 only 45% of African children of school-going age (aged 6-16) were attending school. Thirty-eight percent of this age-group had never been to school. Just the same, this was an improvement over earlier periods, as can be seen from Table 1.1. In 1969, just over half of the 17-29 year age group had completed the five years thought to be necessary for basic literacy. Only one in five children had finished primary school, and only 6% of this age group had achieved entry into secondary school.

TABLE 1.1

Summary of School Standards Reached by Africans Aged 17 Years+, 1969

Age group in census year	Proportion of age group by standard reached			
	No Schooling	Grade 5 or higher	Std 6 or higher	Secondary School
	%	%	%	%
17-29 years	28	52	22	6
30-39 years	41	35	11	2
40 years and over	62	15	4	1

Note: Calculated from table in Census of Population 1969, Central Statistical Office, Salisbury, p.18. Although it would appear that the percentage of children not attending school had increased from the 28% recorded for the 17-29 year-old group to the 38% recorded for the 1969 school-going population, the higher 38% figure probably includes children who at the age of 6 had not yet started school, but may have begun attending school at an older age. This is particularly likely given that the year in which the census was carried out coincided with a drop in primary school enrolments due to the increased burden of school finance imposed upon the parents via the localization of control of primary schools.

The 1966 Plan for Education sought to increase the numbers of African students proceeding to secondary education. The targets set were that 12½% of those students completing primary school would be accommodated in 'traditional' secondary schools and that an additional 37½% would proceed to junior secondary schools with a vocational curriculum. In 1969 the African primary education system was changed to reduce it by one year to the 7 years that had been the pattern for European primary schooling. In 1971, however, only 43% of African schools offered the full seven years of primary education, so that even if the target of a combined 50% transition from Grade 7 to some form of post-primary education had been reached, there were hidden bottlenecks in the provision of even the necessary grades, no less of sufficient numbers of schools. Nonetheless, by 1979 the bottleneck at Grade 5 had been eased, with transition rates to Grade 6 increasing from 67% in 1971 to 88% in 1979.

By 1977 whereas there should have been some 300 'F2' schools, as the junior secondary schools with a vocational orientation were called, only 31 existed. By 1979, instead of a 50% transition rate to some form of secondary education after Grade 7, only 22% of those reaching Grade 7 found Form I places, and this was only 12% of those who actually began Grade 1 in 1972. This was in spite of the fact that over the decade 1969-1979 African secondary enrolments had increased by two and a half times.

The reason for the limited progress made in educational provision during this period was that the government had arbitrarily decided that African educational expenditure could not exceed 2% of the GNP. In addition, the imposition of further financial burdens on an already stretched rural population in the second half of this period in a heightened war situation, made the realisation of the targets unlikely. And as the political will radically to alter the provision of education for the African population did not exist, progress was minimal, despite improvements, particularly in the numbers attending secondary school.

In 1978 the separate divisions of European and African education were formally united under the transitional government of Smith and Muzorewa. Yet, this unification was little more than window-dressing, for the two systems were still distinct, with different fees paid at the respective Government Group A (high fee-paying, read European, Coloured and Asian) and Government Group B (low fee-paying, read African) schools, as well as different teacher pupil ratios, not to mention the legacy of vastly different amounts of educational expenditure in the two sectors. The disparity in educational expenditure on African as opposed to European students in the period prior to Independence is well illustrated by Tables 1.2 and 1.3 which show that despite the increased attention paid by government to the African sector, its relative deprivation was in no way ameliorated.

TABLE 1.2

Educational Enrolments and Finance by Racial Sector,

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Calculated from Reports of the Secretary for African Education and Reports of the Secretary for Education, various years, Government Printer, Salisbury.

TABLE 1.3

Ratio of African to European Per Pupil Expenditure

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Same as for Table 1.2.

In 1979 still under the transitional government, a new Education Act was promulgated, ostensibly as a result of the abolition of racial discrimination, but in fact, allowing for its retention in practice, if through indirect means. Not only did the categories of Group A and Group B government schools apply directly to the previous racial divisions, but the stipulation that fees at Group A schools must not be less than three times as much as the fees payable at Group B schools further distinguished the former European, Asian and Coloured schools from those intended for the African population. Teacher pupil ratios at the two types of schools were also different: 1:18 at Group A schools and 1:39 at Group B schools (Chung, mimeo, pp.14-15). This was of especial significance because teachers' salary grants to these schools were paid according to these ratios, thus ensuring further discrepancies between the two types of schools. In addition, strict zoning regulations made virtually segregated residential patterns the catchment areas for government schools, and specifically discriminating against domestic workers or any other employees resident in the zones only by virtue of their work. If this was not sufficient to distinguish Group A schools from Group B schools, the Act also made it possible for parents to buy Government schools on very favourable long-term loans and so designate the schools "community" schools, which, while not able to discriminate on grounds of race or colour alone, could gear their admissions policy with regard to "the religious or cultural identity of the school".[7]

Table 1.4 provides a telling picture of the educational prospects facing any African pupil before Independence who entered Grade 1. In 1961 s/he stood less than an even chance of reaching Grade 6, about a 1 in 3 chance of completing primary school, and only a 6% chance of entering secondary school. By 1970 her/his prospects had improved somewhat: about 60% of those pupils entering Grade 1 in 1970 completed primary school and about 14% entered secondary school (although these statistics and those for subsequent years are coloured by combining European enrolments). For the 1975 intake it is difficult to discern the correct picture because Independence had been achieved by the time those starting primary school had reached their final year. However, the pupil's prospects are undeniably better as all pupils are now given the opportunity to proceed to secondary school, just as European pupils had had that privilege for many decades before Independence.

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[7] Rhodesia Education Act, 1979, Section 15. An interesting parallel is found in the current proposals in Great Britain to enable schools to opt out of local authority control.

TABLE 1.4

African Student Promotion Rates Before Independence

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Same as for Table 1.2

[1] In the eight year African primary school system, the grades went as follows: Sub-standard A, Sub-standard B, Standard 1, Standard 2, Standard 3, Standard 4, Standard 5, Standard 6. In the seven year African primary school system which was introduced in 1969, the grades were simply 1-7. "Remove", however was an additional class comprising those students caught in the transition between the two systems who would then be removed from schooling following the completion of their final eighth year.

[2] In the list of promotion rates of those starting Grade 1 in 1965, from Form II on the figures are consolidated for African and European students alike. For those starting Grade 1 in 1969, this is also true from Grade 5 on, and for the remaining two years listed, those starting Grade 1 in 1970 and 1975, these promotion rates are all for the combined European and African sectors. Further, the increase in promotion rates for Grade 6 and Grade 7 in the 1975 listing shows a drop <u>in</u> as opposed to a drop <u>out</u> for these first two years of independence, 1980 and 1981.

Independence: 1980-1985

Educational provision for the majority African population in Zimbabwe changed dramatically at Independence. Four major changes need highlighting. First, education, rather than being viewed as a privilege, was deemed to be a basic right. Second, from September 1980, less than six months after Independence, tuition fees were abolished at all primary schools. This was intended as a first major step toward universal primary education. Another main thrust of early post-Independence educational policy was to improve the provision of resources in the rural areas. Thus, thirdly, whereas African government secondary schools had been confined almost exclusively to urban areas, now plans were drawn up to establish at least one government secondary school in each of the 54 rural administrative districts. Finally, although there was no early policy directive regarding the numbers to be allowed to proceed to secondary school, it soon became clear that no student completing Grade 7 would be denied the opportunity. This position was confirmed when it was announced in 1984 that legislation would be forthcoming to make schooling compulsory for those under the age of 16.[*]

The reality of the commitment that every student be able to proceed to secondary school can be judged by the rapid change in Grade 7/Form I transition rates after Independence, compared with the previous decade, shown in Table 1.5.

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[*] Quotation from the Minister of Education, The Herald, 28 April 1984. Although to date there has been no further progress on such legislation, neither has there been any pronouncement of a prescribed transition rate from Grade 7 to Form I of anything less than 100%.

TABLE 1.5

Grade 7/Form I Transition Rates, 1970/1-1984/5

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Calculated from Report of the Secretary for African Education, and Report of the Secretary for Education, various years, Government Printer, Salisbury and Harare, and "Teachers' Colleges and Schools: Staffing and Enrolment Statistics," various years, Ministry of Education, mimeo.

The speed with which the expansion of educational provision after 1980 and the increased priority given to secondary education took place is illustrated in Tables 1.6 through 1.10. Secondary enrolments accounted for 18% of total pupil enrolments by 1985, whereas in 1959 the figure was only 0.7%. By 1969 it had only risen to 3%, and as recently as 1979, secondary enrolments only constituted 5% of the total. In absolute numbers the figures are even more dramatic. In the six years between 1979 and 1985, more was achieved than in the previous twenty years: primary enrolments increased by nearly three times, affording nearly a million and a half additional places, whereas between 1959 and 1979 their numbers did not even double; secondary enrolments, whilst increasing to 14 times above the infinitesimal 1959 figure by 1979, increased 7¼ times their (combined) figure by 1985, affording nearly half a million additional places.

TABLE 1.6

Percentages of Total African Enrolment by Sector, 1959-1979 and Combined European and African Enrolment, 1985

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: (Chung, Fay, mimeo) and Ministry of Education statistics.

TABLE 1.7

Total Enrolments by Sector, 1959-1985

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Same as for Table 1.6

Note: The figures for 1959, 1969 and 1979 are for African enrolments only, whereas the figures for 1985 are the combined European and African enrolments. The combined European and African enrolments can be seen in Table 1.10.

TABLE 1.8

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

TABLE 1.9

Index of Growth in Enrolments by Sector

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Same as for Table 1.6

Note: See note, Table 1.7.

TABLE 1.10

Combined Enrolments by Sector, 1979-1985

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Ministry of Education statistics.

The recent and rapid growth in both the number of schools and the number of teachers can be seen from Tables 1.11 and 1.12. Although the expansion remains remarkable, in the first few years after Independence part of the increase was due to the reopening of schools which had been closed during the war. 1520 primary schools and 57 secondary schools had been closed in the period 1974-1979 as a result of the war, also entailing the displacement of some 10,000 teachers and some 420,000 pupils. The speed with which new schools were opened, (as opposed to the reopening of old ones), was due to the initial use of primary schools as secondary school sites and double sessioning the classes in order to share facilities while new buildings were erected. These new secondary schools were termed "upper tops", as they entailed attaching the first years of secondary school to existing primary schools. Gradually they were upgraded to conventional status.

TABLE 1.11

Number of Schools by Sector, 1979-1985

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Ministry of Education statistics

TABLE 1.12

Number of Teachers by Sector, 1979-1985

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Ministry of Education statistics

The increase in the number of teachers employed of course has had another side to it, namely, the increase in the number of untrained teachers employed, which was inevitable with so rapid an expansion in enrolments. Tables 1.13 and 1.14 illustrate the situation in the years immediately following Independence. Teachers are grouped into three categories: those with non-standard training (NST), those with standard, recognized teacher training (T), and those entirely untrained or in training (UT). Those with non-standard training primarily consist of African teachers who underwent the teacher training that was available for them in the '40s and '50s, resulting in Lower and Higher Primary Teacher Training Certificates, requiring two years of training following a Standard 6 education (full primary) in the case of the Lower Certificate, and Form II (two years of secondary) in the case of the Higher Certificate. This certification contrasts with the former Europeans' 'conventional' teacher training of three years following the successful completion of five 'O' levels.

The increase in the number of untrained teachers over the period 1980-1985, from 28% to 60% of all primary school teachers and from 3% to 45% of all secondary school teachers, occurred despite attempts to address the problem. A crash teacher training course was introduced at the primary level, called ZINTEC (Zimbabwe Integrated Teacher Education Course). This involved only two terms of classroom training at either side of 3½ years of on-the-job training, thus getting new recruits immediately out into the field. The conventional secondary teacher-training was also modified so that two years out of the four years' course were to be spent in the field, following the successes of the ZINTEC programme. Thirdly, there was a recruitment of expatriate teachers. However, such was the expansion in enrolments that the supply of trained teachers could not meet the demand, as is shown.

TABLE 1.13

<u>Teachers' Qualifications, 1980-1984</u>

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Ministry of Education statistics and <u>Statistical Yearbook, 1985</u>, Central Statistical Office, Harare for 1984 statistics, and <u>Annual Report of the Secretary of Education for the Year Ended 31 December 1985</u>, Government Printer, Harare for 1985 statistics.

Note: There are discrepancies in the numbers given in this table compared with Table 1.12 due to the reporting of some secondary teachers still as primary teachers. This is because of the fact that some primary school teachers were transferred to secondary schools but were still reported on the primary school payrolls, particularly in the case of the upper tops schools.

TABLE 1.14

Percentage Untrained Teachers, by Sector, 1980-1984

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Same as for Table 1.13

Another way of addressing the problem of teacher scarcity was to adjust teacher pupil ratios. This not only provided a means of better utilising the limited numbers of trained teachers but also helped to address the inherited discrimination between different types of schools in terms of the class sizes.[7] Whereas prior to Independence at primary level, teacher pupil ratios had been 1:30 at government Group A schools, and 1:40 at government Group B schools and private schools, from 1983 a uniform 1:40 teacher pupil ratio was stipulated throughout. Teacher pupil ratios are important not only for class size but also for the salary grants paid to the schools by government, as all registered schools, including the 'independent' schools, receive teachers' salary grants according to the stipulated teacher pupil ratios. At secondary level, the teacher pupil ratios before Independence had been 1:20 at Group A schools and 1:28 at Group B schools and private schools; after 1982, the stipulated teacher pupil ratios for all schools were as follows:

Forms I-III	1:30
Form IV	1:28
Form VI	1:20

[7] Of course, they were also adjusted for financial reasons.

Other distinctions between the different types of schools have also been removed since Independence. An Education Amendment Act was passed in 1981 to rid Zimbabwe of the curiously devised "community" schools. In 1987 a more thoroughly revised Education Act was legislated which has rid the education system of further anomalies. In particular, it has consolidated the previously separate private and public teaching forces, which had also entailed different conditions of service, less favourable terms for those not teaching at government schools. Although Zimbabwe schools have not been consciously integrated, as happened in many parts of the United States, the application of satellite zoning, that is zoning the pupils of an otherwise Group B school with those of an underutilized Group A school, has meant that African children have "crossed the tracks". However because many white parents have chosen to send their children to independent schools, which have been maintained and even allowed to increase in number, this has meant that many of the former whites-only, government schools have only a handful of 'European' pupils in attendance.

The historical differential fee structures between the two types of government schools have also been eliminated, with the important exception of boarding fees which are still more than twice as high at Group A secondary schools compared with Group B schools. Tuition fees, however, are $60/year irrespective of the classification of government school. The disparity between government and private schools has still not been removed, but the discrimination against rural parents in terms of the higher school fees charged compared with urban parents, has been addressed to some extent since the recommendations made to government by the School Fees Committee which reported on this and other topics at the end of 1983 (Zimbabwe, Report of the School Fees Committee, 1983).

In 1980 the per capita tuition grants made to private primary schools were meant to be on a par with the amounts given in support of government primary schools. These grants, while originally intended to cover the full tuition costs of primary school pupils, have been eroded. In the case of secondary schools, per capita grants are also made by government for each private school pupil, but this is a nominal amount of $10/head and is intended only as a contribution toward the overall tuition costs which otherwise are meant to be covered by the school fees charged. Free secondary school tuition is not envisaged at present.

Tremendous contributions have been made by parents, particularly in the rural areas, toward the provision of new schools for their children. They have contributed bricks, labour and money towards the construction of new classrooms. Part of this spirit of self-help must originate in the localisation of education that occurred in the 1970s, but no doubt spurred on by the announcement of free tuition in 1980. Parents residing in urban areas, by contrast, were fortunate to have schools already *in situ* to which their children were admitted at Independence. At the end of 1982, the government made it possible for parents to draw up school management agreements by which they could take over greater responsibility for the running and provision of their schools. It was stated that this was to provide the means by which parents in urban areas could contribute more greatly to their children's schools. In practice these agreements, rather than facilitating parental contributions across the board, have been limited almost entirely to Group A schools intent either on creating a class, if not a racial exclusiveness, or at least more favourable teacher pupil ratios and other facilities, at the expense of poorer schools, through the levying of hefty, additional fees.

The sexual inequality in school attendance has not been ameliorated since Independence. Whereas in primary school over the period 1981-1985 about 48% of the enrolments were girls, the overall figures hide the decreasing proportion of girls as they proceed through the higher grades of primary school. By Grade 7 in 1984 only 44% of the enrolments were girls. This disparity is even greater at secondary school, and as with the primary grades, increases in the higher forms. Whereas in 1984 40% of the Form I intake comprised female pupils, for Form IV this proportion was 38%, for the lower VIth Form 31% and for the upper VIth Form a meagre 26%. It is of course too soon to see whether the primary school intakes in the first years after Independence result in higher proportions of female pupils by the time they reach secondary school.

A further area in which attempts have been made to bring more equality to the disparate and highly discriminatory educational system inherited at Independence is school examinations. Whereas at the end of Grade 7 African pupils had to undergo a selective examination which determined which 20% would proceed to secondary school, from Independence this was no longer to be a selective but rather an indicative examination, and from 1982 on, all students would have to sit this locally written examination. A further selective examination written by all African students at the completion of Form II, the Junior Certificate, is now written by all students and again, is no longer the basis of selection for promotion.[10] Automatic promotion which had been the preserve of the European students, has become the rule for all

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[10] However, the President's speech in June 1987 indicated that the use of the Junior Certificate Examination as a selective examination would be reintroduced, in order to determine vocational and academic streams at Forms III and IV within the same schools (The Herald, June 24, 1987, p.7).

students. The terminal examinations for those in what had been called the F2 or vocational African schools were also ended, as was the examination written at the end of Form III by academically weak European students. Finally, whereas Europeans generally sat the Associated Examination Board's 'O' and 'A' levels, whilst the Africans sat the Cambridge at 'O' and 'A' level, from 1985 all sit for the Cambridge Syndicate's examinations uniformly and plans have been made for the eventual localization of these examinations.[11]

Table 1.15 shows that whilst there has been a surge in the numbers sitting the Cambridge 'O' level examinations with nearly five times the numbers passing at least five subjects with a grade C or better between 1979 and 1985, the percentage pass rate has decreased steadily over the same period to a fifth of its level before Independence. Given the degree of selection to which aspiring African students were subjected before Independence, it is not surprising that Zimbabwe had among the highest percentage pass rates in the world; nor is it surprising that the percentage pass rate has dropped as the doors into secondary school were opened more widely. Just the same, the level of disappointment can only be surmised of those students today who, whilst being afforded the opportunity to go to secondary school, really don't stand much chance of succeeding, at least in terms of the academic goals which are set them.

The fact that all Zimbabwean pupils now have the opportunity of pursuing a highly academic secondary education, all of them sitting the Cambridge 'O' levels, is undoubtedly a reaction to the opportunities previously denied the majority of the population. Even a so-called developed country such as

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[11] No indication has been given to date as to whether the new GCSE Examination will be introduced in Zimbabwe.

TABLE 1.15

Numbers Sitting Cambridge 'O' Levels and Percentage Pass Rates 1970-1985

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: The numbers who passed and the percentage pass rates come from Ministry of Education Examinations Branch figures. The numbers who sat the examinations come from Reports of the Secretary for Education, various years. The numbers passing are those in receipt of five or more subjects with grade C or better.

Note: The figures for 1970 are for Africans only.

Britain does not aspire to such a goal, streaming off pupils of different academic abilities in more realistic directions. Before Independence, less able European pupils were channelled into less academic streams, but within the same schools that also had 'O' level aspirants. African students, on the other hand, were either denied the opportunity of proceeding to secondary education or were diverted into the vocational and separate F2 schools. The stigma of these past routes or dead-ends has not disappeared. As a result the politically difficult alternative of proposing more realistic structures of assessment has not been raised in public and those committees which have suggested different paths of educational development have not had their recommendations acted upon.

An overview of the changes which have been brought about in the education system since Independence would not be complete without some figures concerning how such rapid expansion has been financed. Table 1.16 details the macro-economic picture of education from 1979-1987, and Tables 1.17 and 1.18 break down the aggregate government expenditure on education into its constituent per capita costs by government and private sector primary and secondary schools.

TABLE 1.16

Government Education Expenditure as a Percentage of Total

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Figures taken from prospective years of Estimates of Expenditure, Government Printer, Harare.
* Figures taken from estimates in Estimates of Expenditure for Year Ending June 30, 1988, Government Printer, Harare.

TABLE 1.17

Per Capita Government Expenditure on Government and

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: Estimates of Expenditure, various years, Ministry of Education statistics, and Socio-Economic Review 1980-1985, Zimbabwe, Ministry of Finance, Economic Planning and Development, 1986, Table 14.
Note: Calculated averaging the votes for the two fiscal years represented in each academic year and dividing by appropriate enrolment figures. Real costs derived by dividing by GDP deflator, again averaged for two calendar years covered by the relevant fiscal years.

TABLE 1.18

Per Capita Government Expenditure on Government and Private Secondary Schools, 1979-1985 ($)

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

[redacted]

Source: See Table 1.17

Note: See Note, Table 1.17.

The disproportionate amount spent on government as opposed to private schools can be seen clearly from these tables. Although this would hardly be surprising in a country such as Britain, in Zimbabwe, private schools encompass the local authority-run schools, in addition to the 'public' or "independent" schools and mission schools. What is also telling from these tables is the difficulty in raising real, as opposed to nominal educational expenditure, despite the massive budgetary allocations which the education sector has received since Independence. Only private primary schools have realised significant rises in the amount of government expenditure, up some 20% in real terms between 1979 and 1985, whereas government primary schools have seen a real decrease in government expenditure of 9% over the same period. For secondary schools, real government expenditure on the government sector has decreased by 66% and by 63% for the private sector.

Given that this is the present situation in Zimbabwe today, and that thousands of pupils will go through a system in which they stand little chance of succeeding, at least in terms of the academic goals which are set them, this study into the cost and quality of secondary education is all the more relevant, for, as will be described in subsequent chapters, it should pinpoint what matters most in terms of educational inputs to the products of the system, the youth of Zimbabwe.

CHAPTER TWO

Review of School-Effectiveness Studies: Methodologies and Conclusions

There has been a great deal of research into school effectiveness in the past twenty years, mainly concerned with schools in industrialised countries, though with some application to Third World countries as well. This research has been designed to ascertain which educational factors- whether in the classroom or the school, whether concerning teaching methods or the provision of physical facilities- have a significant effect on the outcomes of schooling, whether in terms of cognitive achievement or other outcomes. The approach to the present research was conceived not in a vacuum, but after much reflection on the lessons learned from previous research into similar areas, and so it has been possible to benefit from - and hopefully avoid - some of the earlier mistakes made in this field. The aim of this chapter is to present the broad contours of the developments in school effectiveness research, paying particular attention to the differences between studies carried out in industrialised and Third World countries. This will facilitate an evaluation of the eventual conclusions of this research in Chapter Seven, against the backdrop of what has gone before.

There have been at least two waves of research undertaken into school effectiveness. The Coleman and Plowden Reports of the 1960s, concerning American and British schools,(respectively Coleman, et al, 1966 and Plowden, 1967) constituted the first major research projects which investigated achievement differences of pupils across different schools. This initial research, drawing heavily on production functions used at that time, particularly in the United States, in economic research, subsequently led to a host of other research projects designed in a similar fashion, including as well, reanalyses of the original data collected. Following this first wave of research, and emerging from the criticism made of these initial approaches, the second wave made certain refinements to the original research designs and to the conceptions of how to measure school effectiveness. In particular, a greater emphasis was placed on process variables - teaching style, for instance - rather than merely the physical inputs to education such as class size and teachers' qualifications. These studies have recently led to a third wave of research - still in its infancy - and of which the present study is a part. This third wave is distinguished by the use of a multilevel research design.

The First Wave: Research into 'Determinants of Achievement': Methodological Criticism

The first wave of research was essentially designed to uncover the determinants of pupils' academic achievement, rather than the effectiveness of particular schools as such. The question was posed, "Which of the different inputs to a pupil's academic achievement really matter?" Although directly related, this is not the same question as was posed subsequently, "Why do some schools achieve better results than others?" Both the Coleman Report and the Plowden Report were products of the 1960s, reflecting a predominant concern about equality of educational opportunity and designed to explain the sources of disadvantage. In the United States, this concern focused on racial discrimination, and in Great Britain, discrimination on the basis of socio-economic class. The results of the two studies were popularly encapsulated as "schooling doesn't matter". Rather, the importance of the pupils' socio-economic backgrounds far outweighed the impact of the different school-based factors. In other words schooling could not overcome the inequalities present in the student population on intake. Jencks (1972) reiterated the same point in his study.

The importance of background factors to students' achievement was also underlined by other major, longitudinal research projects in Britain (Douglas, 1964; Douglas, et al, 1968; Davie, et al, 1972) which demonstrated the advantages maintained, in terms of educational achievement, of children whose parents were in non-manual occupations.

These first attempts at unravelling the factors responsible for differences in achievement led to many other studies, no doubt in particular, because the results of these initial studies were so disillusioning. A discussion of the results of this first wave of research is not possible outside the context of a discussion of the methodologies employed to reach those results, however. The two are inextricably entwined because the inadequacy of most models used to examine school effects have made their conclusions highly suspect.

The methodology employed in these early studies was almost exclusively ordinary least squares regression analysis. Some measure of cognitive achievement would be regressed on a host of variables divided into five different headings and entered as blocks - the pupil's own characteristics, the pupil's family background, the peer group, the characteristics of the teacher and the school's characteristics. In the key studies, (Plowden, 1967; Coleman, 1966; and Jencks, 1972) the variance attributed to each grouping was then analysed in order to determine the contribution of different types of variables towards the student's achievement, as measured by a particular test.

Unlike the National Child Development Study and the studies by Douglas which were really cast in a different mould, most of this first wave of research was cross-sectional, that is, it involved a snapshot view of students at school, with no information on the previous attainment of the pupils surveyed. Without mentioning some of the other methodological problems involved in disentangling the different influences on student achievement, how could one isolate the school and classroom influences without having a measure of what, in terms of pupils' background abilities, went into the classroom in the first place? This major weakness is probably due to the fact that the methodology - basically a production function which had been applied to factories to determine what mix of inputs produced the optimal output - was superimposed upon a school system which bore little resemblance to the shop floor.

The theories applied to the problems under investigation were seldom well-articulated and in some instances extremely simplistic. The model used in the Coleman study, for instance, assumed that the pupil underwent certain family background influences prior to her/his schooling, after which the influence of school factors came to bear. This ordering of the influences on a student, of course, does not reflect reality, for there is no theoretical reason to assume that family background influences cease to be felt whilst a student is at school. Indeed, the longitudinal studies carried out on child development have shown that the initial advantages or disadvantages imposed by one's social class are cumulative (Douglas, 1964, 1968; Davie, 1972).

Additionally, inappropriate measures of educational attainment were used in some of the studies. Coleman, for instance, used verbal achievement as the school outcome on which all student differences were judged. Yet, it has been argued convincingly that measures of student outcomes should (naturally) reflect what is actually taught in the school (Brimer, 1978), and that the use of verbal achievement as a response variable is both an inappropriate measure of what is being taught as well as being so highly correlated with the student's background as to make analysis awkward.

Furthermore, it should go without saying that schools produce a variety of outcomes, only one of which is cognitive achievement. However, because cognitive achievement is an outcome which ostensibly is already being measured by the achievement tests administered to students, it has most often been utilised as the exclusive outcome in studies of school effectiveness.

Not surprisingly, given these fundamental weaknesses in the approach adopted, the results of this first wave of research following the Coleman and Plowden Reports show remarkable inconsistency. Apart from the strong influence of background factors on student achievement, it has not proved possible to isolate a single <u>school</u> resource which has been shown to make a significant difference to student outcomes across the full range of research carried out (Averch, et al, 1972; Bridge, et al, 1979). Of course, part of this is explained because even within a common framework, the approach to this first wave of research was not uniformly consistent. Different research designs were used; different research questions were asked; student outcomes were measured differently and there was no consistency in the units of analysis employed in the various studies: some were at the level of the individual student, some were at the level of the school, some were at the level of the school district or local authority.

What the first wave of studies did have in common was an almost exclusive use of ordinary least squares regression analysis, and criticism of the application of this technique to research on school effectiveness provides one answer to much of the inconsistency as well as falsehood in their results. Cronbach noted the weakness of the findings from such research when he stated,

> "The majority of studies of educational effects-whether classroom experiments, or evaluations of programs or surveys-have collected and analyzed data in ways that conceal more than they reveal. The established methods have generated false conclusions in many studies." (Cronbach, 1976)

At the root of the problem is the misapplication of a single-level model to a reality which is clearly hierarchical. The nature of educational systems is such that students (who come from different communities and different backgrounds) are grouped together in classes which are located in schools administered by local authorities which themselves are in particular administrative regions, and so forth. These groupings of students are not random but in the first instance, reflect the residential patterns of the various communities which comprise the catchment area of the particular school. Secondly, some schools have admissions policies which further differentiate their student bodies, shifting the group of students even further from a random collection of students. For instance, there are Catholic schools, single-sex schools, grammar schools, etc. Thirdly, selection into particular classes is not necessarily random, either, for streaming by ability is commonly practiced.

This non-random clustering violates two stringent assumptions of ordinary least squares regression analysis: 1)that each case has an equal residual variance and 2) that the covariance between the residuals of any two cases is 0.[1]

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[1] If e_{ij} represents the contribution of the jth child in the ith school:

1) $var(e_{ij})=\sigma^2$
2) $cov(e_{ij},e_{ik})=0$

Pupils in a particular class in a particular school are likely to be more homogeneous than pupils in different classes in different schools. It is therefore reasonable to assume that two pupils in the same class have equal between-pupil variances but not two pupils in different classes, even in the same school, not to mention if they were in different schools. The two assumptions are thus violated because pupils in different classes will have different variances, and due to this greater homogeneity within the clusters, there will be a non-zero covariance between two pupils in the same class.

The result of the above model misspecification is serious. Because the non-random nested structure of a school system is ignored in the assumptions pertaining to classical regression analysis, no distinction is made between the sampling variance, and the parameter variance. In other words, this means that the variance which is attributed to the selection into the different clusters - at whichever level - is confused with the variance which legitimately can be attributed to the explanatory variables in one's model. It is not possible, using a single-level model to separate out the between-level variances, e.g. the between- pupil, the between-class and the between-school variances. The implications are dramatic. Such misspecification leads to inefficient parameter estimation and the too common rejection of null hypotheses. Ordinary least squares (OLS) regression analysis will only yield efficient parameter estimates where the correlations within any clustering, say at the class or school level, are small.

This problem obtains when individual-level data are utilised; it is exacerbated when data are aggregated, for in such circumstances the within-unit (class or school) variability is suppressed and one has no means of separating out the level one variance from the level two variance. The use of aggregated data has been common practice in research into school effectiveness, largely because it is more readily available, such as the data which are already collected by education authorities, or cheaper to obtain. The problems of using aggregate data have been exposed for some time and by a variety of authors who have criticised a multitude of research studies (Alexander, 1983, Bidwell and Kasarda, 1980, Bowles, 1968, 1969, Burstein, 1980a, 1980b, Leiter, 1983, Spady, 1973). The main effect of aggregation bias is to inflate the estimated effects of pupil background on outcomes relative to teacher/classroom/school effects (Burstein, 1980a, p.175).

Another sort of inefficiency has been pinpointed in a different criticism of the first wave of school effects research. This is the inefficiency of the educational system which makes the 'production function' approach particularly inappropriate[2]. Yet, several of these first studies were modeled like other 'production functions' as though one need only change the mix of inputs in order to maximize output, seen only as cognitive achievement. The inappropriateness of the analogy to physical production has been commented upon by several authors (Bee, 1985, Bowles, 1970, Hanushek, 1979, Levin, 1976), but the crudeness of viewing schools as factories for the production of cognitive achievement has not disappeared entirely, particularly with respect to Third World countries (Fuller, 1986).

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[2] If such factors as monopolistic practices in the marketplace can so easily violate the economic assumptions of 'efficiency', how then can one view a head teacher's decisionmaking as anything but "inefficient" when a good deal of her/his decisionmaking comprises little if any budgetary control?

Some of the Results of the First Wave of Research

There have been several reviews of the school effectiveness literature which have enumerated, variable by variable, the nature of the influence of different factors primarily on cognitive achievement in different research studies (Averch et al, 1974, Bridge et al, 1979, Fuller, 1986, Alexander and Simmons, 1975, Schiefelbein and Simmons, 1979, Simmons and Alexander, 1978). Given the weaknesses in the methodologies employed in most of the studies, and thus the suspicion that is cast over the conclusions drawn, little purpose would be served here in going over this well-trodden ground. As Burstein noted,

> "to have any hope of developing adequate models of educational effects on individual student performance, two features of study design are essential
>
> (1) measure every variable at its lowest possible level;
>
> (2) be sure that each student's data can be matched with the data from his or her teacher, classroom, classmates, and school"
>
> "...without these features...the study of the effects of education on individual students might as well be forgotten." (Burstein, 1980a, p.179)

A handful of American studies from the first wave of research fit the minimal criteria noted by Burstein, as well as being longitudinal, comprising intake scores for each student surveyed. They are not multilevel studies, however, and so embody the problems noted above concerning model misspecification. Nonetheless, it is worth summarising their results, even if they must be treated with caution.

Hanushek's study of third-grade pupils in Californian schools in the late 1960s (Hanushek, 1972) found significant teacher effects on the achievement of Anglo-American but not Mexican-American pupils. He concluded that teachers do affect students' achievement in terms of the recentness of the teacher's own education, the teacher's verbal ability and the percentage of time spent on discipline. Neither the teacher's years of experience nor his graduate education was found to affect student achievement, however.

Murnane's study of primary school children in New Haven schools in the early 1970s (Murnane, 1975) concluded that teaching experience, rather than having no effect on student achievement, was a positive influence over the first two years, but diminishing thereafter. Class size was not found to be a significant determinant of achievement, nor was the average achievement of the student's classmates. A significant finding with respect to the conclusions reached by the Coleman Report was that student background characteristics showed no consistent effects once prior achievement had been controlled for. However, the measure of prior achievement may well have served as a proxy for these background influences, given that verbal ability, rather than an achievement measure per se was the variable used.

Winkler's study of Californian secondary school students in 1964-65 (Winkler, 1975) found that student achievement was affected by the racial composition and socio-economic background of the student's peer group, though with different effects across black and white groups. The study also concluded that a teacher's salary is consistently related to the pupil's achievement, as well as the teacher's attendance at a prestigious college.

Summers and Wolfe's study of Philadelphia primary and secondary school students in 1971-72 (Summers and Wolfe, 1977) found that better teachers had a greater effect on the achievement of disadvantaged pupils, that less experienced teachers taught poorer students better, that low achievers did worse in classes larger than 28, (whereas high achievers did better) and that there was no effect of class size on grade-level pupils. In addition, they found that physical school facilities made no difference to achievement, but variations in class composition affected low-achievers, hardly affecting high achievers.

Link and Ratledge studied fourth-graders in Wilmington, Delaware in 1969-70 (Link and Ratledge, 1979) and concluded that teachers' education and experience had no significant effect on student achievement, nor class size, but that the student's perception of a teacher's positive attitude toward her/him was significant. A smaller effect on the student's achievement was also uncovered, that brought to bear by the parents' positive attitude toward the pupil's ability to succeed.

The results of these studies are still not mutually consistent, despite their avoiding some of the pitfalls in research design. To be fair, however, the studies themselves are not consistent in terms of their focus. Nonetheless, it would appear that teaching experience either has no significant, positive effect on student achievement, or only in the first two years of experience. Teachers' educational background similarly either has no positive effect on student achievement or only if the teacher's education is recent. Class size has no effect on student achievement with the exception of Summers and Wolfe's findings that low achievers tend to achieve better results in classes smaller than 28 and high achievers the opposite.

Other school variables have been shown to have different effects on student achievement but with even less reliability than in the above studies. It could be argued that given the inefficiency of the techniques employed in the majority of studies, and therefore the less stringent acceptance of seemingly 'significant' variables, a summary of the conclusions is of didactic interest in telling us what variables do not affect cognitive achievement, for if they could not pass the much easier significance tests of these poorly specified models, there is really no hope of their showing any relationship with achievement. Alas, this is not a reasonable use to which we might put a summary of the results of the remaining studies, for, as has been discussed, in addition to being inefficient, the research designs used have also confounded the sampling variance with the variance of the parameters being estimated.

The relation of certain background characteristics to cognitive achievement is mapped out in several longitudinal studies carried out in Great Britain which though not really belonging to the same genre of studies already discussed, do have results related to the 'determinants of achievement'.

For instance, in his first study of primary school age children (Douglas, 1964), Douglas documented that children from middle class families achieved better results on verbal than non-verbal tests, relative to their working class peers, but they were at an advantage in both subject areas. He also found that girls had higher scores than boys in reading, writing, English and spelling, but not in arithmetic, geography or science, and that the girls retained their particular advantage in these former subjects when they proceeded to secondary school. Poor housing conditions predicted low scores of achievement. Parents' interest in their children's achievement had a significant, positive effect on achievement in primary school. Eldest children achieved better results than subsequent children. The effect of coming from a large family, and the frequent, associated deficiencies in care, yielded a negative effect on student achievement, but this was felt only early on in their lives. Finally, the streaming of classes by ability level served to reinforce the process of social selection.

These differences in achievement according to students' background characteristics were further investigated in Douglas' study of secondary school age children (Douglas, et al, 1968). Here it was found that girls retained their advantage in verbal skills found in primary school but that boys were at an advantage in secondary school in non-verbal subjects such as mathematics. Further, the gap between the social classes observed at primary level increased during secondary school was among the more controversial findings. An important additional conclusion, however, was that although working class children were at a disadvantage relative to their middle class peers, the effect of good schooling could reduce this disadvantage considerably.

The more recent National Child Development Study (Fogelman, 1983) arrived at similar conclusions to these earlier studies. Regarding the influence of sex on achievement, smaller differences were found between boys and girls in mathematics, but the more significant advantage which girls have in reading skills at age 7 is lost by the age of 11, as is the early advantage in mathematics. An increasing social class gap was also found, but interestingly, the negative effect of a student's coming from a large family was greater than the effect of social class on reading and mathematics attainment. Crowded and poor housing conditions, as with the earlier studies, were also good predictors of low achievement, as was the fact of a summer-term birthday, which implied that the pupil received less schooling given intake policies which were based on the term in which the pupil turns five years of age.

A number of school variables were also considered, no effects being found for single-sex schooling, the teacher pupil ratio, streaming, teacher turnover or corporal punishment, and only a very weak effect for school size. The number of hours spent on mathematics is found to have a positive effect. The overall conclusion reached after controlling for the different background characteristics and considering various school factors is that school characteristics are of minor importance to attainment at secondary school relative to the effect of previous attainment, the type of school and the social class of the pupil. The results of such reports as the Coleman and Plowden Reports - although questionable due to poor research design - are echoed in these more sophisticated, longitudinal studies of children at different levels of schooling.

The Second Wave: Research into School Effectiveness

Following this first wave of research was a second which focussed more closely on the ranking of different schools in terms of their effectiveness and which was also concerned with the determinants of student achievement. Together with this different focus, there was often a greater interest in what went on in the classroom, rather than the more physical inputs to the educational system which previously had been measured. In the following paragraphs several representative studies will be reviewed in order to describe the somewhat different directions which such research has taken.

Coleman embarked on a second major research project which was in many ways similar to his original study but which set out to measure the differences between public and private (mainly Catholic) secondary schools in the United States (Coleman, Hoffer, Kilgore, 1982). However, although some attempt was made to avoid some of the weaknesses of the original study's research design, there were sufficient, additional weaknesses in this later project to invalidate its conclusions. Coleman concluded that Catholic schools provided a better education for their pupils than public schools, and he attributed this to such factors as greater amounts of homework, more discipline at school, etc. Yet, the controls made for selection into the different schools were inadequate: there was no measure, for instance, of previous achievement. The interpretation of the need for longitudinal data in such studies was also highly questionable. Although individual students comprised the unit of analysis, the individuals themselves were not measured as they progressed through high school; rather a cross-section of second and fourth year students was taken as representative of the progress made between these two years. Other factors relating to the contextual effects of the school and classrooms' composition were also noticeably absent in the research design for the study.

In two separate studies Steedman used the data from the National Child Development Study which took all children born in March 1958 as its sample in order to compare progress and examination results between different British schooltypes (Steedman, 1980, 1983). These studies were longitudinal in that previous attainment scores were used for each pupil. Controls were also made for the socio-economic background of the pupils. The results after controlling for different background variables, and thus accounting for selection into the different schooltypes, showed few schooltype differences in the report on examination results, but progress for different ability groups in different types of secondary schools in the other report. Because of the nature of the data set, it is not possible to calculate the between and within-school variances, for the sample consisted on average of one pupil per school, its not having been composed for the purpose of school comparisons.

Despite the weaknesses inherent in Steedman's data set, at least for the purpose of schooltype comparisons, the results are considerably more plausible than those deriving from another study of school effectiveness done by Marks et al (Marks, Cox and Pomian-Szrednicki, 1983) in which the methodological weaknesses are so great as to invalidate their conclusions concerning the superiority of the selective system. The Marks study sought to determine whether a system of comprehensive or selective schools produced the best secondary level examination results. The data were aggregate statistics at the level of the school and the local education authority (LEA) which the authors used to compare different schooltypes within 'relatively homogeneous' LEAs, as determined by the proportion of semi-skilled and unskilled manual workers in those LEAs. The Marks et al study is a good example of illegitimate comparisons being made of school examination results due to inadequate controls being made for the social class and intake attainments of the pupils, not to mention the problems of inferences to the pupil level from aggregated data sets.[3]

Two other studies made inferences on school effectiveness as a result of research concerned more with school process than the previously more common physical measurements made of school

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[3] See Oxford Review of Education, Vol.10, No.1, 1984 for several comprehensive critiques.

facilities. Bennett studied the influence of teaching style on school effectiveness and Rutter, what was called the school's 'ethos' (Rutter, et al, 1979) (Bennett, 1976). Bennett's study concluded that a more formal teaching style, rather than the informal approaches which had become popular, produced better examination results. In a reanalysis of the Bennett data, however, the inadequacy of the methodology used to reach this conclusion was revealed (Aitkin, Bennett and Hesketh, 1981 and Aitkin, Anderson and Hinde, 1981). Besides problems concerning the statistical invalidity of the cluster analysis used in the study, the fact that no account was taken of the covariance of pupils within the same class or the existence of differences between individual teachers grouped within one of the three teaching styles, seriously distorted the results. In addition, the sample size, although originally based on some 950 pupils, was reduced to the 36 classes which emerged from the cluster analysis, since it was at the teacher/classroom level that effectiveness was assessed. This meant that statistical inference from such a small sample was not very reliable.

Rutter et al designed a longitudinal research study which set out to determine what accounted for several, differently measured outcomes of twelve Inner London Education Authority secondary schools. Not only did the authors have information on the previous attainment of the pupils surveyed but unique data were obtained from observation in the classrooms studied. Sadly, despite these favourable aspects of research design, the study was limited to only twelve schools not chosen at random and therefore making statistical inference problematical from this otherwise rich data set. The conclusion which resounded after the negative results of the first wave of research into school effectiveness, was that schools did matter, not, however, as a result of the physical resources put into the schools but rather due to their operation as social institutions, i.e. their 'ethos'.

There are a considerable number of other studies belonging to this second wave of research (e.g.Department of Education and Science, 1984, Gray, 1983, Brimer, 1978, Madaus, 1980, Reynolds, 1982). However, it is possible to summarise the lessons concerning comparisons of school effectiveness which have been learned even from the small number represented above, together with the lessons learned from the first wave studies. The first point is fairly obvious: that school effectiveness studies should ensure that the outcome measures relate directly to what is being taught at the schools under study. The second point should also be more obvious than it has been in practice: that controls for the non-random intake into different schools have to be made if the analysis is not to confound the effects of the variables under study, with the sampling variance of the school or classroom population. Thirdly, unless individual pupils are matched with their teachers and their classroom peers, one cannot legitimately measure school effects, for the social context in which such effects are to be felt is absent from the analysis. This leads to a more general point: that inferences to the pupil level - and ultimately, this is where school 'effects' are realised - cannot be made from only aggregated data (Goldstein, 1984).

Third World Research into School Effectiveness

There is a small but quite consistent literature on school effectiveness in Third World countries. This consistency derives not so much from the confirmation of any particular set of variables making for 'effective' schools - the results are as ambiguous as for industrialised countries - but rather because much of the literature evinces a certain conclusion which is meant to differentiate Third World education from education in industrialised countries. This conclusion is summarised thus:

> "the predominant influence on student learning is the quality of the schools and teachers to which students are exposed." (Heyneman, 1986)

Furthermore,

> "the lower the income of the country, the weaker the influence of pupils' social status on achievement." (Heyneman, 1983)

Curiously, this emphasis on school factors is the opposite to that reached in the Coleman and Plowden Reports whose results were paraphrased as "the home is more important than the school", a conclusion which is still upheld today, despite a more sophisticated understanding of the contribution of school-based factors.

There are a number of studies which have sought to explain the sources of differences in achievement in Third World countries. Among these are the International Association for the Evaluation of Educational Achievement (IEA) studies of achievement which included a few Third World countries (Comber and Keeves, 1973) (Thorndike, 1973) (see Comparative Education Review, Vol.31, No.1 for preliminary results from second wave of IEA research), but also studies concentrating on particular countries such as Heyneman's study of Ugandan primary schools in the 1970s (Heyneman, 1976) or Loxley's study of Egyptian primary schools in 1980 (Loxley, 1983). This research is summarised in a handful of reviews by World Bank staff, and through which runs discussion about whether or not school-based factors or the student's socio-economic background are the more important determinants of achievement in Third World countries (Alexander and Simmons, 1975, Simmons and Alexander, 1978, Schiefelbein and Simmons, 1979, Heyneman, 1986).[4] From the number of acknowledgments made that the former, i.e. school-based, factors are what really matters in developing countries, it would appear that the view of Heyneman, the major proponent, has become the conventional wisdom.[5]

While it is quite correct that research results derived from industrialised countries should not be assumed to apply automatically to Third World countries, this does not imply that the Heyneman view is thereby substantiated.[6] The research upon which the Heyneman view is based employs ordinary least squares regression analysis, fitting potential variables as three blocks, consisting of what are termed preschool influences, (comprising age, gender and socio-economic status); school influences, (comprising variables related to teachers, the physical facilities of the school and school administration); and finally pupil attitudes. Of the total variance which is explained in the different studies, the R^2, the proportion explained by school quality and that

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[4] See also (Avalos and Haddad,1981) for review of specifically teacher effectiveness studies in Third World countries.

[5] For instance, the summary of a recent report on raising school quality in developing countries begins thus:

> "Considerable evidence now demonstrates that the quality of a child's school influences his or her academic achievement in developing countries. This differs from the situation within industrialized countries where the effect of school quality is eclipsed by the child's family background." (Fuller, 1986, p.vii)

See also (Saha, 1983) and (Theisen, Achola and Boakari, 1983).

[6] Heyneman's most recent espousal of the view that school-based factors are more important than the student's home background influences on his academic achievement can be found in (Heyneman, 1986), but reference should also be made to (Heyneman, 1976, 1980, 1982 and 1983).

explained by socio-economic status is analysed. The basis for the conclusion that schooling does matter in the case of Third World countries is this analysis of variation which purportedly illustrates the greater importance of school factors relative to socio-economic background.

Even before embarking on a critique of the methodology employed in these studies, and therefore assuming that the research carried out is as accurately modelled as could be expected, one must question the use of the relative proportions of the explained variance as being a correct test of the importance of the constituent factors. The total variation accounted for by the different models' fitted variables is between 11 and 40%, not dissimilar from the proportion of variance explained in studies carried out in industrialised countries. In other words, there is much which is not explained, quite typically, by such models. Quite simply, the remaining 60% or more may be entirely due to between-school variance, but it is not possible to know within the confines of a single level model. To compare the relative proportions of what is in itself an incomplete explanation of the total variance is a meaningless exercise. Furthermore, even if one explained all of the variance in academic achievement, why would the measure of 'importance' be the sums of squared deviations from a mean value? Criticism of such arbitrary use of the proportion of variance as a measure of importance is at least as old as criticism of the Plowden Report (Goldstein, 1972, 1976). Yet, such criticism seems not to have deterred its continued use, no doubt because of the simplicity of a percentage figure.

The R^2 of an equation is a reflection of what one is able to measure. The ability to measure, say, school factors more accurately than socio-economic factors does not bestow on those school factors a greater importance any more than it would if the latter factors proved to be the easier to measure. More surprising then is it to find that Heyneman even elevates this to the level of theory. He argues that we are better able to measure socio-economic background in industrialised countries due to their greater class differentiation: as a country develops, the greater is the variance in educational achievement which can be explained and the greater proportion of this variance which is due to socio-economic factors - hence the greater importance in explaining the determinants of educational achievement (Heyneman, 1986, p.22-3). This, however, is quite circular reasoning and proves nothing. Another interpretation would be that less reliable measurements of socio-economic factors in Third World countries reflect poorly on the instruments devised to detect social and economic differentiation.

Besides the conclusions being suspect for the above reasons, the methodology employed in the Third World studies of school effectiveness also suffers from many of the same inadequacies discussed concerning the first wave of research in industrialised countries, some of them sufficient to invalidate the conclusions reached. The most damaging criticism is, as was seen earlier, the violation of the assumptions required by ordinary least squares regression analysis and so the resultant heavy downward bias of the standard errors on which the statistical significance of different variables is tested.

Some studies have avoided other pitfalls of this type of research and have included, for instance, a measure of the student's prior ability (Heyneman, 1975, Loxley, 1983, Beebout, 1972). It is unfortunate, however, that even when this intake score is included, it is sometimes taken to represent not only the prior achievement of the pupil, but all her/his background influences (Beebout, 1972).[7]

It is ironic that many of the Third World studies have also avoided the problems arising from aggregate data sets because, unlike the situation in most industrialised countries, aggregate data, such as socio-economic indices of different administrative districts, have not been ready at hand. As a result of having to construct original data sets, the individual pupil has had to be used as the first building block. This necessity, in the first instance, to utilise individual data has not informed subsequent data collection at the classroom level, and so the richness of being able to match pupils with their teachers and classroom peers has been lost. The Beebout study, for example, aggregates all the variables studied, save for the individual pupil's examination results, and so loses the potential to describe the variance between pupils and between classrooms. In his of the Third World studies (Heyneman, 1983), Heyneman is not unaware of such problems of level misspecification. Nonetheless he uses a peculiar rationalisation in one instance for accepting the assignment of class-level attributes, such as teachers' qualifications, to the school-level. He explains that although "the ability to specify a particular teacher who might have affected a particular pupil has been lost, ...experience has shown that students are rarely affected by only one teacher." (Heyneman, 1983, p.1171)[8]

If we accept Heyneman's view that there is less socio-economic differentiation in Third World countries - and this is not to

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[7] See (Bulcock, 1977) for an opposing view concerning the use of reading ability as a proxy for socio-economic background factors affecting science achievement in India.

[8] The reference he cites for such a bold statement is his 1975 Ugandan study!

accept that socio-economic factors are necessarily less important in their influence on educational achievement - the need for a correctly specified model is all the more important because the more homogeneous are schools and classrooms, the more important it is to model the levels appropriately to account for the clustering within these units.

A recent school effectiveness study of Zimbabwean secondary schools set out to discover whether differences between schooltypes in examination results at Form II could be attributed to any manipulable school variables (Mazhero, 1986). Although avoiding some of the pitfalls in research design by including pupil-level data, a measurement of prior achievement, and matching pupils with their teachers, the non-random selection of the schools surveyed severely limited the inferences which legitimately could be drawn from the study, while the exclusive use of rank order correlations to test relationships further restricted any possible conclusions that could be made from the otherwise rich data set. No interactions, therefore, were capable of being analysed. These weaknesses were well recognised in this particular study for, as Mazhero honestly states:

> "The knotty problem that could not be disentangled in this study is whether the results were as they were because of the children's ability, or rather whether children produced such results because of the school's characteristics." (Mazhero, 1986, p.430)

Mazhero finds that within-school differences are greater than between-school differences, on the basis of a comparison of the top and bottom stream mean scores for English Language. Further, he notes that the differences within each school category are greater than the differences between individual schools in English examination results. The availability of textbooks not surprisingly matters more for Mathematics than for English, given the greater possible influence of home factors on English. Teachers' qualifications seem to matter more for Mathematics than for English, though all of the top nine classes in English had teachers for whom English was their first language, interestingly. Fewer differences were found between schooltypes in Mathematics achievement than for English. No interactions can be analysed using his methodology, so a model cannot be constructed combining the various influences on academic achievement.

Mazhero draws a peculiar implication, however, from his analysis. Because, not surprisingly, he discovers that pupil ability is the best predictor of examination results, and because he can see that the greater the proportion of higher ability children (such as could be found, for example, in a selective, 'independent' school), the higher the results of the school, he concludes:

> "The most effective way of equalising results...is to ensure a balance in the proportion of higher ability children entering the various schools." (Mazhero, 1986, p.440)

From the evidence provided, such a conclusion is essentially tautological, while Mazhero is astonishingly pessimistic in his final suggestion that improvements in the quality of the poorest schools probably would not affect attainment.

In reviewing the literature on school effectiveness in Third World countries[9], one is struck by the insularity of the research and how like the first wave of studies in industrialised countries are many of the reports. There is still a preoccupation with the division of the variance into

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[9] Mazhero's study stands apart, not employing regression analysis as its tool.

school vs. socio-economic factors together with a concentration on the determinants of achievement rather than with those factors which would tend to make one school more effective than another. In addition, the research is heavily economistic, relying more on a production-function type of approach to data which are the most easily quantified, rather than necessarily being the most educationally significant. One critic of such predominantly quantitative research put it this way:

> "so many of the problems of education in the Third World by virtue of their context cry out for investigation using anthropological techniques." (Hurst, 1987)

The concentration of this Third World research on the dichotomy between school vs. socio-economic factors perhaps should not be surprising. Whilst the conclusions of the Coleman and the Plowden Reports were quite disillusioning in the context of industrialised countries, for donors ever concerned to prove their aid to education is effective, such as the predominant World Bank researchers in this field, it would be far more worrying if research were to indicate that educational achievement is accounted for primarily by socio-economic factors essentially beyond the control of donors.[10] The rationale for giving loans to the education sector of Third World countries would be weakened by such a conclusion and the less targetted objective - for aid officials - of working to raise background economic levels would have to be addressed.

In the second wave of research in industrialised countries, there emerged a greater concern for school processes and the

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[10] Of course the IEA research would not have been coloured by this potential bias.

recognition that the absence of educational theory and an overreliance on statistical significance rather than educational significance limited the value of previous studies. Indeed, what one could call 'anthropological' techniques were used in studies such as Rutter's (Rutter, 1979). Examining the references provided even in recently published reviews of research indicates that the bulk of this second wave of school effectiveness research in industrialised countries - and the changes in concentration together with the exposure of the statistical weakness of single level models to describe a hierarchical educational reality - has simply been overlooked.

A Different(?) Pattern of Third World Educational Achievement: The Theories

Heyneman advances several possible theories to explain his finding of a low association between socio-economic status and achievement in Third World countries (Heyneman, 1986). First of all, he posits that there may be insufficient variance in low-income countries to compare with industrialised countries. Strangely, however, the way he chooses to test this hypothesis is by using only one measure of family background, namely maternal education. He tries to demonstrate that this is not a plausible theory by arguing that there is no consistency across countries at different levels of economic development. Heyneman's choice of the association of maternal education with examination results to test this theory is a poor one, however, given that many students in Third World countries are first-generation students, particularly with respect to their mothers (given the sexual discrimination that has been most prevalent when school fees have to be found for a large family).

Second, Heyneman posits that a tight selection policy may account for the better performance of pupils in Third World countries of low socio-economic status. This view he attempts to test by comparing examination results for the capital of Uganda with those for a more remote region where educational selection is more competitive. In addition, he compares more and less highly selective countries of different levels of economic development and is unable to substantiate this theory. The inappropriateness of his tests is also paramount here. It is not possible to infer from such aggregate data the effect of an individual's socio-economic status on his educational achievement.

Third, Heyneman posits that it may be the multicollinearity between school quality and socio-economic status in Third World countries which accounts for the different pattern of educational achievement. He attempts to test this hypothesis by constructing a questionable index of access to school quality in different Third World studies. Although he does not arrive at any statistically significant results, his interpretation is, nonetheless, that there is an indication that "the degree of distributional inequality is not entirely random but, instead, is slightly higher in lower-income countries." (Heyneman, 1986, p.21) The association between socio-economic status and particular schooltypes and therefore indirectly, school quality, is well-known. The inability of single level models appropriately to attribute the selection effect is not improved by Heyneman's tortuous techniques.

Finally, having rejected all the above hypotheses, Heyneman puts forward several others: 1) that economic scarcity produces equality of performance; 2) that "differences among individuals exist even in the least developed countries, but that those differences are random in nature and therefore appear as a part of the residual in statistical models. As a society becomes more industrialized the residual diminishes." (Heyneman, 1986, p.22); and 3) that the dependence of child-rearing on oral rather than written communication in 'less-developed' countries diminishes the impact of the family on academic achievement.

The fact that classroom discipline is not the problem in many Third World countries to the extent that it is in most industrialised countries supports this first hypothesis insofar as it relates to a similarity in student attitudes across socio-economic classes, but one would be hard-pressed to take it further than this. Heyneman's second hypothesis is simply absurd, the circular reasoning behind it having been exposed above. The fact that there is a larger residual for Third World countries in the studies Heyneman cites should make him reconsider the measurements used and not construct faulty hypotheses that only relate to the investigator's ability to explain what variance exists.

The third hypothesis merits further consideration. It has been found in studies in the industrialised world (e.g. Douglas, 1964, ILEA, 1986) that the association between socio-economic background and mathematics, for instance, is not as great as that for English and one could well be seeing a similar phenomenon here. Mazhero, on a slightly different tack, suggests that the reason behind his finding that working class children achieve better results if they attend the former whites-only Government schools in Zimbabwe is that they have more contact with pupils for whom English is a first language. Saha advances the theory that because modern education is dysfunctional as far as traditional society is concerned that socio-economic factors have a smaller bearing on educational achievement in Third World countries as compared with industrialised countries (Saha, 1983). Niles' study of Sri Lankan urban schools counters Heyneman's view, however. She illustrates how schools tend to reinforce the advantages or disadvantages caused at home, as can be seen by the highly significant correlation between home background and academic achievement in her study (Niles, 1981). She argues that she may have discovered an urban Third World phenomenon, however, where a strong socio-economic influence is brought to bear.

The Third Wave: The Potential of Multilevel Studies of School Effectiveness

Recent developments in statistical theory and the associated development of relevant computer software have made it possible to overcome many of the methodological weaknesses of studies of school effectiveness referred to in the earlier parts of this chapter. As two authors have put it:

> "Research on school effects has been plagued by both methodological and conceptual problems. ...the two are closely related. The available analytic models tend to limit conceptualization to what can be empiricially tested through such models." (Raudenbush and Bryk, 1986)

The inability of single level models appropriately to reflect the hierarchy which exists in education systems has been the main stumbling block in such studies. Whilst improvements have been made with respect to better measurements, such as including measurements of prior ability as well as other student background factors, the stringent assumptions required by ordinary least squares regression analysis have continued to constrain the range of conclusions capable of being reached with any credibility. It should not be surprising, in view of the predominant model misspecification, that results from school effectiveness studies have not been consistent. As these studies have rarely succeeded in measuring what they have purported to measure, the relationships drawn between different variables will remain in doubt.

What characterises this third wave of school effectiveness studies is the use of multilevel models. These are unique in being capable simultaneously of analysing data at different levels of the educational hierarchy - at the pupil level, the level of the classroom, and the level of the school or a higher level, such as the local education authority. This means that a choice does not have to be made with respect to the appropriate level at which to analyse the data. Nor does one have to make unrealistic assumptions such as that there is no covariance between two pupils in a particular class or that two pupils, no matter at which school or in which class, have a variance equal to that of any other two pupils. Instead, the fact that two pupils within a particular class are more alike than two random pupils (i.e. that they are more likely to have a non-zero covariance), and the variances of two pupils in different classes or moreover different schools are more likely to be different rather than the same, are modelled explicitly.

A consequence of modelling at each level is that one is able to determine the effect of the inclusion of different explanatory variables at each level. In the simplest three level model, three residual terms will be estimated, each relating to the variance attributed to the particular level, whether the pupil, the class or the school. This is in sharp contrast to the one residual produced by single level models, which is hamstrung by its restrictive assumptions. The proportion of variance which is due to variation at each level can then be analysed so that a rich tapestry of results is produced, reflecting much more closely the social interactions present in educational reality.[11]

Multilevel models, in addition to benefitting from rather than avoiding the natural clustering which occurs in education systems, have further potential. The coefficients of the explanatory variables, rather than being modelled as fixed, can also be modelled to vary randomly across classes or schools. In other words, instead of having to assume that the effect of, say, the proportion of working class children, is the same in each school class, it can be assumed that this proportion varies from class to class.[12] It is the

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[11] If one starts with a simple single level model with only one explanatory variable and in which the random variation is only at the pupil level, the model would look like this (i=class, j=pupil k=school):

$$y_{kij}=\alpha_0+\beta x_{kij}+e_{kij}$$

$var(e_{kij})=\sigma^2$ the pupil level variance

However, the simplest three level model in which the random variation is taken to be at the pupil, the class and the school levels, would look like this (the random terms are in brackets):

$$y_{kij}=\alpha_0+\beta x_{kij}+(v_k+u_{ki}+e_{kij})$$

$var(v_k)=\sigma_v^2$ the school level variance

$var(u_{ki})=\sigma_u^2$ the class level variance

$var(e_{kij})=\sigma^2$ the pupil level variance

Efficient estimates of these residual variances are obtained through iterative generalised least squares (See Goldstein, 1986 and Goldstein, 1987 for full details.)

[12] If one allows the coefficient of the explanatory variable, β, to vary randomly across classes (and designate it as β_1 to distinguish it from the fixed β), the further random class level residual, $w_{ki}x_{kij}$, would be estimated for this coefficient, which, in general, will have a non-zero covariance with the other class level residual. This last model would look like this, with all the random terms in brackets:

multiplicity of random terms which can be estimated using multilevel models that enriches their use.

Some of the multilevel models becoming increasingly available have a further feature of importance. This is a correction for the reliability of the measurements used. Errors of measurement in the explanatory variables are likely to lead to inconsistent estimates, in particular, underestimates of the fixed parameters. Other problems arise in the case of errors of measurement in the response variable, as Goldstein explains:

> "these will not lead to inconsistencies in the fixed parameter estimates but will lead to inconsistencies in the random parameter estimates and will reduce efficiency." (Goldstein, 1987, p.45)

Some of the differences which such corrections can make can be found in one of the multilevel studies of school effectiveness (ILEA, 1986, Technical Appendices, pp.93-4).[13]

Given the recent development of these models and their accompanying software, there are but a few examples of their application, the most comprehensive being the Inner London Education Authority's Junior School Project (ILEA, 1986). Reanalyses of previously worked data sets, however, have also been carried out (Aitkin, Bennett and Hesketh, 1981; Raudenbush and Bryk, 1986; Aitkin and Longford, 1986; Goldstein, 1987; and Goldstein in Hull, Smith and Skinner (to appear)).

$$y_{kij}=\alpha_0+\beta_1 x_{kij}+(v_k+u_{ki}+w_{ki}x_{kij}+e_{kij})$$

[13] It was not possible in this research to take advantage of this feature, however, due to certain software problems that had not been resolved at the time.

Typically, the multilevel reanalyses which have been carried out of data sets previously analysed using single level models, have produced much more conservative estimates of differential effectiveness. It can be assumed that this is largely because of the greater control multilevel models have over sources of variation. So, the reanalysis of Bennett's Teaching Styles found that the variation among teaching styles was quite small in comparison with that among teachers within particular teaching styles (Aitken, Bennett and Hesketh, 1981). Similarly, the reanalysis of the Coleman, Kilgore study of public and private secondary schools in the United States found that after including the effect of school-level socio-economic status, no significant variation was found between schooltypes (Raudenbush and Bryk, 1986).

Goldstein's use of some of the IEA data to illustrate the potential of multilevel studies for the purposes of school comparisons across different countries illustrates how 'comparable' tests need not be devised given the relative, rather than the absolute comparisons which can be made between the variance attributed to each level of the school system by different factors (Goldstein, in Hull, Smith and Skinner (to appear)).

The wealth of analysis facilitated by multilevel models, however, is nowhere exemplified in better fashion than in the ILEA Junior School Project (ILEA, 1986). In this study, a mammoth task has been undertaken, involving the analysis of numerous, longitudinal, cognitive and non-cognitive outcomes of pupils in the junior schools of the Inner London Education Authority. A full summary of the conclusions reached would be beyond the scope of this chapter, but several results of importance to this study can be presented briefly.

One of the conclusive results of the ILEA study was the finding that schools which were found to be effective for one social class, generally were found to be effective for all social classes. This was also true across sexual as well as ethnic differences. Also of interest was the finding that progress in mathematics was not related to social class after intake attainment and other background factors were controlled for. Home factors in general, however, were found to be less important influences on mathematics progress and attainment than upon reading. There was also wider variation between schools in reading than was the case for mathematics. Further, schools which tended to be 'effective' in reading, tended to be 'effective' in mathematics as well. It was found that progress in mathematics may well be more prone to variation in progress at the class level than progress in reading. Finally, the impact of school and class membership is likely to be cumulative.

When an attempt is made to distinguish those particular factors which make for a more or less effective school, in terms of any of the different outcomes analysed, it is interesting to note that the multilevel model is abandoned, and instead, single level techniques of multiple regression analysis are employed. This is no doubt due to the need to screen so many variables on which data was collected. It seems unfortunate, however, that the fruits of such an exercise are not then fed into one of the multilevel models for further analysis. Nonetheless, the study outlines twelve key factors as being the most important influences on whether a school is 'effective' or not. Significantly, none of these factors consist of measurements of physical inputs to the education system - the predominant concern of the first wave of studies. Rather, such factors as the head teacher's leadership qualities, a work-centred environment, intellectually challenging teaching, limited focus sessions in the classroom, and a positive school climate are all singled out for attention. This underlines even further the sort of data collection that is necessary in school effectiveness studies. The requirements consist not only of longitudinal data on individual students, matched with their teachers and classroom peers, but measurements at the school and classroom level that are unlikely to be reached satisfactorily without some degree of observational studies. This is far removed from the production function approach but makes exhaustive demands on individual researchers.

One final, critical note seems necessary regarding the presentation of some of the findings of the ILEA study. It seems strange that with such a rich data set that some of the conclusions arrived at hark back to previous studies in which the components of variance cannot be distinguished. For example, one finds much discussion of the proportion of variance 'explained' by school or background factors which is essentially referring to the proportion of R^2, much as was discussed concerning Third World studies of school effectiveness. Instead, what should be discussed in a multilevel study are those changes in the proportion of variance attributed to different levels as particular variables are introduced to the models. This is, however, a criticism of the presentation and not the analysis carried out in the study.

The methodological criticism of this chapter should throw light on the rationale behind the design of this study which is presented in Chapter Three. In addition, the conclusions reached by this research concerning the effectiveness of Zimbabwean secondary schools will be compared in Chapter Seven with the review of research results just presented.

CHAPTER THREE

A Description of the Study, the Sample, the Variables and the Schooltype Differences

The Study

The origins of this study are to be found in the exigencies of planning for the massive expansion of secondary education which has taken place in Zimbabwe since Independence, as described in Chapter One. This expansion has occurred despite financial limitations, as well as constraints in terms of the supply of trained teachers, textbooks, classroom furniture, not to mention classrooms, i.e. physical schools. One of the aims of the research is to provide a data-base that will facilitate government budgetary decisionmaking helping to determine priority areas for funding by uncovering those educational inputs in Zimbabwe which appear to be influential. The study assumes that the political decision to afford an 'O' level education for all continues to be the driving force behind the growth of secondary education. If this policy were to change, (for instance, if pupils of different abilities were to be channelled into schools or streams offering different curricula, as was the case in the past), the results of the research would still hold for the academic sector, particularly as the initial intake characteristics of the pupils are controlled for in the models presented in Chapter 5.[1] It would not be relevant, however, were the form of the school leaving assessment to change its nature markedly.

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[1] As has already been pointed out, it may be that in the future the Junior Certificate Examination, taken after the first two years of secondary school, will be used as a selective examination for the purposes of channelling students into academic or technical/vocational streams. "Reforms aim to make school education more relevant", <u>The Financial Gazette</u>, 13 March 1987, Harare, p.2, and report of the President's speech, <u>The Herald</u>, 24 June, 1987, p.7.

The initial research consisted of collecting the 1985 'O' level results in English Language, English Literature and Mathematics for all the Form IV pupils in a sample of schools covering the gamut of schooltypes in Zimbabwe. As a measure of intake ability, the pupils' Grade 7 Examination grades in these three subjects were retrieved. All the pupils were matched with their Form IV teachers in these three subjects as well as their classmates. Extensive, further information was also collected on the pupils' backgrounds, their teachers, and the facilities and characteristics of the different classes and schools. A full description of this data is given below. Goldstein's multilevel model (Goldstein, 1986) was used to analyse the data. Details of the analysis are presented in Chapter Six.

Data collection was carried out in 1985 during two visits made to Zimbabwe. During the first visit, from February to April 1985, the sample of schools was constructed and the questionnaires written, distributed and explained to the concerned parties, in order to begin generating the data required for the study. A teachers' verbal aptitude test also was piloted. Much of the data were obtained from questionnaires directed at all the 1985 Form IV pupils in the schools sampled, their English and Maths teachers, the headmasters and the responsible authorities of the schools. (See Appendix 3.1). In addition, a great deal of data were collected from the Ministry of Education concerning the teachers' background information, government school running costs, goverment allocations and overall education statistics. During the second visit, from October to November 1985, the questionnaires were chased up and additional information obtained from the Ministry of Education and the responsible authorities of the sampled schools.

FIGURE 3.1

DIAGRAM REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

Source: Ministry of Finance, Economic Planning and Development, 1986.

FIGURE 3.2

Map of Zimbabwe's Administrative Provinces

DIAGRAM REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

Source: Statistical Yearbook of Zimbabwe, 1985, Central Statistical Office, Harare, 1985.

Construction of Sample

A variety of factors were considered in the construction of a sample of secondary schools in Zimbabwe to ensure that it was representative of the total population. A first consideration was that both urban and rural schools be represented. A second factor was that the major ethnic groups should receive adequate coverage. To meet these requirements the two major urban areas of Harare and Bulawayo were chosen, Harare being the urban centre of the predominantly Shona population and Bulawayo the urban centre of the predominantly Ndebele population. (The maps in Figures 3.1 and 3.2 show the major cities and administrative regions from which sampling districts were subsequently chosen.) In addition, of course, a representation of Europeans (i.e. whites) was also ensured by coverage of urban schools, since European pupils are found predominantly in the cities, even when the parents are farmers, for it is the custom to send their secondary school-age children to urban boarding schools.

In choosing the other areas from which a sample would be constructed, factors of time, distance and expense had to be considered, as well as security, given the circumstances in the country at the time. Thus of the six educational regions, Mashonaland East and Midlands Regions were chosen, this choice enabling the study to cover the two major ethnic groups as well as satisfying these other considerations. Midlands was a compromise, not being too distant and yet covering an Ndebele population without the same security risks involved in selecting Matabeleland.

Having chosen the regions, preliminary population census figures from the 1982 census were used to select rural administrative districts from which to sample rural secondary schools.[2] Although figures for the age-cohorts in each district would have been preferable, total population figures by district were used because, at the time, the age cohort figures available were unreliable.[3] The districts in each region were listed alphabetically and their populations added cumulatively. Random numbers were applied to select the one major district per region to be sampled as well as one minor district per region to be used as a fallback in case the number of schools by schooltype in the major region was insufficient. The districts chosen in this manner, thus reflecting a probability proportional to the size of the total population, if not ideally the total secondary-school-age population (Hoinville, G., 1977, pp.66-67), were Mudzi (Mashonaland East) and Mashambazhou (Midlands) as the two major districts, with Rudhaka (Mashonaland East) and Zvishavane (Midlands) as fallback districts.

For the selection of urban schools, alphabetical lists were compiled in which the total school enrolments were cumulated for each of the following three urban schooltypes: government Group A (the former whites-only government schools), Government Group B (urban) (the former non-European government schools) and 'independent'(as in the British usage, 'public' schools).[4] A list was compiled for each of the following

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[2] 1982 Population Census: A Preliminary Assessment, Central Statistical Office, Harare, February 1984. The final census figures were unavailable in February 1985 when the sample was chosen.

[3] Age-cohort figures from a 10% sample of the census were available but officers of the Central Statistical Office regarded them as unreliable due to the strong urban bias in the sampling. Interview with Mr. Mzilethi, CSO, 20 February 1985.

[4] 1984 enrolment statistics were used as the 1985 statistics were unavailable at the beginning of the year when the sampling had to be done. Primary Schools', Secondary

regions: Harare, Bulawayo, Mashonaland East and Midlands. Schools were selected from these lists with probability proportional to size in an analogous way to that described for the selection of administrative districts, determining the sampling interval by dividing the total population by the number of schools to be selected. Only secondary schools having a Form III class in 1984 were listed, so as to ensure that only schools going up to Form IV in 1985 were selected, since 1985 'O' level results were to be the outcome measure.

The selection of rural schools was made in the same manner, compiling alphabetical lists for each of the four rural administrative districts of the following rural schooltypes: Government Group B (rural), mission, and district council (i.e. local authority-run schools).

It was not possible to duplicate in the sample the proportions of particular schooltypes in the total school population because to do so would have produced negligible numbers of schools on which to base schooltype comparisons in the cases of those schools not well represented in the total school population. This would have occurred, for example, in the case of the 'independent' schools, as also with the two categories of government schools. A minimum of four schools was thought to be necessary per schooltype for the analysis. Thus, four schools therefore were selected, in the above manner, for the government A schools, the government B schools, divided into four urban and four rural Group B schools, the mission schools and the 'independent' schools. Given the high number of district council schools, 60% of the total, it was thought important to capture a good proportion of these in the sample. Sixteen were selected from this

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<u>Schools' and Teachers' Colleges' Enrolment and Staffing Statistics First Term 1984</u>, prepared by Statistics Unit, Planning Division, Ministry of Education.

category, which in fact was more than could be obtained from the two 'major' administrative districts sampled. Table 3.1 illustrates the representation of different schooltypes in the total school population for 1983 and 1984, as well as the proportion of the schooltypes selected in the final sample of schools.[8] One can see the effect of the rapid educational expansion, even with the passage of only one year, on the proportions represented by different schooltypes.

TABLE 3.1

<u>Breakdown of Total Number of Secondary Schools by Schooltype</u>

[redacted]

TABLE REDACTED DUE TO THIRD PARTY RIGHTS OR OTHER LEGAL ISSUES

Source: Ministry of Education statistics

[1] More recent figures broken down by these schooltypes have not been available.
[2] Farm schools
[3] Zimbabwe Foundation for Education with Production schools. See below.

Not all schooltypes were included in the sample, as can be seen from Table 3.1. Certain judgments had to be made regarding which schooltypes to include. The low

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[8] More recent figures broken down by these schooltypes are not available.

representation, together with the anomalies of the excluded categories, not to mention the limit of schooltype comparisons that can reasonably be made, argued in favour of their exclusion. Rural councils present a case in point. The farmworkers who predominantly reside on these former European commercial farming areas, are still disenfranchised, and five years after Independence it was still not clear which administrative body would take control of educational provision in these areas. As a result, the schools are in some respects in a no-man's land. Thus, besides being small in number (at least those which are registered), their characteristics are quite atypical. The Provincial Authority schools are a dying breed, being subsumed by the district councils. The mine schools suffer some of the same constraints as the farm schools. And the ZIMFEP (Zimbabwe Foundation for Education with Production) schools, although government-run, are few in number and represent a different type of education, initially intended to be model schools pointing to different ways forward educationally.

No further sampling was done at the school level. All the Form IV pupils in each of the 36 schools were included in the study. The intake year for the group of 1985 Form IV pupils was therefore 1982 or later.

An assumption which had to be made in the study was that the Form IV pupils were representative of the whole school body at each school. It was not felt that such an assumption was unreasonable, given that admission into these schools had already changed before the sampled group of pupils entered secondary school: the new government's commitment to 100% transition from Grade 7 to Form I had already opened the net to these children. In addition, as will be explained in Chapter Four in greater detail, the analysis of these pupils' 'O' level results uses a Grade 7 intake score together with other background measures, thus controlling in large part for the variablity of the intake. Thus, the possible unreliability of this assumption is further reduced.

Overview of the Sample and the Response Rate

Having selected the schools in the sample, the headmasters were sent over the Easter holidays, 1985 the set of six forms which are in Appendix 3.1 (Items B-H): the Form IV Student Questionnaire, the Form IV English and Maths Teachers' Questionnaire, the Headmaster/Headmistress' Questionnaire, the Teachers' Verbal Aptitude Test, and the Checklists of Recommended Form IV English and Form IV Maths Books. Out of the 36 schools selected, 32 returned sufficient forms to be included in the study.* The sample comprised 3413 pupils distributed over 103 classes in the 32 schools and 98 teachers of either Form IV Mathematics or English. Table 3.2 shows the breakdown by schooltype of the numbers of pupils, classes, and schools, giving the percentage of the total sample population in each category.

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* As the study necessitates pupil-level information, if the student questionnaires were not returned, there was no point in pursuing the return of the other forms. Only in the case of one mission school was cooperation received in the return of the student questionnaires but not in the return of the teachers' questionnaires, thus including the school in the descriptive side of the study although excluding it from the analytical side.

TABLE 3.2

Description of Sample Population of Pupils, Classes and Schools by Schooltype

Schooltype	No.Pupils	%	No.Classes	%	No.Schools	%
Govt A	416	12	16	16	4	12.5
Govt B Urb.	1208	35	36	35	4	12.5
Govt B Rur.	479	14	12	12	4	12.5
Indep.	182	5	7	7	3	9
Mission	392	11	10	10	4	12.5
Dist.Coun.	736	22	22	21	13	41
TOTAL:	3413	100	103	100	32	100

The reason for the disproportionate number of pupils in the government Group B urban schools is that some of these schools have as many as twelve Form IV classes averaging 40 pupils per class. Given that all Form IV pupils were to be included in the study, this meant that the proportion held by this schooltype was going to be very high.

The total sample comprises 4% of the 91,723 Form IV pupils in the country in 1985, but an 8% sample of all government Group A Form IV pupils, 6% of all government Group B Form IV pupils, but only 2% of all private school Form IV pupils. If one takes the number of secondary schools in 1981 as indicative of the number of secondary schools reaching Form IV in 1985, then the schools selected comprise a 5% sample of the 685 secondary schools likely to have Form IV classes in 1985.

The response rates for the return of pupil questionnaires were very high. Table 3.3 depicts the proportion of pupils responding by schooltype. There was an overall response rate of 79% of all pupils surveyed, according to the number of Form IV pupils reported to be at the sampled schools in the second term of 1985, when the survey was conducted.[7] Of all the schools responding - and three did not return pupil questionnaires - 84% of the pupils replied.

TABLE 3.3

Response Rates of Pupils by Schooltype

Schooltype	Response Rates
Government Group A	77%
Government Group B Urban	84%
Government Group B Rural	92%
Independent	58%[1]
Mission	82%
District Council	70%[2]

[1] 70% of pupils from all schools responding (one school did not)
[2] 86% of pupils from all schools responding (three schools did not)

The response rates were also quite high for the other questionnaires and forms despatched. For the 32 schools included in the study, all the headmasters completed the questionnaires addressed to them; all but five teachers at one school wrote the verbal aptitude test sent them; 87 of the 98 teachers completed their questionnaires; and lists of textbooks available for individual classes were completed for 84% of all the 309 subject classes.

Choice and Description of the Variables

The choice of variables used in the study was determined by a number of factors: the particular methodology adopted; a review of previous research; information available from the Ministry of Education; information that could be obtained

[7] ED46 (Part II) statistics for 1985 from Ministry of Education, Harare.

primarily through a postal survey, etc. In the following three sections a description of the variables on which information was collected will be given, explaining the rationale for the choice of each variable, how the information was obtained, the names of the variables used in the research and the coding applied to them. In the final sections a description of the variation between schooltypes will be given, illustrating those differences which one is trying to explain in the research in the response variables as well as the differences by schooltype in the explanatory variables.

Clearly, using a postal survey has major limitations. No observational variables could be included in the research. Teacher-pupil interactions were thus eliminated as well as information on teaching style. The study has an economic bias in that it springs from concern over the financial implications of the rapid educational expansion and the effects on the quality of education. There is no doubt that less tangible inputs than those included in the study, such as teaching style, have a major impact on the learning that takes place in the classroom. Furthermore, it could be argued that such inputs are liable to manipulation without major cost implications as, say, in the provision of sufficient textbooks which would have a direct economic impact. In addition to the absence of these variables in the present study, the use of a postal survey also raises questions about the reliability of the information provided. There is no opportunity, as in the case of an interview, of verifying the data. As the Ministry of Education fully cooperated in the study, however, and the survey was conducted with its support, it is likely that, barring any misunderstanding of the questionnaires, the information so obtained is as accurate as could be expected.*

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* The questionnaires and returning data were sent through Ministry of Education channels.

Data for the variables were collected at three levels, the pupil, the classroom and the school. The pupil-level variables will be dealt with first.

Pupil Level Variables

As the research was to be based on the data of individual pupils, collecting certain background information on each pupil was an obvious starting point. All of the pupil-level variables were obtained through the pupils' questionnaires (See Item C, Appendix 3.1), with the exception of the Grade 7 and 'O' level Examination scores which were obtained from Ministry of Education, Examinations Branch records.

Three 'O' level subjects were chosen: English Language, English Literature and Mathematics. The reason for this particular selection was that these are the subjects tested in the final year of primary school on the Grade 7 Examination so there would be intake scores for all three subjects. Furthermore, the fact that all pupils proceeding to 'O' level must take English Language and Mathematics (in addition to other subjects of their choice), ensured a certain amount of consistency in the subjects tested. Whereas prior to Independence the Grade 7 Examination used to be a selective examination for entrance into secondary school, it no longer serves that purpose. Today it is used only to indicate previous achievement, as all pupils are to be afforded Form I entrance on completion of Grade 7, and not exclusively the 'European' population. Unlike the Cambridge 'O' level examinations which are in the process of being localised, the Grade 7 Examination was set internally in 1981, the year in which most of the 1985 Form IV pupils selected in the sample survey sat it. Unfortunately for the purposes of the research, it was not until 1982 that the Grade 7 Examination was made obligatory for all pupils, however. As a result, European pupils are eliminated from the final analyses for the reason that no intake scores for them were available.

The variable names for the pupils' grades on the six examinations included in the study are as follows: GR7E1, GR7E2, GR7M for Grade 7 English Language, English Literature and Mathematics, respectively, and OLEVENG1, OLEVENG2 and OLEVMATH for the same respective subjects at 'O' level. (Appendix 3.2 consists of a glossary of the full set of variables and their names.) The widely used ILEA translation of the alphabetic 'O' level grades to numeric grading was used. This is shown in Table 3.4.

TABLE 3.4

Translation of Alphabetic 'O' Level Grades to a Point System

'O' Level Grades:	A	B	C	D	E	U
'O' Level Points:	7	6	5	4	3	0

Source: ILEA Research and Statistics, School Examination Results in the ILEA 1984, RS977/85, Inner London Education Authority, London, 1984, p.33.

A stanine scoring system was used on the 1981 Grade 7 Examination, with grades ranging from 1 to 9, 1 being the highest grade and 1 through 6 being passes. However, as this was the reverse ordering for achievement from the 'O' level point system, the scores at Grade 7 were inverted, a score of 9 representing the top score and 4 through 9 being passes. Without such a reversal of scoring, the regression equations would have been awkward to interpret.

The pupil questionnaire provided the following, straightforward information (the variable names are given in parentheses): the sex of the pupil (SEX), his class (CLASS), his English and Maths teachers (ETEACHER, MTEACHER), whether he was a day or a boarding pupil (DAYBDING), his age (AGE), and his ethnic group (ETHNICGP), coded Ndebele, Shona, Coloured, Asian, European and Other. The inclusion of these variables, beyond the identification of the pupil's class and teachers, was to determine whether or not pupil achievement was stratified with respect to any of these background factors. A discussion of the initial regressions of 'O' level results on these and subsequent background variables is found in Chapter 4, and Table A4.1 in Appendix 4.1 gives the results of the single level regressions on individual background variables.

As not all pupils had attended the same secondary school for four years, the variable ATHISCH was used to indicate the number of years the pupil had attended the particular school at which s/he sat the 'O' level examinations. This variable was important because the additional assumption had to be made: that the influences ascribed to each pupil's Form IV English and Maths teachers represented the influences of all of his English and Maths teachers in the years between Grade 7 and Form IV.[9] Although not a realistic assumption, it must be admitted that in effect the regressions of the teachers' characteristics on the pupil's 'O' level achievement, after controlling for his Grade 7 achievement, are doing just this. If a large proportion of the sampled pupils had not spent the four years of secondary school at the particular school in question, then the assumption would be questionable. However, as some 79% of the pupils had spent the four years at the same secondary school as that in which they sat their 'O' levels,

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[9] In addition, it had to be assumed that the school-level variables measured in the fourth year of secondary school represented all of the influences of the four years the pupil attended secondary school.

and only 3% were new to their Form IV schools, the assumption did appear reasonable.[10]

Another variable, FAVORSCH, was intended to distinguish between those pupils who stated that their Form IV school was their first choice and those who stated that they would have preferred to have been at another school. The use of this variable was intended to give some idea of the pupil's attitude toward her/his Form IV school, as well as possibly to give a ranking to the schools in terms of the most favoured ones.

Four separate questions were asked of the pupils in order to build a picture of whether or not they lived at home, together with information about who paid their school fees. It was thought that these variables might discriminate between different subpopulations and might prove of interest. The reason for the complexity of the particular questions asked in this regard is the influence in Zimbabwe of the extended family and the difficulty of defining 'home' simply.[11] The variables considered consisted of the following: a) who of the

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[10] With hindsight, the wording of the question concerning the variable ATHISCH could have been improved. The 79% figure is probably lower than the actual percentage who spent four years at their Form IV secondary school due to possible confusion with the previous question about the school where they sat the Grade 7 Examination. (See questions 10 and 11 on the student questionnaire - Item C, Appendix 3.1).

[11] In particular the intention was to isolate those students who really didn't live at 'home' in any sense of the word. For instance, a phenomenon had cropped up whereby some pupils would live with relatives for the purpose of being in the catchment area of a particular school, notably the case of those pupils migrating from the rural areas which were, for a time, in the anomalous position of having to pay higher school fees than the pupils in urban areas at more well-provided schools. There were also cases of some pupils living in improvised huts of their own making during the week, so as to be near the school of their choice.

following people paid the pupil's school fees (FEEPAYER): father/mother, aunt/uncle, grandparent, sister/brother and other; b) whether or not the pupil lived at "home" during the school term (in the case of day pupils) or during the school holidays (in the case of boarding pupils) (LIVEHOME); c) with whom the pupil lives (LIVEWHOM) (same distinction made between day and boarding pupils), of the following people: father and mother, father only, mother only, aunt and/or uncle, grandparent/s, other; and d) whether the people with whom the pupil lives are the people who provide for him (LIVEPROV). The correspondence between the variables LIVEHOME and LIVEPROV was ultimately what needed to be examined, and of the 91% of the pupils who stated that they lived at home, 95% also stated that they lived with those who provided for them.

Three remaining sets of pupil-level variables were used to delineate the socio-economic status of the pupils by detailing the educational and occupational background of their parents and certain home amenities. Analogous variables for father and mother included FEDUC and MEDUC, the highest academic level reached by the father and mother respectively. These levels were broken down and initially coded as shown in Table 3.5:

TABLE 3.5

Coding for Father and Mother's Educational Background

0	No Schooling
1	$\leq$ Standard 3
2	Standard 4,5
3	Standard 6/Grade 7
4	Form I,II,III
5	Form IV,V
6	Form VI
7	Certificate
8	Diploma
9	Degree and above

Subsequently, in order to use a more simplified equation in the final models, this coding was collapsed into the following five categories:

> 1) No Schooling; 2) Standard 3 - Standard 5; 3) Standard 6/Grade 7; 4) Forms I-V; 5) Form VI and higher.

Two further variables, FWORKS and MWORKS were used. These indicated whether or not the father or mother, respectively, earned a living. The use of these particular variables was intended to isolate those pupils, either of whose parents was unemployed. This was further corroborated by subsequent questions, for it was not the intention to exclude those engaged in peasant farming or in informal sector activities, as it was quite common for a pupil to reply that his mother or father did not earn a living, but subsequently to state that s/he was a peasant farmer. The variables FJOB and MJOB coded the father's and mother's occupational categories, respectively.[12] An adaptation of the International Labour Office's classification of occupations (ILO, 1969) was devised to make particular distinctions which are important in the Zimbabwe context. Table 3.6 illustrates the adaptations made, with asterisks showing the differences from the ILO classifications.

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[12] On reflection, the wording of the introduction to questions 20-29 on the student questionnaire (Item C, Appendix 3.1) may have had the unfortunate effect of excluding many mothers from having a full description made of their economic activities, but peculiarly, not of their educational backgrounds. The intention was for the pupils to detail the backgrounds only of those providing for them, in the same sense as in the previous questions related to their 'home'. What resulted in practice was that respondents simply gave incomplete answers as to their mothers' backgrounds. The discrepancy shows up in the frequency with which MJOB is left blank. Although there are only 350 missing responses for MWORKS, there are 1691 missing responses for MJOB, whereas for FWORKS there are 170 missing responses and 587 for FJOB. We expect that a large proportion of the missing responses for MJOB would have been coded 62, 80 or 90, more realistically. (See Table 3.6)

TABLE 3.6

Coding of Father and Mother's Occupational Categories

10	Professional
20	Administrative, Managerial
30	Clerical
*41	Sales - Proprietors Only
*42	Sales Workers, including Managers (not 41) (ILO #4 otherwise)
*51	Service - excluding domestic (not 52) (ILO #5 otherwise)
*52	Service - domestic, unskilled service
*61	Commercial Farmers
*62	Peasant Farmers and Commercial Farmworkers
70	Production Workers, Drivers, Craftsmen
*80	Informal Sector
*90	Unemployed

Some explanation of these differences in occupational classification needs to be given. As working sales proprietors are set apart from salesworkers in practice, in terms of socio-economic status and real earnings, it was thought unwise to group these together (as the ILO classification does), particularly as in the rural areas the ownership of a shop would clearly differentiate the parent, and thereby the pupil, from his peers who were otherwise engaged only in farming. Similarly, given the size and importance as an occupationsl classification of domestic workers in Zimbabwe - they comprise about 10% of the formal sector labour force - placing them in a separate category of relatively unskilled service workers also seemed more sensible. Again, to classify commercial farmers together with peasant farmers would only serve to obfuscate what is one of the most disparate divisions in Zimbabwe, so a separate category was made for each. In practice, the coding sometimes proved difficult, given the vagueness of some of the answers provided, but usually it was possible, particularly with the answers to the subsidiary questions, to correctly classify the parent. This is corroborated in part by the cross-tabulation of father's occupation with father's educational level as described below and in Table 3.7.

The importance of the informal sector as a source of earning and its differentiation from more formalised entrepreneurial activities made the choice of a separate classification desirable. It applies equally to rural and urban families, in urban areas comprising predominantly hawkers - male or female - as well as dressmakers, knitters, crocheters; in rural areas this category was predominantly made up of female hawkers, selling garden - as opposed to field - produce, pots, baskets, mats, etc., not to mention the widely reported hawking of goods imported illegally from Botswana and South Africa.[13]

Subsequent to the original coding, a further collapsing of the occupational categories was found to be necessary, in order to simplify the regression equations in which these variables were to be included. Although perhaps seeming tendentious, commercial farmers were grouped together with the otherwise white collar occupations, professional, administrative and managerial and clerical, as well as sales proprietors. In other words, categories 10, 20, 30, 41 and 61 comprised the new category 1. As the commercial farmers are likely to have more in common with the white-collar workers, in terms of socio-economic background, this was not thought unwise, given the use to which these classifications are put. The grouping

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[13] Clearly some of the responses were easily coded, while others required some thought as to what occupation was being described. The following examples illustrate amusing light relief from the otherwise tedious process of coding nearly 3500 student questionnaires. For mother's occupation: 1) She is a mistress (teacher). 2) She sells muddy pots. 3) She swores cloths. 4) She is a green monker. 5) She tells me not to be hush. 6) Bus Driver (but divorced mother). 7) She sells beasts (cattle). Much more typically: 8) She works as a numberless farmer.

of categories 42, 51, 52 and 70 into a 'blue-collar' category 2 would seem more straightforward perhaps. Finally, category 3 is made up of classifications 62, 80 and 90, in other words, peasant farmers, the informal sector and the unemployed. It might seem nonsensical to include the 'unemployed' in this category, but the rationale is fairly obvious: the drift between the three classifications which make up category 3 is quite common and the distinctions between the three groupings not all that distinct.

The cross-tabulation of father's occupation with father's educational level (see Table 3.7) bears out the above groupings in terms of the expected educational level of each category. Strictly speaking, there need not be any necessary correspondence between educational and occupational categories, although in practice, this frequently proves to be the case. Yet, the purpose of coding both the parents' educational and occupational grouping, together with certain home amenities, is to arrive at a composite variable representing the socio-economic background of the pupil. So in this sense, the cross-tabulation of the two variables should be considered legitimate. Table 3.7 shows the percentages of each occupational category in the bottom two and the top two educational levels.

TABLE 3.7

Cross-tabulation of Occupational Categories with Educational Levels

		No Schooling or up to Std.5	Form I or higher
CATEGORY 1:	White Collar and Commercial Farmers	7%	71%
CATEGORY 2:	Blue Collar	30%	30%
CATEGORY 3:	Peasant Farmers, Informal Sector and Unemployed	62%	7%

The final set of pupil-level variables concerns certain home amenities: how much living space there is at home, measured in rooms per person (LIVSPACE), whether or not there is a radio present at home (RADIO), a television (TV), electricity (ELECTRIC) or whether newspapers are regularly received in the home (NEWS). There is no causal influence assumed in the choice of these variables. The reason for their inclusion is to further characterise the home background of each pupil. In a country such as Zimbabwe, these items serve to differentiate the pupils considerably, particularly, of course, with respect to rural or urban location. The variable LIVSPACE may be the most tendentious in that no calculations of room size are given, and in particular, in the rural areas there can be many different huts for members of the same family, but some indication of whether or not the pupil has to cope with cramped conditions at home is probably reflected in this variable. Two remaining variables complete the description of the pupil's background: how many hours of homework the pupil estimates he does each day (HOMEWORK) and whether or not there is anyone living with the pupil from whom he can obtain help with his homework (HELP). Regarding HOMEWORK, as experience suggests that pupils would tend to exaggerate the number of hours of homework completed, if there was a spread of the number of hours given, for example 6-7 hours, the lower figure was taken. Similarly, figures were rounded down, not up, if rounding needed to be done.

Class Level Variables

Pupils are grouped together educationally in classes. They undergo common influences which can be attributed to variables at the classroom level, in relation to the teacher, the textbooks, the class size, etc. Each pupil was identified in her/his particular class and with her/his teachers so that the part played by these classroom factors could be analysed. The data for the class-level variables were obtained from different sources: the teachers' questionnaire (Item D, Appendix 3.1), the verbal aptitude test sat by the teachers (Item F, Appendix 3.1), and the checklists marked by the teachers, indicating the textbooks available for the classes taught (Items G and H, Appendix 3.1). In addition, certain background information on the qualifications and experience of the teachers was obtained from Ministry of Education records. The class size (SIZE) was taken from the revised second term statistical returns, the ED.46 (Pt.II). It was thought that the second term records would give a more accurate picture of the actual class size than the first term records which are completed in the first week of term.

The availability of textbooks varies considerably between schools and has been shown to be related to academic achievement in Third World countries (Heyneman 1978, Simmons 1978). Whether or not previous research has substantiated this relationship, it is an obvious variable of interest. As a means of counting the numbers of textbooks available in each class, checklists were drawn up from the lists of books recommended by the Ministry of Education and teachers were asked to fill these in for each class taught. The total number of texts per class was divided by the class size to make up the variables ELANPUP, ELITPUP and MTEXPUP, denoting the number of texts per pupil for English Language, English Literature and Mathematics, respectively. These three variables were coded as follows: a) no texts, b) fewer than 1 text per pupil, c) fewer than 2 texts per pupil and d) 2 or more texts per pupil. In addition, the number of teachers' texts available for each class was also recorded, denoted by ETEXTCHR and MTEXTCHR.

Teachers' verbal aptitude was included as a variable for two reasons, firstly, because of its prominence as a significant factor in much of the first wave of American research into school effectiveness, (however questionable some of the findings) (Coleman, et al, 1966, Hanushek, 1979, 1981, Levin, 1976, Murnane, 1981, Summers and Wolfe, 1977, Winkler, 1975). Secondly, however, it is a variable of particular interest in this study because English is a second (or third) language in Zimbabwe, whilst being the language used for teaching. Given that it was likely that the sample would have a high proportion of unqualified teachers who were also non-native English speakers, it was thought important to test whether their verbal aptitude had a significant influence on the academic achievement of their pupils[14]. As there was no appropriate, 'standard' test which could be put to the group of teachers in the sample, a test unique to the study was devised and piloted with the assistance of the Ministry of Education.[15] (See Appendix 3.1, Item F.) It consists of a cloze test constructed from a slightly adapted passage from

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[14] In fact, as can be seen in Table 3.11, although overall, no more than one-quarter of the teachers surveyed were unqualified, in certain categories of schools, such as district council schools, more than two-thirds of the teachers were untrained.

[15] I am indebted to Nicolas Hawkes, a British Council technical expert seconded to the Ministry of Education, for his help in constructing and piloting the teachers' verbal aptitude test.

Edward De Bono's <u>Lateral Thinking</u> (De Bono, 1977) in which every sixth word is missing and the task is to fill in the blanks with an appropriate and grammatically correct word, (not necessarily the original word left out), as can be seen from the answer sheet. About two-thirds of the blanks consist of structural words and one-third relate to the meaning of the passage. The test was scored in relation to the percentage of words correctly inserted in the 100 blanks.

The test was first piloted on a group of predominantly native English speakers in two 'A' level English classes at a commercial college in Harare. The results were high as could be expected from a group whose native tongue was English. The average score of the 15 native English speakers was 87, with a minimum of 76 and a maximum of 95. The three non-native English speakers averaged 73, with scores of 64, 75 and 79.

The next step was to pilot the test on a group of teachers, particularly those for whom English was a second language. This was facilitated at a large government Group B secondary school in Harare where 17 teachers agreed to sit the test. The teachers in this second group were mostly unqualified and all spoke English as a second (or third) language. Their average score was 59 with a minimum of 33 and a maximum of 82.

Although it was intended to compare each teacher's score with the grades s/he received on her/his own English 'O' level examination, and also with the number of passes obtained at 'O' level, unfortunately, this data was available for fewer than half the teachers tested. Limited as they are, the results are shown in Table 3.8. Besides noting that the teacher with the highest score for verbal aptitude has the highest grade and number of passes at 'O' level, and that the teacher with the lowest score has the worst grade, there is little more than can be said. It is possible that the test does discriminate between the extremes, and in particular between native and non-native English speakers.

TABLE 3.8

Comparison of Results of Pilot Verbal Aptitude Test with No. of 'O' Level Passes and English 'O' Level Grades

Teacher	Score on Verbal Apt.	No. 'O' Level Passes	English 'O' Level Grade
1	77	7	B
2	62	4	C
3	60	5	
4	56	4	B
5	53	3	
6	52	5	
7	44	5	D

Other background information from the teachers in the study was also felt to be important in identifying class-level influences on pupil achievement. From the teachers' personal files[16] in addition to their questionnaires, it was possible to obtain the following information: their sex classification (ESEX and MSEX)[17], to which ethnic group they belonged (ETHNIC), their age (AGE), the number of years they had taught at the particular school in question (ATHISCH), the total number of years of teaching experience they had (EXPER), their qualifications level (QUALEV)[18] and whether they were

[16] Personal information on individual teachers was treated with the strictest confidentiality and was only used for the purpose described, to relate teachers' attributes to their pupils' achievement.

[17] Subsequent variables are also identified with respect to whether they pertain to the English or Maths teacher by a prefix of E or M.

[18] The coding for QUALEV is as follows: 1) Certificated Graduates, 2) Uncertificated Graduates, 3) 4/5 Years' Teacher Training, 4) 'O'-Level plus 2/3 Years' Teacher Training, 5)

qualified in the subject they were teaching (SUBJ). The teachers were also asked whether they were engaged in studies themselves (STUDY) and for which qualification (STUDLEV), whether the present school was their first choice (FAVSCH), whether they were committed to teaching or would prefer another occupation (CMTMNT), and finally the number of hours of homework assigned per week (HMWK). The rationale for the inclusion of the above variables is straightforward. Any of them might have contributed significantly to pupil achievement.

Other class-level variables were constructed from the aggregation by class of certain pupil-level variables, for instance, the mean Grade 7 scores for each subject as well as their standard deviations (CLGR7E1, SDCL7E1)[19], likewise the percentage of pupils in each class associated with particular educational or occupational groupings of their fathers (CLFED0, CLFED1 etc., CLFJB1, CLFJB2), and also the ethnic composition of the class (CLETH1, CLETH2). The idea behind collecting such aggregated class data is that it is thought that the influence of the particular composition of the class will affect the pupil's achievement. Thus, if a particular class has a high mean Grade 7 intake score, its influence on individual pupils' subsequent achievement can be measured.

<u>School Level Variables</u>

Classes are located in schools which have certain overriding characteristics which provide pupils in the same school, though in different classes, with combined influences which pupils in different classes in different schools do not share.

Unrecognised Degrees, 6) Junior Certificate plus 2/3 Years' Teacher Training, 7) Standard 6 plus 2 Years' Teacher Training or Journeyman, 8) Teacher Trainee and 9) Untrained.

[19] For the other subjects, CLGR7E2 and SDCL7E2, and CLGR7M and SDCL7M.

Although a stratified sample according to certain schooltypes has been constructed, these schooltypes do not fully characterise all the factors which differentiate schools. Thus, the set of school-level variables are intended to identify certain factors measured at the school-level, which differentiate schools from one another beyond the simple schooltype classification. Most of the data for these particular variables was obtained from headmasters' questionnaires (Item E, Appendix 3.1) or from the ED.46 statistical returns collected by the Ministry of Education. The sources for the information pertaining to school costs is detailed separately.

The age of a school comprises an initial characteristic (SCHAGE); another is whether there are evening study facilities at school (EVESTUD), for, in the latter case, it was thought that the accessibility of lit classrooms, specifically geared for study purposes, could well differentiate inputs to pupils' education, in contrast to those pupils who have to use candlelight and study in often cramped, family huts. Further, the number of hours per week focused on academic rather than practical, vocational or physical education was thought to be another differentiating factor (ACADTIME). Different admissions policies would also distinguish schools from one another (ADMIT). This variable was coded as follows: a) drawing on feeder schools or first come/first served; b) Grade 7 Exam results; c) combination of a) and b); and d) entrance exam and/or interview. Another school-level variable pertains to whether or not streaming by ability is practised in the school (STREAM). Importantly, the headmaster's statement of whether or not streaming took place did not always tally with the facts of the streaming made apparent by comparing within schools the mean Grade 7 scores by class. The number of pupils at a particular school was a further variable (SIZE) as well as whether the school was a boarding or a day school (BOARD).

In addition to the variables already mentioned, the aggregate, rounded teacher pupil ratio was included (TPR) as well as the percentage of the student body which was African by ethnic origin (PERCTAF); the cost per day pupil (DAYFEES) and per boarding pupil (BDFEES) to the parents or guardians was also recorded.[20] The school's physical characteristics would not adequately be captured by noting, say, the construction materials used in the buildings, but whether or not there were flush toilets (FLUSH) would capture something in the way of the degree of sophistication of the physical plant. Whether or not there were adequate numbers of desks for all the pupils (DESKS) would also help in this respect. The DESKS variable was coded as "adequate number of desks" if the number was greater than or equal to 90% of the total enrolment. This figure thus made allowances for specialist classes, e.g. woodworking, domestic science, etc. where a normal classroom setting is inapplicable. The total enrolment was not used in the calculations if hot-seating[21] was practiced, but a revised figure taking into account the number of classes hot-seated.

Aggregate variables representing the total teaching body's characteristics form another set of school-level variables. This set includes: the percentage of women teachers out of the total number of teachers (TCHSEX), the percentage of European teachers (TCHRACE), the average age of all the teachers

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[20] Where different fees per form were levied, those for Form IV were used.

[21] "Hot-seating" is the term given to the practice whereby a school's classrooms are used double-time, i.e. one part of the school will attend mornings-only sessions and another part afternoons-only sessions to effectively double the utilisation of the school plant.

(TCHAGE), the average number of years spent at the particular school by all the teachers (TCHTHIS), the average number of years of teaching experience of all the teachers (TCHEXPER), and finally four variables denoting the percentage of all the teachers having certain qualification levels (TCHQUALA through TCHQUALD).[22]

Other variables consisting of pupil-level variables aggregated to the school-level were also considered in the models. These included the Grade 7 Examination scores for each subject averaged for the school (SCHGR7E1, SCHGR7E2, SCHGR7M), father's occupation similarly aggregated as was done at the class-level (SCHFJB1 and SCHFJB2) and ethnic group as well as father's educational level (SCHETH1, SCHETH2, and SCHFED0 through SCHFED3).

Finally, data on school-level recurrent costs were collected from a variety of sources, depending in part on whether the school was government-run or private. In the case of government schools, actual expenditure is itemised by certain categories which were replicated for the private sector, for the sake of consistency. Government figures were extracted from Ministry records, whereas the responsible authorities for the private schools were asked to complete a form concerning 1985 running costs (Item N , Appendix 3.1). (Figures for district council-run schools were obtained directly from the district councils, after personal consultation.) Government and district council school headmasters were asked to complete an additional form (Item L, Appendix 3.1) giving details of

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[22] See Note 20 for original coding of teachers' qualifications. TCHQUALA comprises 1-6 of the original coding, or standard trained teachers plus university graduates; TCHQUALB comprises categories 6-7 or non-standard trained teachers, i.e. the 'old' qualifications which yielded PTH and PTL certification; TCHQUALC comprises category 8 or teacher trainees, and TCHQUALD category 9 or untrained teachers.

subsidiary fundraising and expenditure. Salaries were taken from the February, May, August and September paysheets, when available, or otherwise from one of the paysheets for each quarter, and extrapolations were made for each quarter. Teachers' allowances were included in overall costings as well as bonuses. Boarding costs were itemised separately, together with any allowances and specific boarding staff salary costs. In the case of Government boarding schools, three-quarters of the expenditure on water, light and sanitation was allocated to day costs. One-quarter of the expenditure on post and telecommunication services was allocated to boarding costs.

Several final cost variables were constructed from the above data. First is the cost per day pupil (COSTDAY) which took the specifically non-boarding costs and divided them by the total number of pupils at the school, secondly the cost per boarding pupil (COSTBD) which added to the cost per day pupil, all those boarding costs itemised separately. Third, the per capita cost to government was calculated (COSTGOVT), isolating the total expenditure per pupil made from government funds. In the case of government schools, where tuition fees ultimately revert to government, the net cost was calculated. In addition, separate cost figures were worked out to estimate the specific per capita expenditure on textbooks, library and stationery (TLS) as well as professional salary costs (PROF).

Differences Between Schooltypes

Having presented the whole list of variables on which data were collected, the differences between schooltypes, according to the three sets of variables at the pupil, class and school levels, will be illustrated in the following sections. Tables 3.9, 3.11 and 3.12 depict these differences, giving the average responses for all schools and then broken down by the six schooltypes. These responses are taken from the total sample of 3413 pupils. Although in the final models the

TABLE 3.9

Differences Between Schooltypes by Pupil Level Variables

	All Sch.	A(Urb)	B(Urb)	B(Rur)	Indep.	Mission	D.C.
Number Pupils	3413	416	1208	479	182	392	736
Variables							
SEX[1]	38%F	18%F	41%F	33%F	81%F	62%F	24%F
DAYBDING[2]	83%D	82%D	96%D	100%D	46%D	17%D	93%D
AGE	17.8	17.1	17.7	18.0	16.5	17.5	18.6
ETHNICGP[3] (N-S-E)	15-76 -4	10-70 -8	18-75 -0	4-95 -0	6-45 -32	13-85 -0	24-74 -0
FAVORSCH[4]	66%Y	66%Y	67%Y	72%Y	81%Y	65%Y	60%Y
FEEPAYER[5] F/M	76%	80%	77%	68%	92%	81%	73%
LIVEHOME	91%Y	97%Y	92%Y	84%Y	98%Y	94%Y	87%Y
LIVEPROV	89%Y	96%Y	91%Y	81%Y	96%Y	95%Y	83%Y
FEDUC[6] (01234)	6-27 -32-29 -6	5-6 -16-54 -19	3-24 -40-30 -3	7-37 -36-19 -1	1-1 -16-47 -36	5-12 -33-43 -8	14-49 -28-10 -0
MEDUC (01234)	10-39 -27-22 -3	6-12 -25-48 -9	5-40 -35-19 -7	11-53 -28-9 -0	1-3 -20-55 -22	7-24 -27-42 -1	25-56 -15-4 -0
FWORKS	80%Y	94%Y	88%Y	63%Y	98%Y	88%Y	63%Y
FJOB[7]	31-45 -24	42-43 -6	26-62 -13	20-33 -47	74-25 -2	50-36 -14	12-37 -51
MWORKS	49%Y	61%Y	43%Y	49%Y	69%Y	63%Y	42%Y
MJOB	29-11 -60	57-10 -33	22-15 -63	10-7 -83	71-16 -11	48-4 -48	8-8 -85
LIVSPACE[8]	0.8	1.0	0.8	0.6	1.4	0.9	0.7
RADIO	69%Y	90%Y	79%Y	42%Y	97%Y	85%Y	41%Y
TV	30%Y	71%Y	30%Y	1%Y	91%Y	46%Y	3%Y

TABLE 3.9 (CONT.)

Differences Between Schooltypes by Pupil Level Variables

Variables	All Sch.	A(Urb)	B(Urb)	B(Rur)	Indep.	Mission	D.C.
ELECTRIC	54%Y	91%Y	82%Y	2%Y	98%Y	65%Y	6%Y
NEWS	45%Y	74%Y	60%Y	12%Y	89%Y	56%Y	9%Y
HOMEWORK[9]	3.2	3.4	3.1	3.1	3.2	3.4	3.0
HELP	49%Y	64%Y	49%Y	40%Y	82%Y	67%Y	31%Y
GR7E1	5.8	6.4	5.8	5.6	7.9	6.2	5.2
GR7E2	5.7	6.7	5.7	5.6	8.0	6.0	5.2
GR7M	5.7	6.1	5.7	5.9	7.8	6.1	5.1
OLEVENG1	2.6	3.4	2.6	2.1	5.7	3.3	1.5
OLEVENG2	2.4	3.0	2.2	2.1	5.7	3.3	0.9
OLEVMATH	1.7	1.9	1.4	1.7	5.1	2.1	1.2
BKGRDE1[10]	n.a	3.5	2.8	2.0	3.7	2.8	1.9
BKGRDE2	n.a.	3.1	2.4	2.0	3.9	2.6	1.9
BKGRDM	n.a.	2.1	1.5	1.5	2.3	2.5	1.6

[1] Percentage female students
[2] Percentage day students
[3] Percentage Ndebele (N), Shona (S) and European (E)
[4] Y=Yes for this and subsequent variables
[5] Percentage whose father or mother pays their school fees
[6] Percentage in each of the five collapsed, educational level categories: 0) No Schooling; 1) Standard 3-5; 2) Standard6/ Grade 7; 3) Forms I-V; 4) Form VI and higher. Applicable to MEDUC as well.
[7] Percentage in each of the three collapsed, occupational categories: 1) White Collar and Commercial Farmers; 2) Blue Collar; 3) Peasant Farmers, Informal Sector and Unemployed. Applicable to MJOB as well.
[8] Rooms per person
[9] Hours per night
[10] See Chapter 4 for construction of index variables. Applicable to BKGRDE2 and BKGRDM as well.

sample size is much reduced - to 2366, due to the current size limitations of the multilevel regression model used - the responses from the smaller sample are very similar to those for the total sample, as can be seen in Appendix 3.3.

Differences Between Schooltypes by Pupil Level Variables

The percentage of female pupils for the total sample was 38%, showing the disparity between boys and girls who reach Form IV. This is the same percentage as was recorded for the total population in 1984 (the most recent year available for such information). The percentage of female pupils by schooltype is skewed for Government Group A schools, independent schools and mission schools due to the fact that two boys-only Group A schools were selected in the sample, two girls-only independent schools, and one girls-only mission school. The fact that the percentage of female Form IV pupils at rural Group B and district council schools is lower than the average for all schools, being 33% and 24% respectively is notable and probably indicates the greater conservatism with which girls are afforded full secondary education, particularly in the rural areas.

The percentages of day pupils at the sampled schools are not indicative of the overall population, but of course reflect whether the actual schools selected had a boarding component or not. In fact, out of the sample of 32 schools, 12 (37%) were boarding schools: 3 Group A, 1 Group B (urban), the 3 independent schools, the 4 mission schools and 1 district council school. The overall percentage of 83% day pupils, however, is not far off the figure for the total secondary school population in 1985 of 87%.

The average age of the Form IV pupils does not vary greatly over the schooltypes, but it is notable that the lowest average age, 16.5 years, is at the independent schools, and the highest average age, 18.6 years, is at the district council schools. This is as one would expect. It is far more likely for independent schools to have a student body primarily composed of pupils who have progressed continuously throughout the years of primary and secondary education, whereas the new, rural district council schools are catering for many pupils who have had sporadic education or who started late.

The overall breakdown of the sample by ethnic group is fairly representative of the overall population breakdown between Ndebele and Shona people. No new percentages are as yet available from the 1982 Census, but in 1969 15% of the total population were Ndebele-speaking (Zimbabwe, Census of Population, 1969). The European population is over-represented in the sample, with 4% of the total, but this is due to the need to have a minimum of four schools per category and the consequent oversampling of Europeans in the independent schools where they constitute 32% of the total. The estimated number of Europeans in the total population is some 2% of the population, about 147,000.[23]

Not much can be deduced from the variable FAVORSCH, although it is notable that the highest percentage of pupils saying that their present school was their first choice is found in the independent school sector, whereas the lowest percentage is found in the district council schools. In the case of the latter schools, there is probably little choice for the pupils: the district council school may be the only accessible school, given distance and cost.

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[23] Main Demographic Features of the Population of Zimbabwe: An Advance Report Based on a Ten Percent Sample, Central Statistical Office, Harare, June 1985, Table II.6, p.16.

Of the three variables FEEPAYER, LIVEHOME, and LIVEPROV, there is not a lot of variation between schooltypes. However, the lowest percentages of pupils whose father or mother pay their school fees, live at home or live with those who provide for them are found in Group B (rural) and district council schools. The FEEPAYER variable, picks out a distinction between Group B (rural) schools and the rest: just under one-third of the pupils at these schools have someone other than their mother or father paying their school fees.

The variables FEDUC and MEDUC, denoting the educational backgrounds of the fathers and mothers of the pupils are much more telling of the differences in the composition of the pupil bodies across schooltypes. For instance, the percentage of fathers having a Standard 5 education or less varies from 2% in the case of the independent schools to 63% in the case of the district council schools. The intake of pupils is markedly different across schooltypes. Ranking the schooltypes by the percentage in the first two educational categories, i.e. fathers having no schooling or only up to Standard 5, and then by the percentage in the top educational category, i.e. having Form VI or higher, the picture is as follows:

TABLE 3.10

Ranking of Schooltypes by Father's Educational Level

	Rank	Std.5 or Less (%)		Form VI+ (%)	
Highest	1	Indep.	(2)	Indep.	(36)
	2	A Urb.	(11)	A Urb.	(19)
	3	Mission	(17)	Mission	(8)
	4	B Urb.	(27)	B Urb.	(3)
	5	B Rur.	(44)	B Rur.	(1)
Lowest	6	D.C.	(63)	D.C.	(0)

Thus, whether one focuses on the bottom or top educational levels, the ranking is the same, though with more marked contrasts at the lower levels. The other socio-economic variables, FWORKS, FJOB, MWORKS, and MJOB further corroborate the picture, with minor variations. FJOB illustrates well how skewed is the distribution of occupational categories at the top and the bottom of the ranking. Whereas nearly three-quarters of the fathers of the Form IV pupils at independent schools are in the 'white-collar' occupational category, more than half of the fathers of the district council school pupils are in category three, comprising peasant farmers, the informal sector and the unemployed. While none of these results is surprising, they do confirm the picture of great disparities between schooltypes in terms of pupil backgrounds.

Of the variables describing the level of home amenities, the variable LIVSPACE does not discriminate well between schooltypes, no doubt for reasons already mentioned, whereas the spread of the other variables RADIO, TV, ELECTRIC, and NEWS follow the expected patterns, with the lowest percentages being in the poorest rural schools, the district council schools, and the highest among the independent schools followed by Group A urban schools. Even the variable HELP follows this pattern, though with mission schools slightly ahead of Group A urban schools. The variable HOMEWORK does not contribute to any delineation of schooltype differences.

The average grades by schooltype for the Grade 7 Examination are ranked in a similar way. Independent schools always come first, and district council schools always come last. Group A urban schools and mission schools nearly always take up the next two places (they are not so dissimilar); and Group B rural schools follow. The only exception to this ranking is for Grade 7 Mathematics, where Group B rural schools take precedence over Group B urban schools. The ranking of the background index variables which are meant to represent the influences of different background factors, as discussed in Chapter 4, also exhibits the same pattern for English Language and Literature. However, for Mathematics, whose constituent background variables are different from the English subjects, the ranking is different, with mission schools followed by independent, Group A urban, district council, and finally the two Group B schooltypes at the bottom.

The general picture emerging from this data is of a quite disparate array of schooltypes in Zimbabwe, characterised at the top by pupils of independent and Group A urban schools having relatively well educated parents, in the highest status jobs, with the best provision in terms of home amenities and the most favoured background ability. The pupils of the mission and Group B urban schools are favoured next in terms of the above characteristics, having less well-educated parents in less high status jobs, with fewer home amenities, and less favoured background ability. At the bottom end of the scale are the pupils of the Group B rural and district council schools, who are the least privileged on average than pupils from the other schooltypes. This summary, of course, only gives the broad outlines of the socio-economic background. However, it does give a good indication of the differences in the composition of the student bodies and how misleading it would be simply to draw schooltype comparisons of examination results without in some way accounting for these differences in background, initial ability and privilege.[34]

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[34] See, for example "Big Surprises in A-Level Results", The Herald, 10 February 1987.

Differences Between Schooltypes by Class Level Variables

The differences between schooltypes by class-level variables are illustrated in Table 3.11.

TABLE 3.11

Differences Between Schooltypes by Class Level Variables

	All Sch.	A(Urb)	B(Urb)	B(Rur)	Indep.	Mission	D.C.
Number Classes	103	16	36	12	7	10	22
Variables							
CSIZE	38	34	40	43	29	40	38
EVERBAL	79	88	80	72	86	87	71
EHMWK[1]	4.6	3.8	4.9	4.0	5.0	2.0	6.0
MVERBAL	76	85	76	76	90	80	65
EAGE	30	34	30	24	42	41	22
EATHISCH	3	1	3	1	4	4	1
EEXPER	7	5	6	1	10	15	2
MAGE	28	29	31	24	47	28	22
MATHISCH	3	1	4	1	4	2	1
MEXPER	7	6	8	1	17	3	1
ETEXTCHR	2	5	1	1	2	6	2
MTEXTCHR	5	5	6	5	8	3	2
ELANPUPL	2	4	1	1	4	2	2
ELITPUPL	4	6	3	1	10	7	4
MTEXPUPL	2	1	1	2	3	1	2
ESTUDY[2]	42%Y	0%Y	50%Y	33%Y	57%Y	0%Y	82%Y
EFAVSCH	46%Y	60%Y	40%Y	25%Y	75%Y	67%Y	55%Y
ECMTMNT	92%Y	100%Y	87%Y	100%Y	100%Y	67%Y	95%Y
MSTUDY	33%Y	7%Y	22%Y	50%Y	29%Y	0%Y	68%Y

TABLE 3.11 (CONT.)

Differences Between Schooltypes by Class Level Variables

Variables	All Sch.	A(Urb)	B(Urb)	B(Rur)	Indep.	Mission	D.C.
MFAVSCH	45%Y	44%Y	25%Y	25%Y	86%Y	67%Y	75%Y
MCMTMNT	90%Y	100%Y	78%Y	100%Y	71%Y	100%Y	100%Y
ESEX[3]	75%M	53%M	81%M	100%M	0%M	60%M	100%M
EETHNIC[4]	79%N	53%N	89%N	100%N	0%N	70%N	100%N
EQUALEV[5]	81%T	100%T	92%T	75%T	100%T	100%T	32%T
MSEX	76%M	63%M	69%M	100%M	14%M	100%M	91%M
METHNIC	86%N	56%N	100%N	100%N	17%N	78%N	100%N
MQUALEV	76%T	100%T	83%T	75%T	100%T	100%T	32%T
CLSE1[6]	2.5	3.1	2.2	2.3	3.9	2.7	2.3
CLSE2	2.3	4.1	2.3	1.2	5.9	2.7	1.6
CLSM	1.8	2.1	1.8	1.3	3.5	1.6	1.4

[1] Hours of homework assigned per week. Applies to MHMWK also.
[2] Y=Yes for this and subsequent variables
[3] M=Male for this and subsequent variables
[4] N=Non-European for this and subsequent variables
[5] T=Trained, implying categories 1-5 of coding for EQUALEV and MQUALEV. See above.
[6] See Chapter 4 for construction of index variables. Applicable to CLSE2 and CLSM as well.

Average class sizes do vary considerably between schooltypes, ranging from 29 per class in independent schools to 43 per class in Group B rural schools.

There is not much variation in the verbal aptitude scores of English teachers; there is more variation between Maths teachers, as can be seen from Table 3.11. The three leading schooltypes are also those with the lowest percentages of non-European teachers, as could be expected.

The average age of the Form IV English and Maths teachers is considerably lower for the district council and Group B rural schools. As might be expected, these teachers also have the least teaching experience of all the teachers sampled, and together with the teachers at the Group A urban schools, they have taught for the least number of years at the particular school in question.

The same pattern is not apparent for the variable measuring the number of teachers' texts, and it may be that this measurement, taken on average, is not useful. The variation in the numbers of textbooks per pupil between schooltypes, however, puts independent schools in the lead for all three subjects with either mission or Group A urban schools coming second.

It is interesting to note that the highest percentage of teachers currently studying by themselves is found in the district council schools. As these teachers have the lowest qualification levels, this should not be surprising. Many of them are untrained and are studying either for their 'A' levels or diplomas. This interpretation is further corroborated by the fact that the lowest percentages studying are in the Group A urban and mission schools which, together with the independent schools, have the most well-trained staff. Where information was given on the qualifications for which teachers at the independent schools were studying, this was consistently degree-level and not the diplomas or 'A' levels towards which, most of the other teachers who stated they were studying, were working.

The lowest percentages of teachers who felt that the present school where they were teaching was their favourite school were those at the Group B rural schools or the Group B urban schools. Given that the teachers in either of these government schooltypes already had more favourable conditions of service than their colleagues in the private sector[25] and are relatively more well-trained, one could surmise that their dissatisfaction is due to a lower level of amenities at the Group B schools and more crowded conditions than in the Group A government schools, as well as being further from the urban areas, in the case of the Group B rural schools. For both subject-teachers there is less dissatisfaction among those at the district council schools than one might otherwise expect- perhaps due to their gratefulness for teaching jobs, given the poor qualifications on average of the teachers at these schools. On the other hand, their colleagues at the government B schools may be expressing dissatisfaction with their appointments, given the alternatives otherwise open to them.

The level of commitment to teaching as a profession is at its weakest in the mission and Group B urban schools. The relatively low percentages of teachers who stated they were committed to teaching at the mission schools are surprising. One could surmise that this might be due to the mooted changes, at the time, in the conditions of service of these teachers, whereby under a unified teaching service rather than the separate private and Government services, they would become government rather than specifically mission employees.[26] The relatively low commitment of teachers at the Group B urban schools is probably due to the changes that had been carried out up to and including at the time of the survey. These changes - the crowded conditions, the double-sessioning, the diversity in student bodies in terms of

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[25] The two teaching services have been merged as a result of the 1987 Education Act. Thus there are no longer different conditions of service between the private and public sectors.

[26] See 1987 Education Act.

background ability, relative to the past - will have affected their conditions of service, and may have led to this dissatisfaction.

The sex and ethnic breakdown of the Form IV English and Maths teachers by schooltype can be seen from Table 3.11. Male teachers predominate except at the independent schools; otherwise, higher percentages of female teachers are found in the Group A schools. European teachers predominate only in the independent schools as well, also with large numbers still occupying posts in the Group A schools.

The largest disparity between schooltypes of all the class-level variables is found in the qualifications of the teachers. For both subjects, only the district council schools have less than one-third of their Form IV English and Maths teachers in the first five categories of qualification levels, i.e. comprising either standard, trained teachers or graduates. The next step up from the district council level of 32% in this category is three-quarters of all the teachers in the Group B rural schools having these qualifications. The Group B schools come out clearly as poor cousins to the Group A government schools in terms of qualification levels.

The ranking of the class index variables by schooltype clearly puts the independent schools in the lead and the Group B rural and district councils schools at the bottom. The poor showing of the Group B rural schools in the ranking of the class index variable can most likely be attributed to such factors as their larger class sizes and their relative underprovision of adequate numbers of student textbooks.

The disparities between the different schooltypes at the class-level parallel those that were found at the pupil-level, with the poorest resources in the district council schools and the best-provided schools being the independent schools, though on many of the measures the Group B rural schools are on a par with the district council schools in terms of poor resources.

Differences Between Schooltypes by School Level Variables

Table 3.12 illustrates the differences between schooltypes by school-level variables, some of which are the same variables as those measured at the class-level for the teachers of Form IV English and Maths alone, whereas here at the school-level, they comprise measurements of all the teachers in the school.

The ages of the different schools vary, though one must treat with skepticism some of the averages reported. For instance, in the case of the district council schools, undoubtedly, the headmasters must have reported the age of the associated primary school, for most of the district council secondary schools were established after Independence.

There is not a lot of variation in the number of hours spent per week at different schooltypes on academic subjects, but the ranking of the schooltypes for this variable is surprising. Mission, district council and Group B rural schools spend the most time on academic subjects and independent schools the least. Perhaps this is a reflection of the smaller selection of subjects at the former schools, but the obsession with sport in some of the independent schools could also be manifesting itself in these figures.

There is a tremendous amount of variation in the size of the different student bodies, averaging 363 pupils at the district council schools, compared with an average of 1453 for the Group B urban schools.

TABLE 3.12

Differences Between Schooltypes by School Level Variables

	All Sch.	A(Urb)	B(Urb)	B(Rur)	Indep.	Mission	D.C.
Number Schools	32	4	4	4	3	4	13
Variables							
SCHAGE	22	36	17	5	60	41	11
ACADTIME[1]	22	19	21	23	18	25	23
SSIZE	634	925	1453	621	455	551	363
TPR	27	28	25	31	15	28	27
PERCTAF	93	81	100	100	46	100	100
TCHSEX[2]	32%F	37%F	35%F	19%F	82%F	25%F	23%F
TCHRACE[3]	15%E	37%E	5%E	3%E	77%E	16%E	0%E
TCHAGE	29	34	30	25	43	33	23
TCHTHIS	2	2	3	2	4	3	1
TCHEXPER	6	7	6	2	15	9	3
TCHQUALA[4]	57	84	85	54	88	93	25
TCHQUALB	2	5	2	1	6	3	2
TCHQUALC	7	9	9	21	6	2	3
TCHQUALD	33	6	10	23	9	3	69
DAYFEES	133	186	94	83	343	116	100
BDFEES	447	480	375	n.a.	681	313	255
COSTDAY	422	598	453	246	1213	626	215
COSTBD	1605	1685	1237	n.a.	2208	895	637
COSTGOVT	304	549	368	161	534	386	176
TLS	42	31	33	39	81	50	39
PROF	305	362	356	174	913	422	162

TABLE 3.12 (CONT.)

Differences Between Schooltypes by School Level Variables

Variables	All Sch.	A(Urb)	B(Urb)	B(Rur)	Indep.	Mission	D.C.
EVESTUD[5]	47%Y	100%Y	50%Y	0%Y	100%Y	100%Y	15%Y
ADMIT[6] (1-2-3-4)	59-13 -9-19	100- --	75-0 -0-25	25-25 50-0	-- -100	0-50 0-50	85-8 8-0
STREAM	53%Y	100%Y	50%Y	50%Y	100%Y	50%Y	31%Y
BOARD	38%Y	75%Y	25%Y	0%Y	100%Y	100%Y	8%Y
FLUSH	62%Y	100%Y	100%Y	75%Y	100%Y	100%Y	8%Y
DESKS	58%Y	100%Y	50%Y	75%Y	100%Y	100%Y	17%Y
SCHLE1[7]	2.4	3.5	2.7	2.0	4.0	3.8	1.9
SCHLE2	2.9	3.3	3.0	1.9	6.3	3.4	1.6
SCHLM	1.8	2.3	1.9	1.3	4.1	2.4	1.3

[1] Hours spent per week on academic subjects
[2] F=Female
[3] E=European
[4] TCHQUALA, TCHQUALB, TCHQUALC, and TCHQUALC refer to the collapsed coding of teachers' qualification levels: a)standard trained teachers plus university graduates; b)non-standard trained teachers (old PTL/PTH); c)teacher trainees; d)untrained teachers. See above.
[5] Y=Yes on this and subsequent variables
[6] The numbers refer to the types of admissions policies: 1)feeder schools/first come, first served; 2) Grade 7 Exam results; 3) combination of first two; 4) entrance exam and/or interview. See above.

Independent schools are significantly different from the rest of the schooltypes in having the most favourable teacher pupil ratio, whereas there is not much in the variation of this variable among the other schooltypes. This is not surprising since the government applies the same staffing ratios to all schools and clearly the independent schools stand out in hiring additional teachers, at their own expense. Similarly, independent schools are the only schooltype to have less than a majority of African pupils; they average 46% African pupils which is very likely higher than the average for the total population of this schooltype, given the schools that happened to be selected.[27]

Taking the whole teaching force of each schooltype, female teachers average about one-third of the total or less, with the exception of the independent schools in the sample which average 82% female teachers. The highest percentages of European teachers are found, as could be expected, in the independent and Group A sectors, though it is only in the independent schools in which they predominate with more than three-quarters of the teaching force being European. The Group A schools' teaching force, like its student body has subsumed a majority of Africans since Independence.

The differences in the other teacher body variables are not as marked as at the class-level, though the same patterns indicated earlier appear to hold. The oldest average teachers' age is found at the independent schools and the youngest at the district council schools. Independent schools on average have teachers who have been at the school for four years, whereas district council schools have a higher turnover with the average number of years at the present school being one. There is not much in the differences between the other schooltypes for this variable. Group B rural and district council schools stand out as having the least experienced teachers on average, whereas independent schools have the teachers with the greatest number of years of experience.

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[27] Some of those selected have a tradition of majority non-European attendance, though this is the exception, not the norm.

A comparison of the breakdown of the four teacher qualification level variables illustrates well the disparities in the distribution of trained and untrained teachers across the schooltypes. The district council schools stand out as having the least number of standard trained teachers, or conversely, the greatest number of untrained teachers. There is not a lot of difference between the other schooltypes in the distribution of trained teachers, with the exception of the Group B rural schools which fall behind the others. They seem to have the bulk of the teachers in training.

The various cost variables, loaded as they are with the aggregate effects of different class sizes, staffing ratios, salary scales, levels of school amenities, etc. display the largest disparities between schooltypes. The ratio of cost per day pupil at an independent school as compared with a district council school is more than 5½ to one; even excluding the independent schools the ratio comes to 3:1. For the cost per boarding pupil the comparison is about 3:1 between the independent and district council schools. Ironically, if understandably, the cost to the government per pupil is the highest at the most well-provided schools, reflecting as it does the different salary costs which are directly related to qualification levels. The differences in government costs do not embrace all of the differences in expenditure per pupil at the different schooltypes, of course. This can be seen from an examination of the variables PROF and TLS which illustrate how subsidised are the salaries of teachers at the independent schools and to some extent at the mission schools, as well as expenditure on textbooks, library and stationery. The professional salary cost averaged out per pupil is greater than the cost per pupil to the government for these two schooltypes. In terms of cost to the government, Group B rural schools and district council schools are on a par for cheapness, Group B urban and mission schools comprise the next rung up and at the top are Group A and independent schools.

Certain school-level amenities are measured by some of the other variables, such as whether or not evening study facilities are available at the school. The disparities are great here, reflecting both an urban/rural divide as well as the divide between the Group A and B urban schools. The admissions policies clearly divide the schooltypes between those able to admit pupils of their choice vs. those having to serve the feeder schools in the area. The streaming variable, as already mentioned, is thought to be unreliable in view of the more detailed analysis on a class by class basis that counters the statements by some of the headmasters as to whether streaming is practised or not. The BOARD variable merely illustrates what proportion of the schools within each schooltype had a boarding component. No further comparisions are intended. The availability of flush toilets gives some indication of the sophistication of the school plant. The district council schools are singled out as being the most underdeveloped in this respect, not surprisingly, given their recent establishment. Whether or not there are adequate desks at the school also illustrates and singles out the new secondary schools, the district council and Group B rural schools as being the least well provided.

Finally, the ranking of schooltypes according to the three school index variables further substantiates the differences that have been described at the school-level. At the top are the independent schools, followed by the mission and Group A urban schools, then further down the rungs come the Group B urban schools followed by the Group B rural schools, and at the bottom are the district council schools.

Having covered each variable on which data were collected in this study, the next step presented in Chapter Four, is to detail the construction of the three index varialbes, which consolidate the most influential constituent variables for the purpose of the multilevel analyses which follow.

APPENDIX 3.1

TABLE A3.1

List of Forms and Questionnaires

Item A: Initial letter to all headmasters of the 36 schools in the sample

Item B: Second letter to all headmasters, containing Items C-H

Item C: Form IV Student Questionnaire

Item D: Form IV English and Maths Teachers' Questionnaire

Item E: Headmaster/Headmistress's Questionnaire

Item F: Teachers' Verbal Aptitude Test "Vertical and Lateral Thinking" (and answer sheet)

Item G: Checklist of Recommended Form IV English Books

Item H: Checklist of Recommended Form IV Maths Books

Item I: Follow-up letter to headmasters who had not replied by deadline

Item J: Follow-up letter to headmasters who had not sent all the forms by the deadline

Item K: Letter to government and district council school headmasters containing Item L

Item L: Government and District Council Schools' Additional Recurrent Income and Expenditure Account, January to December 1985

Item M: Letter to Mission and 'Independent' School headmasters containing Item N

Item N: Recurrent Income and Expenditure Account: January to December 1985 (Revised for use by mission and independent school headmasters)

ITEM A

SURVEY OF COST AND QUALITY OF SECONDARY SCHOOLS 28 February 1985

Dear Headmaster,

Your school has been selected as one of 36 schools in the country to be part of a survey into the cost and quality of secondary schools in Zimbabwe. The purpose of the survey is to ascertain the least costly educational practices which still maintain educational effectiveness as measured by Cambridge 'O' level results. The attached form is urgently required in order to extract further information from Head Office on the Form IV students and Form IV English and Maths teachers at your school. I would be grateful if you could complete it listing in Part I the names and EC numbers of only your Form IV English and Maths teachers, indicating which class/stream/s they teach in each subject. In Part II what is required are the names of only the Form IV students at your school, their class or stream, the name of the school and the region where they sat the Grade 7 exam and the year in which it was taken.

In the third term I will be visiting your school as part of the same exercise and I shall look forward to meeting you then.

Thank you very much for your cooperation. Do attach additional sheets if required.

Yours sincerely,
A.R. Riddell

Name of School__________ Region__________

I. TEACHER INFORMATION

Name of Teacher	EC number	Indicate which Form IV stream/s taught in: English	Maths

Name of School ______________________ Region ______________________

Headmaster ______________________

II. STUDENT INFORMATION

Name of Student	Class/ Stream	Grade 7 School and Region	Year Sat Grade 7 Exam

April 1, 1985

RESEARCH INTO THE COST AND QUALITY OF SECONDARY SCHOOLS

You will recall my earlier letter of 28 February 1985, requesting the names of your Form IV students and their English and Maths teachers. Thank you for sending this information, those who were able to collect it; for those who have still not sent off these lists, I have incorporated the same questions in the accompanying questionnaires so no longer require these earlier listings, as the deadline has passed.

I would be extremely grateful for your full cooperation in the main data collection for this survey into the cost and quality of secondary schools. As I explained earlier very briefly, the purpose of this research is to ascertain the least costly educational practices which still maintain their educational effectiveness, as measured by Cambridge 'O' level results in English and Maths. The study assumes that future educational expansion and quality improvements at secondary level will be effected under conditions of financial constraint. Therefore, it is extremely important to be able to determine priorities not just in crude financial terms, but in terms of the educational impact which is made by different sorts of financial inputs, be they improved teachers' qualifications, textbooks, class size, etc. If all of the enclosed forms are completed by each school in the survey, together with information available at Head Office, it should be possible to determine the different relative contributions made by various inputs to secondary education.

Although the detail necessary at the level of each school is considerable, the purpose of the survey is <u>not</u> to investigate individual schools, nor individual students or teachers, but rather to be able to make generalisations about different types of schools which organise their secondary education in different ways. A further aim of the study is to distinguish how students of different socio-economic backgrounds fare under different school conditions. I can confirm that the information which is made available in the enclosed questionnaires and tests will be treated in strict confidence and will not be disclosed in such manner as to draw attention either to individual schools or individual students or teachers. It is only for the purpose of building up a better understanding of how different networks of educational inputs affect students' educational outcomes.

There are 6 different sets of forms which accompany this letter and which I will explain below:

1) Headmaster/Headmistress' Questionnaire: 1 copy. This is, of course, to be completed by yourself.
2) Form IV English and Maths Teachers' Questionnaires: sufficient copies for every teacher of Form IV English and Form IV Maths only. This is to be completed by each of these teachers and returned to you.
3) Form IV Students' Questionnaires: sufficient copies for every Form IV student. If you have Form V classes or students sitting their 'O' levels after 5 years rather than 4 years of secondary school, do not have these additional students complete the forms; they are only for Form IV students. These are to be completed by every Form IV student and returned to you.
4) Checklist of Recommended Form IV English Books: sufficient copies for one checklist for each Form IV English class/stream. These are to be completed by every teacher of Form IV English. If a teacher teaches more than one stream of Form IV English, he/she is to complete one checklist for each class. These are to be returned to you.
5) Checklist of Recommended Form IV Maths Books: as for 4).
6) "Vertical and Lateral Thinking"-test for Form IV English and Maths teachers: sufficient copies for every teacher of Form IV English or Maths. Although originally it had been intended that this test would be administered by the Education Officers, it is not certain that the Education Officers will make it to all of your schools in the second term so I must kindly ask you to administer this test, preferably under 'examination' conditions, that is, with the test being sight unseen by the teachers before it is given, and with no opportunity for the comparison of test responses between teachers.

I must reiterate that no individual teacher's results will be disclosed. These tests will be treated in strict confidence and are given solely for the purpose of correlating teachers' English proficiency with students' outcomes.

The teachers should be allocated a maximum time of one hour to complete the test, but in practice, it is likely to take them considerably less time, around 30-35 minutes.

If you as headmaster or headmistress teach Form IV English or Maths, of course the above forms would also apply to yourself.

I am dispatching these forms in time for the beginning of the second term. May I kindly request that you coordinate their completion and return them not later than 7 June 1985 to:

Dr. C.N. Hawkes
Curriculum Development Unit
P.O. Box MP 133
Mount Pleasant, Harare

I have estimated from your ED46s(Part 1) the number of forms needed at your school. Should I have underestimated the number you require, additional forms can be obtained from Dr. Hawkes as well. So that you can keep a record of the number of each set of completed forms you send, I also am enclosing a checklist for dispatch with the completed forms.

I do realise that I am making a heavy demand upon what I am sure is already a very busy schedule for you, but I hope that you will embrace the goals of this research which has been enthusiastically received by the Minister of Education and that you will be able to cooperate fully in the necessary data collection. For the results of the research to be meaningful, it is important that each school provide all the requested information.

I truly will be most grateful for your help in this exercise.

Thanking you in advance. Yours sincerely,

A.R. Riddell

RESEARCH INTO THE COST AND QUALITY OF SECONDARY SCHOOLS

HEADMASTER/HEADMISTRESS' CHECKLIST FOR DISPATCH OF FORMS

INSTRUCTIONS: Please indicate the number of each of the items which you are enclosing. If any forms are missing, please explain why and when they will be sent.

Name of School______________________________________

No. Forms Enclosed	Item	Are Any Missing?
	Headmaster/Headmistress' Questionnaire	
	Form IV English and Maths Teachers Questionnaires	
	Form IV Students' Questionnaires	
	Checklists of Recommended Form IV English Books	
	Checklists of Recommended Form IV Maths Books	
	"Vertical and Lateral Thinking"- Test for Form IV English and Maths Teachers	

ITEM C

RESEARCH INTO THE COST AND QUALITY OF SECONDARY SCHOOLS
FORM IV STUDENT QUESTIONNAIRE

Blank Boxes for Office Use

1. Name of School________________________________ ☐

2. Name of Student________________________________ ☐

3. Please circle appropriate number:

Male	1
Female	2

4. Which Form IV class or stream are you in?_____ ☐

5. Name of English teacher________________________ ☐

6. Name of Maths teacher__________________________ ☐

7. Please circle appropriate number:

Day student	1
Boarding student	2

8. Date of birth: day______
   month____
   year_____

Age in years	☐☐

9. Please circle appropriate number:

Ndebele	1
Shona	2
Coloured	3
Asian	4
European	5
Other(specify)	6

10. In which school and in which year did you sit the Grade 7 exam?
    Name of Grade 7 school________
    Region____________________
    Year Sat Grade 7 exam: 19_____

11. In which year did you first start attending this school? 19_________ ☐

12. Was this school your first choice for secondary school?(Please circle the appropriate number):

Yes	1
No	2

13. Who pays your school fees?(Please circle appropriate number):

father/mother	1
aunt/uncle	2
grandparent	3
sister/brother	4
other(specify)	5

DAY STUDENTS ANSWER QUESTIONS 14, 15, 16 THEN QUESTIONS 20-37
BOARDING STUDENTS GO TO QUESTIONS 17, 18, 19 THEN QUESTIONS 20-37

DAY STUDENTS ONLY:

14. Do you live at home during the school term? (Please circle the appropriate number):

Yes	1
No	2

15. With whom do you live during the school term? (Please circle the appropriate number):

father and mother	1
father only	2
mother only	3
aunt and/or uncle	4
grandparent/s	5
other(specify)	6

16. Are the people whose numbers you have circled in Question 15 your parents or guardians, that is, the people who provide for you? (Please circle the appropriate number):

Yes	1
No	2

NOW GO TO QUESTIONS 20-37

BOARDING STUDENTS ONLY:

17. Do you live at home during the school holidays?
(Please circle the appropriate number):

Yes	1
No	2

18. With whom do you live during the school holidays?
(Please circle the appropriate number):

father and mother	1
father only	2
mother only	3
aunt and/or uncle	4
grandparent/s	5
other(specify)	6

19. Are the people whose numbers you have circled in Question 18 your parents or guardians, that is, the people who provide for you?
(Please circle the appropriate number):

Yes	1
No	2

ALL STUDENTS TO ANSWER REMAINING QUESTIONS:

Please answer questions 20-29, referring to your parents or guardians, that is, the people who provide for you. If only one parent or guardian provides for you, answer only those questions which apply in your case, that is, either for your father/male guardian or for your mother/female guardian.

20. What is the highest academic level reached by your father or male guardian?________________

21. What is the highest academic level reached by your mother or female guardian?________________

22. Does your father or male guardian earn a living?
(Please circle the appropriate number):

Yes	1
No	2

23. If you have answered 'Yes' to Question 22, what is the main thing he does to earn a living? Please describe his position and what he actually does in his work:

24. Does your father or male guardian do anything else to earn a living? (Please circle appropriate number):

Yes	1
No	2

25. If you have answered 'Yes' to Question 24, please describe the other things he does:

26. Does your mother or female guardian earn a living? (Please circle the appropriate number):

Yes	1
No	2

27. If you have answered 'Yes' to Question 26, what is the main thing she does to earn a living? Please describe her position and what she actually does in her work:

28. Does your mother or female guardian do anything else to earn a living?(Please circle appropriate number):

Yes	1
No	2

29. If you have answered 'Yes' to Question 28, please describe the other things she does:

For Questions 30-37, day students please answer for where you live during term time; boarding students please answer for where you normally live during the school holidays.

30. How many rooms(not including toilets or bathrooms) are there in the house you live in?_______________

31. How many people live in the house you live in?_____

32. Is there a radio in the house you live in? (Please circle the appropriate number):

Yes	1
No	2

33. Is there a television in the house you live in? (Please circle the appropriate number):

Yes	1
No	2

34. Is there electricity in the house you live in? (Please circle the appropriate number):

Yes	1
No	2

35. Are there current newspapers regularly in the house you live in?(Please circle appropriate no.):

Yes	1
No	2

36. How many hours of homework, on average, do you do every day?____________________________

37. When you have problems in doing your homework is there anyone living with you who can help? (Please circle the appropriate number):

Yes	1
No	2

THANK YOU VERY MUCH FOR COMPLETING THIS QUESTIONNAIRE. PLEASE MAKE SURE THAT YOU HAVE ANSWERED ALL THE QUESTIONS WHICH YOU WERE ASKED TO COMPLETE AND RETURN THE QUESTIONNAIRE TO THE HEADMASTER/MISTRESS.

RESEARCH INTO THE COST AND QUALITY OF SECONDARY SCHOOLS

ITEM D

FORM IV ENGLISH AND MATHS TEACHERS' QUESTIONNAIRE

Blank Boxes for Office Use

1. Name of School________________________________

2. Name of Teacher________________________________

3. Teacher's UTS or EC number____________________

4. Subject taught at Form IV level (Please circle appropriate number)

English	1
Maths	2

5. Please list below the Form IV classes/streams you teach, indicating the class size for each stream:

Form IV English Class/Stream	Class Size	Form IV Maths Class/Stream	Class Size

6. Are you presently enrolled in a course of study in order to obtain a further qualification? (Please circle appropriate number)

Yes	1
No	2

If yes, please state which qualification:

____

7. Please estimate the number of hours homework per week you assign in each Form IV English or Maths class:

Form IV English______________

Form IV Maths______________

8. Was this school your first choice for a teaching assignment when you began here? (Please circle appropriate number)

Yes	1
No	2

9. Do you think you will continue to teach, or would you prefer another occupation? (Please circle appropriate number)

Will continue to teach	1
Would prefer another occupation	2

THANK YOU VERY MUCH FOR COMPLETING THIS QUESTIONNAIRE. PLEASE RETURN IT TO THE HEADMASTER/HEADMISTRESS FOR POSTING.

ITEM E

RESEARCH INTO THE COST AND QUALITY OF SECONDARY SCHOOLS
HEADMASTER/HEADMISTRESS'S QUESTIONNAIRE

Office Use Only

1. Name of School ______________________________

2. Age of School(in years) ______________________________

3. Is the headmaster or headmistress a teaching or non-teaching head?(Please circle one)
   Teaching head
   Non-teaching head

4. Total number of teachers at school(including head only if he/she is a teaching head) ______________________________

5. Number of teachers(including head)whose salaries are grant-aided by Government ______________________________

6. Number of teachers(including head) whose salaries are not aided by Government ______________________________

7. Number of administrative staff(including head if he/she is a non-teaching head) ______________________________

8. Number of non-professional staff with non-boarding duties ______________________________

9. Number of non-professional staff with boarding duties ______________________________

10. Are there study facilities at the school for the use of students in the evenings?(Please circle one)
    Yes
    No
    If yes, please state the seating capacity ______________________________

11. Number of ordinary classes ______________________________

12. Number of hot-seated classes ______________________________

13. What is the length of a class period?(in minutes) ______________________________

14. Please specify the total number of class periods in a week devoted to:

academic subjects________________

practical subjects________________

sports(compulsory)________________

other(specify______________)________

TOTAL NUMBER OF CLASS PERIODS PER WEEK________________

15. What is the admissions policy of the school? How are those students who gain admission to the school selected? Please describe the procedure:

16. Is streaming practiced at the school?(Please circle one)

Yes

No

If yes, please describe the basis of selection for each stream:

THANK YOU VERY MUCH FOR COMPLETING THIS QUESTIONNAIRE. IT SHOULD BE POSTED ALONG WITH ALL THE OTHER QUESTIONNAIRES NOT LATER THAN 7 JUNE 1985 TO:

Dr. C.N. Hawkes
Curriculum Development Unit
P.O. Box MP 133
Mount Pleasant, Harare

ITEM F

NAME OF TEACHER __________________ NAME OF SCHOOL __________________

INSTRUCTIONS: Please read the following passage and fill in each blank with the word that you think fits best. Each blank should be filled in with one word only.

EXAMPLE: The sun was coming out ___from___ behind a cloud. I reached ___for___ my sunglasses to protect my ___eyes___.

VERTICAL AND LATERAL THINKING

Many years ago, when a person who owed money could be thrown into jail, a merchant had the misfortune to owe a huge sum to a money-lender. The money-lender, who was old and ugly, fancied the merchant's beautiful daughter. He proposed a bargain. He said that he would cancel the merchant's debt if he could have the girl instead.

Both the merchant __________ his daughter were horrified at __________ idea. So the cunning money-lender __________ that they should let Providence __________ the matter. He told them __________ he would put a black __________ and a white pebble into __________ empty money-bag and then the __________ would have to pick out __________ of the pebbles. If she __________ the black pebble she would __________ his wife and her father's __________ would then be cancelled. If __________ chose the white pebble she __________ stay with her father and __________ debt would still be cancelled. __________ if she refused to pick __________ a pebble her father would __________ thrown into jail and she __________ starve.

Reluctantly the merchant agreed. __________ were standing on a pebble-strewn __________ in the merchant's garden as __________ talked and the money-lender stooped __________ to pick up the two __________. As he did so the __________, sharp-eyed with fright, noticed that __________ picked up two black pebbles __________ put them both into the __________. He then asked the girl __________ pick out the pebble that __________ to decide her fate and __________ of her father.

Imagine that __________ are standing on that path __________ the merchant's garden. What would __________ have done if you had __________ the unfortunate girl? If you __________ had to advise her what __________ you have advised her to __________?

What type of thinking would __________ use to solve the problem? __________ may believe that careful logical __________ must solve the problem if __________ is a solution. This type __________ thinking is straight-forward vertical thinking; __________ other type is lateral thinking.

__________ thinkers are not usually much __________ to a girl in this __________. The way they analyse it, __________ are three possibilities:

1. The girl __________ refuse to take a pebble.
2. __________ girl should show that there __________ two black pebbles in the __________ and expose the money-lender as __________ cheat.
3. The girl should __________ a black pebble and sacrifice __________ in order to save her __________ from prison.

None of the __________ is very helpful, for if __________ girl does not take a __________ her father goes to prison, __________ if she does take a __________, she has to marry the __________.

The story shows the difference __________ vertical thinking and lateral thinking. __________ thinkers are concerned with the __________ that the girl has to __________ a pebble. Lateral thinkers become __________ with the pebble that is __________ behind. Vertical thinkers take the __________ reasonable view of a situation __________ then proceed logically and carefully __________ work it out. Lateral thinkers __________ to explore all the different __________ of looking at something, rather __________ accepting the most promising way __________ proceeding from that.

The girl __________ the pebble story put her __________ into the money-bag and drew __________ a pebble. Without looking at __________ she fumbled and let it __________ to the path where it __________ immediately lost among all the __________.

'Oh, how clumsy of me,' __________ said, 'but never mind - if __________ look into the bag you __________ be able to tell which __________ I took by the colour __________ the one that is left.'

__________ the remaining pebble is of __________ black, it must be assumed __________ she has taken the white __________, since the money-lender dare not __________ his dishonesty. In this way, __________ using lateral thinking, the girl __________ what seems an impossible situation __________ an extremely advantageous one. The __________ is actually better off than __________ the money-lender had been honest __________ had put one black and __________ white pebble into the bag, __________ then she would have had __________ an even chance of being saved. As it is, she is sure of remaining with her father and at the same time having his debt cancelled.

Answer Sheet for Teachers' Verbal Aptitude Test: "Vertical and Lateral Thinking"

Paragraph 1:
1. the, this
2. proposed, suggested, decided
3. decide, settle, resolve
4. that
5. pebble
6. an, his
7. girl, daughter
8. one
9. chose, picked, took, drew
10. become
11. debt
12. she
13. would
14. the, his
15. But, However
16. out
17. be
18. would

Paragraph 2:
19. They
20. path
21. they
22. down, over
23. pebbles
24. girl, daughter
25. he, he'd
26. and
27. money-bag, bag
28. to
29. was
30. that

Paragraph 3:
31. you
32. in, inside
33. you
34. been
35. had
36. would
37. do

Paragraph 4:
38. you
39. You
40. analysis, thinking deduction, reasoning
41. there
42. of
43. the

Paragraph 5:
44. Vertical, Logical
45. help, use
46. situation, predicament
47. there
48. should
49. The
50. are
51. bag
52. a
53. take, pick, choose
54. herself
55. father

Paragraph 6:
56. suggestions, above, solutions, alternatives, possibilities
57. the
58. pebble
59. and
60. pebble
61. money-lender

Paragraph 7:
62. between
63. Vertical, Straight-forward, Logical
64. fact
65. take, pick, choose
66. concerned
67. left
68. most
69. and
70. to
71. tend, try, prefer
72. ways, angles
73. than
74. and

Paragraph 8:
75. in
76. hand
77. out
78. it
79. fall, drop
80. was

81. others, rest,
    pebbles, stones

Paragraph 9:

82. She
83. you
84. will
85. pebble, stone, colour
86. of

Paragraph 10:

87. Since, As, Because
88. course
89. that
90. pebble, one
91. admit, confess,
    display, show,
    disclose, reveal,
    expose
92. by
93. changes, converts,
    turns, transforms
94. into
95. girl
96. if
97. and
98. one
99. for, as, because
100. only, just

ITEM G

RESEARCH INTO THE COST AND QUALITY OF SECONDARY SCHOOLS
CHECKLIST OF RECOMMENDED FORM IV ENGLISH BOOKS

INSTRUCTIONS: Please fill out one checklist for each Form IV English class/stream, indicating in the boxes opposite each listed book the number of copies of that particular book that is available for that class/stream. At the end of the listing, please indicate in the space provided the number of additional texts available for that particular class/stream which are not on the recommended list.

Office Use

Name of School______________________________ [ ]

Name of Form IV English Class/Stream______________ [ ]

Name of English Teacher_________________________ [ ]

NO.	TITLE AND (PUBLISHER)	AUTHOR
	ENGLISH LANGUAGE	
[ ]	'O' Level English for Overseas Candidates(Macmillan)	Cox
[ ]	English through Reading(Macmillan)	Bhasker
[ ]	Structures and Skills in English,Bks1-4(Macmillan)	Dawson
[ ]	Basic English Exercises(Macmillan)	Edwards
[ ]	English for Communication, Book 1(College)	Hurry
[ ]	Tests in English Structure and Usage(Macmillan)	Stone
[ ]	New Cambriege First Certificate English(Macmillan)	Stone
[ ]	Common Errors in English Language(Macmillan)	Golding
[ ]	Revision Exercises and Test Papers in English(Macmill)	Golding
[ ]	Effective English, Pupils' Books 1-5(Evans)	Montgomery
[ ]	Integrated English Course(CUP)	Howe/Tom.
[ ]	Foundation Secondary English Books 1+2(Longman)	McAdam
[ ]	English for Zimbabwe, Students' Bks 1-4(Longman)	Grant
[ ]	Reading for a Purpose,Bks 1-3(Longman)	Grant
[ ]	A Graded Secondary English Course,Bks 1-2(Longman)	Etherton
[ ]	A New Certificate Comprehension Course(Longman)	Etherton
[ ]	Practical English,Bks 1+2(Longman)	Ogundipe
[ ]	How to Write Good Letters(Longman)	Roberts

NO.	TITLE	AUTHOR
ENGLISH LITERATURE		
	Macbeth	Shakespears
	The Tempest	"
	As You Like It	"
	The Taming of the Shrew	"
	King Lear	"
	Merchant of Venice	"
	Twelfth Night	"
	Far from the Madding Crowd	Hardy
	Jude the Obscure	"
	Mayor of Casterbridge	"
	Woodlanders	"
	Jane Eyre	Bronte
	Wuthering Heights	"
	Lord of the Flies	Golding
	The School for Scandal	Sheridan
	Great Expectations	Dickens
	Pride and Prejudice	Austen
	Lord Jim	Conrad
	Murder in the Cathedral	Eliot
ENGLISH READERS		
	The Betrayer	Adewoye
	The South African Affair	Okpi
	State Secret	Dube
	Cross-Fire	Okpi
	Naria Power	Emecheta
	The Cyclist	Ebosi
	The Instrument	Thorpe
	The Smugglers	Okpi
	Son of Woman	Manguwa
	Portrait of Apartheid	
	Palm Wine Drunkard	Tutuola
	Wreath for Udomo	Abrahams
	Down Second Avenue	Mphahlele
	My Life in the Bush of Ghosts	Tutuola
	Modern Short Stories	Hunter
	Tell Freedom	Abrahams

NO.	TITLE	AUTHOR
	Plate of the Peacock	Wilson
	Jikinya	Ndhlala
	The March and Other Pieces (Longman)	
	The Coming of the Dry Season	Mungoshi
	Dew in the Morning	Chinodya
	Weep Not Chile	Ngugi
	Chirundu	Mphahlele
	Jande's Ambition	Ndaga
	Growing Up at Lena	Oludhe
	Keep My Words	Ogutu
	Shaka	Langa
	Mapondera	Mutswairo
	Muriel at Metropolitan	Tlali
	Nothing is Impossible	Chimsoro
	Waiting for the Rain	Mungoshi
	No Easy Walk to Freedom	Mandela
	Petals of Blood	Ngugi
	Devil on the Cross	Ngugi
	Non-Believer's Journey	Nyamfukudza
	Battlefront Namibia	ya-Otto
	Bandiet	Lewin
	Amandla	Tlali
	Forced Landing	Mutsatse
	Call Me Not a Man	Matshoba
	With the People	Nyagumbo
	Forward Ever(Life of K. Nkrumah)(Panaf Books)	
	Game of Silence	Imbuga
	King Emene	Imbuga
	Egori	Kanaka
	The River Between	Ngugi
	Houseboy	Oyono
	Myths and Legends of the Swahili	Knappert
	The Black Hermit	Ngugi
	The Girl from Abroad	Kahiga
	Maru	Head
	The Only Son	Munonye
	The Trial of Dedan Kimathi	Ngugi
	We Killed Mangy Dog	Honwana
	The Real Life of Domingo Xavier	Vieira

NO.	TITLE	AUTHOR
	Chaka	Motolo
	Rebel	Agaro
	Year of the Uprising	Samkange
	Kill Me Quick	Mwangi
	The Wedding Zein	Salih
	The White Man of God	Jumbam
	A Simple Lust	Brutus
	Mission to Kala	Beti
	Poems of Black Africa	Soyinka
	Grain of Wheat	Ngugi
	God's Bit of Wood	Ousmane
	Anthem of the Decades	Kunene
	Climbie	Dadie
	A Walk in the Night	LaGuma
	-----any other African Writers' Series books	
DRAMA		
	The Sun Men	Matindi
	The Battlefield	Gatanyu
	The Breaking Branch	Chubule
	The End of the Beginning	Makumi
	The Scapegoat	Garchago
	The Bystander	Green
	The Last Laugh	Brown
	The Sacrifice	Brown
	Play of the Shepherds	Brown
	Brass Butterfly	Golding
	I Will Wait	Musora
	Generation Gap	Pearce
POETRY		
	When Bullets Begin to Flower	Dickinson
	Song of Lawino and Ocol	p'Bitek
	Song of Lawino	p'Bitek
	Song of Ocol	p'Bitek
	Echoes of My African Mind	Muronda
	Kingfisher, Jikinya and Other Poems	Zimunya
	Thought Tracks	Zimunya
	Up in Arms	Hove
	Songs that Won the Revolution	Pongweni
	And Now the Poets Speak	Zimunya
	Zimbabwean Poetry in English	Muchemwa

NO.	TITLE AND (PUBLISHER)	AUTHOR
	DICTIONARIES	
	Oxford Advanced Learners Dictionary of Current English	Hornby
	Oxford Student's Dictionary of Current English	Hornby
	Oxford Dictionary of Current Idiomatic English	Cowie/Mackin
	Longman Dictionary of Current English	Proctor
	Learning with the Longman Dictionary of Current Eng.	Whitcut
	An International Reader's Dictionary(New Ed.)(Longman)	West
	Longman's Dictionary of English Idioms	
	Roget's Thesaurus of English Words and Phrases(Longman)	
	'O' Level Senior Dictionary (Oxford)	Hawkins
	TEACHERS' BOOKS	
	Structures and Skills Form 4 Teachers Book(College)	Dawson
	Effective English Teachers' Books 1-5(Evans)	Montgomery
	English for Zimbabwean Teachers, Bks 1-4(Longman)	Grant
	ADDITIONAL STUDENTS' BOOKS NOT LISTED ABOVE	
	ADDITIONAL TEACHERS' BOOKS NOT LISTED ABOVE	

THANK YOU VERY MUCH FOR COMPLETING THIS CHECKLIST. PLEASE RETURN IT TO THE HEADMASTER/HEADMISTRESS, TOGETHER WITH THE CHECKLISTS FOR THE OTHER FORM IV ENGLISH CLASSES YOU TEACH, FOR POSTING.

DO NOT WRITE BELOW THIS LINE (OFFICE USE)

- [ ] Total number of Recommended Students' Books
- [ ] Total number of Recommended Teachers' Books
- [ ] Total number of Students' Books
- [ ] Total number of Teachers' Books

RESEARCH INTO THE COST AND QUALITY OF SECONDARY SCHOOLS **ITEM H**

CHECKLIST OF RECOMMENDED FORM IV MATHS BOOKS

INSTRUCTIONS: Please fill out one checklist for each Form IV Maths class/stream, indicating in the boxes opposite each listed book the number of copies of that particular book that is available for that class/stream. At the end of the listing, please indicate in the space provided the number of additional texts available for that particular class/stream which are not on the recommended list.

Office Use

Name of School________________________________ [ ]

Name of Form IV Maths Class/Stream______________ [ ]

Name of Maths Teacher__________________________ [ ]

NO.	TITLE AND (PUBLISHER)	AUTHOR
	Modern Mathematics for Zimbabwe, Bks 1-4 (College)	Ferris
	Modern Alternative Mathematics, Pts 1+2 (College)	Lefevre
	Mathematics: An Integrated Approach (Macmillan)	Elwood
	Cornerstone Mathematics, Bks 1-4 (Macmillan)	Harris
	Four Figure Mathematics Tables (Macmillan)	Castle
	Logarithmic and Other Tables for Schools (Macmillan)	Castle
	New General Mathematics, Bks 1-4, OLD EDITION (Longman)	Channon
	New General Mathematics: A Modern Course for Zimbabwe, Bks 1-4, REVISED EDITION (Longman)	Channon
	Secondary Mathematics for Zimbabwe (FEPI/Boka)	
	TEACHERS' BOOKS Mathematics for Today (Macmillan)	Buckwell
	Mathematics-A School Certificate Revision Course (Macmillan)	Chacko
	Problems in Mathematics (Macmillan)	Buckwell

NO.	TITLE AND (PUBLISHER)	AUTHOR
	TEACHERS' BOOKS CONTINUED Mastering Mathematics (Macmillan)	Perry
	Mathematics to 16, Bks 1-5 (NTP)	Bolt
	'O' Level Mathematics (Heinemann)	Clarke
	Mathematics for Schools (Heinemann)	Clarke
	A First Course in Modern Mathematics, Bks 1-4 (Heinemann)	Anderson
	Modern Mathematics at 'O' Level (Heinemann)	Anderson
	Modern Mathematics (Longman)	Talbot
	New General Mathematics - A Modern Course for Zimbabwe (with answers)(Longman)	Channon
	ADDITIONAL STUDENTS' BOOKS NOT LISTED ABOVE	
	ADDITIONAL TEACHERS' BOOKS NOT LISTED ABOVE	

THANK YOU VERY MUCH FOR COMPLETING THIS CHECKLIST. PLEASE RETURN IT TO THE HEADMASTER/HEADMISTRESS, TOGETHER WITH THE CHECKLISTS FOR THE OTHER FORM IV MATHS CLASSES YOU TEACH, FOR POSTING.

DO NOT WRITE BELOW THIS LINE (OFFICE USE)

☐ Total number of Recommended Students' Books

☐ Total number of Recommended Teachers' Books

☐ Total number of Students' Books

☐ Total number of Teachers' Books

ITEM I

Curriculum Development Unit
P. O. Box MP 133
MOUNT PLEASANT
Harare

June 17, 1985

Dear

You will recall that in April (or earlier) you received a letter and a number of questionnaires from Mrs . Riddell, because your school had been random-selected to take part in a research programme on the cost and quality of Secondary education in Zimbabwe. My name and address was given as the 'Post Office' for the research.

Unfortunately I have not received any papers from you. While appreciating that you and your staff are extremely busy, I am writing to remind you of this matter, and to ask you to send in all the papers (forForm IV students, their English and Maths teachers, and self) as a matter of urgency. Most schools have already replied.

This is a uniquely important research study into the cost-effectiveness of Secondary schools, whose results will be of great practical value to Zimbabwe. May I repeat Mrs Riddell's assurance that there is no intention of focussing attention on your school as such; it has been chosen in a random and therefore representative sample, and all data will be treated as strictly confidential.

I look forward to receiving your parcel within the next 10 days. Please ensure that <u>all</u> questionnaires, tests and booklists are returned completed.

With many thanks,

Yours sincerely,

Dr C. N. Hawkes

ITEM J

Curriculum Development Unit,
P. O. Box MP 133,
MOUNT PLEASANT
Harare

June 19, 1985

Dear

Thank you very much for sending in the papers for the research programme into the cost and quality of Secondary schooling in Zimbabwe, which reached me . . . . ' They will be of great value in the study. Unfortunately however, certain papers were lacking in your returns, and these are listed below. The effect of their absence will be to reduce, or even to cancel out, the value of the data you have provided.

Could I therefore ask, on behalf of Mrs Riddell, that you make good the deficiency? Papers are enclosed as necessary.

With apologies for troubling you again,
Yours sincerely,

Dr C. N. Hawkes

ITEM K

Thank you very much for organising the completion and despatch of all the questionnaires and related papers concerning the research into the cost-effictiveness of secondary schools. I am very grateful for your cooperation which will enhance the representativeness of the sample of schools chosen.

I am writing, finally, to request certain income and expenditure data which is not available at Head Office but which also concerns the effective running costs at your school. Specifically, on the income side, I need to know how much has been collected by the school in fees, levies or fund raising which is in addition to tuition and boarding fees, in other words, all the income which is retained by the school for its own discretionary use. Your school may have a General Purpose Fee or a PTA Fee or a School Management Levy. What I need to know is how much has been collected in such fees or other fund raising in this school year, how much has been spent from such funds, and in general, on what such expenditure has been made, be it additional salaries, sports equipment, textbooks - not an itemised account, but just what categories of expenditure. (I am not concerned with any Building Fees, as this entails capital, not recurrent expenditure).

As I am interested in the total income and expenditure for January to December 1985, please wait until your accounts are finalised for the year before completing the attached form, but I would be grateful if it could be sent to me as soon as possible in the New Year.

Thank you once more for all your cooperation. The completed forms should be addressed as follows:

Attention : Mr I. Menashe
Mrs A.R. Riddell
Ministry of Education
P.O. Box 8022
Causeway
Harare

Yours sincerely

A.R. Riddell

RESEARCH INTO THE COST AND QUALITY OF SECONDARY SCHOOLS: GOVERNMENT AND DISTRICT COUNCIL SCHOOLS' ADDITIONAL RECURRENT INCOME AND EXPENDITURE ACCOUNT: January to December 1985

Name of School____________________________

1. INCOME (NOT including Building Fees)	Total Amount Collected
General Purpose Fund/PTA:	______
School Management Committee Levy:	______
Other Fundraising:	______

2. EXPENDITURE (NOT including Building Fees)	Total Amount Spent
General Purpose Fund/PTA:	______
School Management Committee Levy:	______
Other Fundraising:	______

3. CATEGORIES OF EXPENDITURE

Could you please indicate how these funds have been spent, indicating approximate amounts on different categories of expenditure, e.g. additional teachers' salaries+, science equipment, sports equipment, practical subjects' equipment, maintenance of buildings and furniture, etc. (You may have other categories than those suggested.) If some of the above funds have been used for capital expenditure, such as for the construction of new classrooms or other facilities, please indicate what amount has been so spent as it needs to be separated from your recurrent expenditure.

CATEGORIES OF EXPENDITURE	Amount Spent
1. ____________	______
2. ____________	______
3. ____________	______
4. ____________	______
5. ____________	______

Many thanks for your cooperation. Please send completed forms to:

Attention: Mr. I. Mcnashe
Mrs. A.R. Riddell
Ministry of Education.
P.O. Box 8022
Causeway, Harare

+ If you have used these funds for additional teachers' salaries, please indicate on a separate sheet the number of additional teachers employed, their total annual salaries for 1985 and any allowances paid on top of their salaries, and whether or not these teachers have been reported on the ED 46 Part II.

ITEM M

Thank you very much for organising the completion and despatch of all the questionnaires and related papers concerning the research into the cost effectiveness of secondary schools. I am very grateful for your cooperation which will enhance the representativeness of the sample of schools chosen.

I am writing, finally, to request certain information on your running costs which, together with the student and teacher information already provided, will com lete the picture. May I once more reiterate that the information which you provide will be kept strictly confidential. The purpose of the investigation is not to identify your particular school's running costs, but to investigate different combinations of educational inputs (together with the costs of these inputs) which go towards producing different educational outcomes. Without this final information concerning school running costs, the data which you have already kindly submitted will be invalidated.

.... The enclosed account sheet divides income and expenditure into a number of headings. Regarding the first heading, Income - Received from Government, I will have collected this information from Head Office and this section is merely to corroborate what has been compiled. If this item is not straightforward in your accounts, please do not bother with it. The other headings concern information which is not available at Head Office, however, and I hope that it will not be too much trouble to complete. As I am interested in the total income and expenditure for January to December 1985, please wait until your accounts are finalised before completing the form, but I would be grateful if it could be sent to me as soon as possible in the New Year.

Regarding Expenditure on Professional Salaries, if it is easier to itemise only those salaries not aided by government, rather than combining the overall totals for aided and unaided staff, as requested under Expenditure, as long as you indicate that you are only supplying information on unaided salaries, that is fine. I know that where a Responsible Authority has more than one school on its payroll, this item could prove troublesome.

Where day and boarding students attend the same school, an exact demarcation is not possible in allocating expenses between the two sectors I will assume, however, that 75% of expenditure on water, light and sanitation, post and telecommunication services, maintenance of buildings, furniture and maintenance of grounds, should be allocated to boarding expenses unless you indicate a more realistic division for your school.

May I thank you once more for your cooperation in helping to compile a more substantive data base which should contribute greatly towards policy making in this fraught area of educational finance.

Please address all correspondence to : Attention : Mr I. Menashe
Mrs A.R. Riddell
Ministry of Education
P.O. Box 8022
Causeway

Yours sincerely

A.R. Riddell

ITEM N

RESEARCH INTO THE COST AND QUALITY OF SECONDARY SCHOOLS: Revised

RECURRENT INCOME AND EXPENDITURE ACCOUNT: January to December 1985

Name of School________________________________

to nearest $

INCOME

Received from Government

- Per capita grant ________
- Boarding grant ________
- Salary grant:
  - Teachers' salaries ________
  - Teachers' allowances ________
  - ~~Teachers' pension contributions~~ ________
  - ~~Teachers' cash in lieu of leave~~ ________
  - Other(specify________________) ________

Received from Parents/Students

- Tuition fees collected ________
- Boarding fees collected ________
- General Purpose fees collected ________
- Sports fees collected ________
- Textbook fees collected ________
- Other fees collected(NOT including building fee) ________
  (Please specify________________)

Received from House Rentals ________

Received from Other Sources(e.g. fundraising etc.) ________
(Please specify____________________)

EXPENDITURE

Professional salaries(include in addition to the Government salary grant any payments made by the school over and above this amount)†

- Teachers' salaries(include head if teaching head) ________

only if paid by R.A. + not by Gov't {
- Teachers' pension contributions ________
- Teachers' cash in lieu of leave ________
- Teachers' additional benefits ________

Administrative salaries

- Headmaster's salary(only if non-teaching head) ________
- Clerical salaries ________
- Teachers' allowances ________
- Administrative expenses(specify amount applied toward administrative expenses if deducted from grant) ________

† If you do have teachers salaries not paid by Gov't, please indicate the number of additional salaries: ________ and their amount.

Non-professional salaries and wages

Non-boarding salaries and wages(e.g.groundsmen, messengers,etc.) ________

Boarding and supervisory allowances for teaching staff ________

Boarding salaries and wages(e.g.matron, cook,etc.) ________

Tuition Expenses(not including salaries)

Textbooks, Library, Stationery ________

Science Equipment ________

Practical Subjects Equipment ________

Sports Equipment ________

Water,Light, Sanitation ________

Post & Telecommunication Services ________

Maintenance of buildings, furniture ________

Maintenance of grounds ________

Transport ________

Miscellaneous ________

Other(Please specify________________________) ________

Boarding Expenses(not including salaries)

Provisions ________

Fuel ________

Laundry ________

Transport(specifically boarding) ________

Miscellaneous ________

Other(Please specify________________________) ________

DO _ _ NOT _ _ WRITE _ _ BELOW _ _ THIS _ _ LINE _ _ _ (OFFICE USE ONLY) _ _

Government Income ________

Tuition ________

Boarding ________

Salaries ________

Parent/Student Income ________

Other Income ________

TOTAL INCOME ________

Professional Salaries Expenditure ________

Administrative Expenditure ________

Tuition Expenditure ________

Boarding Expenditure ________

TOTAL EXPENDITURE ________

APPENDIX 3-2

TABLE A3.2

Glossary of Variable Names

Pupil Level Variables

SEX	sex of pupil
CLASS	class
ETEACHER	English teacher
MTEACHER	Maths teacher
DAYBDING	day or boarding school
AGE	age of pupil
ETHNICGP	ethnic group of pupil
ATHISCH	number of years at this school
FAVORSCH	whether present school was pupil's first choice
FEEPAYER	who pays school fees
LIVEHOME	whether pupil lives at home
LIVEWHOM	people with whom pupil lives
LIVEPROV	whether pupil lives with those who provide for him
FEDUC	father's educational level
MEDUC	mother's educational level
FWORKS	whether father works
FJOB	father's occupation
MWORKS	whether mother works
MJOB	mother's occupation
LIVSPACE	rooms per person at home
RADIO	whether there is a radio at home
TV	whether there is a tv at home
ELECTRIC	whether there is electricity at home
NEWS	whether there are regular newspapers at home
HOMEWORK	number of hours of homework per day
HELP	whether anyone at home can help with pupil's homework

GR7E1	Grade 7 English Language Exam Score
GR7E2	Grade 7 English Literature Exam Score
GR7M	Grade 7 Mathematics Exam Score
OLEVENG1	'O' Level English Language Exam Grade
OLEVENG2	'O' Level English Literature Exam Grade
OLEVMATH	'O' Level Mathematics Exam Grade
BKGRDE1	background index variable for English Language
BKGRDE2	background index variable for English Literature
BKGRDM	background index variable for Mathematics

Class Level Variables

CSIZE	class size
ETEXTLAN	number of English Language texts available
ETEXTLIT	number of English Literature texts available
ETEXTCHR	number of teacher's English texts available
MTEXT	number of Maths texts available
MTEXTCHR	number of teacher's Maths texts available
EVERBAL	English teacher's verbal aptitude score
ESTUDY	whether English teacher is currently studying
ESTUDLEV	qualification for which English teacher is studying
EHMWK	number of hours of English homework assigned
EFAVSCH	whether present school was English teacher's first choice
ECMTMNT	English teacher's commitment to teaching
MVERBAL	Maths teacher's verbal aptitude score
MSTUDY	whether Maths teacher is currently studying
MSTUDLEV	qualification for which Maths teacher is studying
MHMWK	number of hours of Maths homework assigned
MFAVSCH	whether present school was Maths teacher's first choice
MCMTMNT	Maths teacher's commitment to teaching

ESEX	sex of English teacher
EETHNIC	ethnic group of English teacher
EAGE	age of English teacher
EATHISCH	number of years English teacher has taught at present school
EEXPER	number of years of English teacher's teaching experience
EQUALEV	qualifications of English teacher
ESUBJ	whether English teacher is qualified in subject being taught
MSEX	sex of Maths teacher
METHNIC	ethnic group of Maths teacher
MAGE	age of Maths teacher
MATHISCH	number of years Maths teacher has taught at present school
MEXPER	number of years of Maths teacher's teaching experience
MQUALEV	qualifications of Maths teacher
MSUBJ	whether Maths teacher is qualified in subject being taught
CLSE1	class/teacher index variable for English Language
CLSE2	class/teacher index variable for English Literature
CLSM	class/teacher index variable for Mathematics

School Level Variables

SCHAGE	age of school in years
EVESTUD	whether evening study facilities are available
ACADTIME	hours per week spent on academic subjects
ADMIT	admissions policy of school
STREAM	whether streaming is practiced
SSIZE	school size
BOARD	whether school is day or boarding
TPR	aggregate teacher pupil ratio

PERCTAF	percentage African pupils
DAYFEES	fees for day pupil
BDFEES	fees for boarding pupil
FLUSH	whether there are flush toilets at the school
DESKS	whether there are adequate numbers of desks
TCHSEX	percentage female teachers at the school
TCHRACE	percentage European teachers at the school
TCHAGE	average age of teachers
TCHTHIS	average number of years teachers have taught at present school
TCHEXPER	average number of years teaching experience
TCHQUALA	percentage teachers having standard teachers' qualifications
TCHQUALB	percentage teachers having non-standard teachers' qualifications
TCHQUALC	percentage teachers in training
TCHQUALD	percentage untrained teachers
COSTDAY	cost per day pupil
COSTBD	cost per boarding pupil
COSTGOVT	cost per pupil to government
TLS	per capita amount spent on textbooks, library and stationery
PROF	per capita amount spend on professional salaries
SCHLE1	school index variable for English Language
SCHLE2	school index variable for English Literature
SCHLM	school index variable for Mathematics

Note: Further categorical variables were derived from the above set of variables, such as FJOB1 and FJOB2, denoting the coded categories for FJOB of 1 and 2, respectively. These further variable names are straightforward derivations from the original variable names and should need no further explanation than is given in the text.

APPENDIX 3-3

TABLE A3.3

Differences Between Schooltypes by Pupil-Level Variables: Reduced Sample

	All Sch.	A(Urb)	B(Urb)	B(Rur)	Indep.	Mission	D.C.
Number Pupils	2366	323	400	400	182	325	736
Variables							
SEX[1]	37%F	18%F	39%F	33%F	81%F	63%F	24%F
DAYBDING[2]	79%D	80%D	95%D	100%D	46%D	20%D	93%D
AGE	17.8	17.1	17.6	18.0	16.5	17.5	18.6
ETHNICGP[3] (N-S-E)	16-74 -4	11-67 -9	22-70 -0	5-94 -0	6-45 -32	15-82 -0	24-74 -0
FAVORSCH[4]	67%Y	65%Y	68%Y	74%Y	81%Y	66%Y	60%Y
FEEPAYER[5] F/M	77%	80%	79%	69%	92%	81%	73%
LIVEHOME	90%Y	97%Y	91%Y	85%Y	98%Y	94%Y	87%Y
LIVEPROV	89%Y	97%Y	91%Y	81%Y	96%Y	96%Y	83%Y
FEDUC[6] (01234)	7-29 -30-27 -6	3-6 -13-43 -14	3-24 -40-31 -3	7-38 -36-18 -1	1-1 -16-47 -36	6-12 -34-40 -8	14-49 -28-10 -0
MEDUC (01234)	13-39 -24-22 -3	4-19 -18-39 -8	5-37 -37-20 -1	11-52 -28-9 -0	1-3 -20-55 -22	8-25 -28-39 -0	25-56 -15-4 -0
FWORKS	78%Y	94%Y	90%Y	63%Y	98%Y	89%Y	63%Y
FJOB[7]	31-41 -28	52-42 -6	24-65 -11	19-32 -49	74-25 -2	49-37 -14	12-37 -51
MWORKS	51%Y	63%Y	41%Y	50%Y	69%Y	63%Y	42%Y
MJOB	30-10 -61	58- 9 -33	16-19 -66	9-7 -84	71-16 -14	47-4 -49	8-8 -85
LIVSPACE[8]	0.8	1.1	0.8	0.6	1.4	0.8	0.7
RADIO	65%Y	91%Y	79%Y	42%Y	97%Y	85%Y	41%Y

TABLE A3.3 (CONT.)

Differences Between Schooltypes by Pupil-Level Variables: Reduced Sample (Cont.)

Variables	All Sch.	A(Urb)	B(Urb)	B(Rur)	Indep.	Mission	D.C.
TV	29%Y	73%Y	30%Y	1%Y	91%Y	42%Y	3%Y
ELECTRIC	45%Y	92%Y	83%Y	2%Y	98%Y	65%Y	6%Y
NEWS	39%Y	75%Y	57%Y	12%Y	89%Y	56%Y	9%Y
HOMEWORK[9]	3.2	3.4	3.1	3.1	3.2	3.4	3.0
HELP	49%Y	65%Y	48%Y	40%Y	82%Y	69%Y	31%Y
GR7E1	5.7	6.4	5.8	5.6	7.9	6.0	5.2
GR7E2	5.7	6.7	5.8	5.6	8.0	6.0	5.2
GR7M	5.7	6.1	5.7	5.9	7.8	6.1	5.1
OLEVENG1	2.6	3.5	2.8	2.1	5.7	3.3	1.5
OLEVENG2	2.5	3.3	2.4	2.1	5.7	3.5	0.9
OLEVMATH	1.8	2.0	1.3	1.7	5.1	2.1	1.2
BKGRDE1[10]	n.a	3.5	2.8	2.0	3.7	2.8	1.9
BKGRDE2	n.a.	3.1	2.4	2.0	3.9	2.6	1.9
BKGRDM	n.a.	2.1	1.5	1.5	2.3	2.5	1.6

[1] Percentage female students

[2] Percentage day students

[3] Percentage Ndebele (N), Shona (S) and European (E)

[4] Y=Yes for this and subsequent variables

[5] Percentage whose father or mother pays their school fees

[6] Percentage in each of the five collapsed, educational level categories: 0) No Schooling; 1) Standard 3-5; 2) Standard6/ Grade 7; 3) Forms I-V; 4) Form VI and higher. Applicable to MEDUC as well.

[7] Percentage in each of the three collapsed, occupational categories: 1) White Collar and Commercial Farmers; 2) Blue Collar; 3) Peasant Farmers, Informal Sector and Unemployed. Applicable to MJOB as well.

[8] Rooms per person

[9] Hours per night

[10] See Chapter 4 for construction of index variables. Applicable to BKGRDE2 and BKGRDM as well.

CHAPTER FOUR

Constructing Index Variables for Pupils' Background, Class/Teacher and School Effects on Achievement

Given the large number of variables on which information was collected in this research and the high degree of correlation expected between some of them, index variables were computed to cover the three levels of effect under investigation: the pupil's own background, the influence of the class and the particular teacher on the pupil's achievement, and the school's influence on the pupil's 'O' level results. These three index variables were computed separately for each of the three 'O' level examination results, and therefore for each of the three models. The choice of different subsets of variables was based not only on a view of which individual variables really matter, but also on the necessity of isolating those variables which covered for others due to high intercorrelations between them. For instance, whether one chooses day pupils' fees or the total cost per day pupil is not a simple choice of preference. Day pupils' fees are 'covered' by the total cost figure which is a more comprehensive measure of the cost per pupil, but one would not include both figures due to the high correlation (.78) between them.

The first step in the construction of the index variables was to test individual regressions for each subject, a variable at a time, in order to determine whether it was at all worthwhile to include particular variables in the overall regression equations. (The results of these single level regressions can be seen in Appendices 4.1 to 4.3.) The second step was to examine the correlations between the subsets of variables to be considered for inclusion in the final equations. Where correlations above .30 were found, the stronger of the two variables in terms of the T-test statistic was normally chosen. However, this did not mean that the stronger of the two variables was always included in the final regression, for in some instances, there were whole chains of high correlations which excluded particular variables. The third step was to examine the significance of the variables after their inclusion in the regression equation and to weed out those whose significance fell below the 90% significance level benchmark. Finally, having chosen the 'best' set of variables to be included in each of the three index variables for each subject's regression equation, the three index variables were combined in a new regression equation and the significance of their constituent variables in combination tested. As with step three, if they fell below the 90% T-test statistic, or if as a result of their inclusion, other variables' coefficients became counterintuitive, they were excluded.

The T-test was used as a heuristic cut-off point since the standard errors used in computing the T-test statistic, of course, are biased due to the misspecification of a single level model in the SPSSx regression programme, as explained in Chapter 2. The final three index variables for pupil, class and school level effects on achievement were thus tested internally as well as in combination with each other, before being entered into the multilevel regression equation.[1] In addition, judgement as to 'meaningfulness' was exercised at each stage.

In the following sections each index variable will be taken in

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[1] Although the Grade 7 Examination score was taken as a separate explanatory variable in the subsequent multilevel regressions, it was included with the constituent background variables at this earlier stage to test its interaction with them and the other index variables because of its strength and its eventual inclusion in the fully specified model.

turn, subject by subject, with a discussion of the final constituent variables and their weights.

Pupil Background Index Variable

Table 4.1 lists the variables finally selected for inclusion in the pupil background index variable for English Language, BKGRDE1. Reference should be made to Chapter 3 for the definitions of the variables and their exact coding. Appendix 3.2 contains a glossary of variable names, for reference.

TABLE 4.1

Final Constituent Variables of Background Index Variable for English Language

Variables	B	T
MEX (Male)	.34	4.307
ETH1 (Ndebele)	-1.07	-6.523
ETH2 (Shona)	- .85	-6.169
ETH3 (Coloured)	.62	1.833
FJB1 (White Collar)	.86	7.800
FJB2 (Blue Collar)	.37	3.921
FEDO (No Schooling)	- .68	-3.499
FED1 (Up to Std.5)	- .71	-5.470
FED2 (Up to Gr.7)	- .57	-4.610
FED3 (Up to Form V)	- .25	-2.001
ELECY(Electricity)	.78	9.274
(CONSTANT)	2.86	16.442

Note: B stands for regression coefficient; T stands for T-test statistic, for this and subsequent tables.

The final background index variable for English Language controls for several different aspects of a pupil's background. It consists of sex, ethnic group, father's occupation and education and certain home amenities, represented by the presence of electricity at home. As can be seen from Table 4.1, boys do marginally better than girls, and in the ethnic grouping variable in which Europeans serve as a reference point, Ndebele and Shona children are at a disadvantage, whereas Coloured children appear to have a slight advantage.

The occupational and educational backgrounds of both parents were found to be significant variables on which to regress pupils' 'O' level English Language results. However, as has been explained in Chapter 2, the low response rate regarding the mothers' background characteristics necessitated a reliance solely on the father's background. In relation to occupational category, (peasant farmers, the informal sector and the unemployed serve as reference point), there is a clear disparity between the three categories, with the white collar and commercial farmers' sector ahead of the other two categories, as would be expected. The effect of the father's educational level, the reference point being any education above Form V, is similarly delineated, with the distinction being greater between those having reached secondary school and those who had not, rather than between any of the smaller gradations in the variable.

The presence of electricity at home, serving as a proxy for a variety of 'modern' home amenities such as a radio, a TV and regular newspapers, appears to make a final positive contribution toward English Language achievement.

Table 4.2 illustrates the very similar constituent variables of the pupil background index variable BKGRDE2 for English Literature.

TABLE 4.2

Final Constituent Variables of Background Index Variable for English Literature

Variables	B	T
MEX (Male)	- .17	-1.718
ETH1 (Ndebele)	-1.16	-5.566
ETH2 (Shona)	-1.38	-7.893
ETH3 (Coloured)	- .36	- .842
FJB1 (White Collar)	1.13	8.205
FJB2 (Blue Collar)	.46	3.966
FED0 (No Schooling)	-1.13	-4.659
FED1 (Up to Std.5)	-1.24	-7.628
FED2 (Up to Gr.7)	- .85	-5.430
FED3 (Up to Form V)	- .57	-3.589
(CONSTANT)	4.00	19.151

The constituent variables and their influences on achievement in English Literature are almost identical to those for English Language, with the exception of the variable electricity, which covers for a variety of home amenities, and is not included in BKGRDE2. The only other differences between the two sets of variables is that for English Literature, it appears that girls, rather than boys achieve better results and the Coloured pupils in the sample, rather than exceeding European pupils, do slightly worse.

Table 4.3 depicts a quite dissimilar set of constituent background variables for Mathematics, however.

TABLE 4.3

Final Constituent Variables of Background Index Variable for Mathematics

Variables	B	T
MEX (Male)	.88	10.347
ETH1 (Ndebele)	-1.20	- 6.880
ETH2 (Shona)	- .87	- 5.985
ETH3 (Coloured)	- .35	- .963
DAY (Day Pupil)	-1.55	-14.182
HOMEWORK (Hrs./Night)	.09	3.536
(CONSTANT)	3.03	16.310

What is most striking about the above table is the absence of the two sets of variables measuring the father's occupation and educational levels. Interestingly, for Mathematics, these variables did not exert the influence they did for the two English subjects. (Their weaker influence was notable at the first stage of regressing achievement on individual variables, shown in Appendix 4.1.) What immediately springs to mind from this result is that unlike English achievement, where the reinforcement at home of things learned at school can be decisive, this is not the case with Mathematics. In contrast with the two English subjects, the pupil's sex has a marked effect, with boys being favoured over girls in Mathematics achievement. The influence of the pupil's ethnic group is the same as for the two English subjects, though the effect of being of Coloured origin has become formally insignificant. A strong factor which comes into play in the case of Mathematics achievement is whether the pupil is a day or a boarding scholar, the latter presenting a clear advantage. A small, additional influence on Mathematics achievement is brought to bear by the number of hours of homework the pupil reports s/he does every night.

Class/Teacher Index Variable

The higher degree of correlation between the class and the school level variables, (such as, for instance, between class size or teachers' qualifications and cost per pupil-teachers' salaries correspond directly with teachers' qualifications) means that the final constituent variables of either of these indices, contain fewer, but more 'loaded' variables than was the case for the background index variables in each subject. It also means that the bare skeletons of constituent variables remaining are more awkward to interpret. As a help toward understanding how the final constituents were arrived at and which variables are being 'covered', reference can be made to Appendices 4.4 and 4.5 which show those constituent class and teacher variables included prior to testing in combination with the other index variables for the two English subjects. (Mathematics had more straightforward regressions.)

Table 4.4 illustrates the final constituents of the class/teacher index variable for English Language.

TABLE 4.4

Final Constituent Variables of Class Index Variable for English Language

Variables	B	T
EX (Male)	-1.28	-12.421
TEXT01 ($\leq$1)	- .56	- 5.957
TEXT2 (>1)	- .30	- 2.792
(CONSTANT)	3.85	45.885

Only two class-level variables survived the combination with the school-level variable, cost per day pupil: the sex of the teacher, and the number of textbooks per pupil available in the classroom. It would appear from Table 4.4 that to have a female teacher is an advantage to the pupil regarding her/his English Language achievement. The significance of this variable, however, is as much related to the ethnic origin of the teacher as to her/his sex, due to high intercorrelations between the two variables, European teachers having a stronger positive influence on their pupils than non-European ones, as could be expected. If more than one textbook per pupil is available, the pupils of that class are at an advantage, again, following common sense. (The reference point for the textbooks variable is having at least two textbooks per pupil.) The strong influences exhibited previously (see Appendix 4.4) of such important aspects of a teacher's background as qualifications, age, verbal aptitude, years of experience as well as experience at the particular school in question, appear to have been subsumed under the highly aggregated school-level variable, cost per day pupil.

The final constituents of the class/teacher index variable for English Literature are listed in Table 4.5 below. They are quite different from those for English Language. Whereas the final variables for English Language consisted of textbooks per pupil and the sex of the teacher, in the case of English Literature the final constituent variables are EVERBAL, the teacher's verbal aptitude score, which also covers here for the teacher's qualifications, CSIZE, the class size, NONEUR, whether the teacher was non-European and EX, the sex of the teacher. Perhaps there is something in the fact that more class/teacher variables are represented in the case of English Literature than for English Language which, it might be assumed, would be influenced more greatly by background factors than English Literature which relies more heavily on classroom inputs.

TABLE 4.5

Final Constituent Variables of Class Index Variable for English Literature

Variables	B	T
EVERBAL	.04	8.017
EX (Male)	-1.09	-8.758
CSIZE	- .08	-8.591
NONEUR	- .97	-7.312
(CONSTANT)	3.85	6.751

For every ten points increase in the teacher's verbal aptitude score the pupils' 'O' level English Literature grades go up by .4 points. For an increase of ten pupils to the class, the pupils' English Literature grades go down by .8 points. Finally, as can be seen, female European teachers seem to have a positive effect on the pupils' grades in this subject.

Table 4.6 shows the final constituent variables of the class index variable for Mathematics. As for English Literature, the variables retained, after the cost per day pupil is tried in combination, are more comprehensive than for English Language, in which the school-level index variable took on the influence of many of the class/teacher variables.

TABLE 4.6

Final Constituent Variables of Class Index Variable for Mathematics

Variables	B	T
CSIZE	- .02	-2.140
MEXPER	.06	9.679
NONEUR	-1.14	-7.316
TEXTO1 (≤1)	- .34	-3.195
TEXT2 (>1)	- .35	-3.040
(CONSTANT)	3.35	9.310

For every additional year of teaching experience, Maths 'O' level examination grades increase by .06 points. European teachers achieve better results than non-Europeans. For every additional 10 pupils per class grades are reduced by .2 points. Pupils with access to more than two texts each, achieve higher grades. Although these are formally significant results, they are not all that decisive, as can be seen from the low B-coefficients, with the exception of NONEUR.

School Index Variable

The variables for possible inclusion in an index variable denoting the school's characteristics are desribed in Chapter 3. They can be grouped into three subsets pertaining to the school's costs, the type of school and its amenities and the composition of the teaching body. As has already been mentioned, the variable, cost per day pupil, covers for many of the class/teacher characteristics having a cost implication, such as class size, teachers' qualifications, years of teaching experience, etc. At the school level, this is also the case where aggregate variables describing the teaching body are subsumed under the one variable. In addition to teachers' qualifications and experience, it is also assumed that the teacher pupil ratio is covered by the comprehensive variable, cost per day pupil.

For English Language only two school level variables survived the different combinations tested, the cost per day pupil, and whether or not the school had boarding facilities. This latter variable also covered for the pupils' access to evening study facilities. Table 4.7 shows the final constituent variables of the school index variable for English Language.

TABLE 4.7

Final Constituent Variables of School Index Variable for English Language

Variables	B	T
COSTDAY	.003	15.420
BOARDY	.80	8.213
(CONSTANT)	1.28	18.382

For every additional $100 spent on each pupil, the pupil's English Language 'O' level examination grade rises by .3 points. The advantage of attending a boarding school is a .8 increase in the pupil's English Language grade.

For English Literature and Mathematics the composition and interpretation of the school index variable is very similar to that for English Language. Whether the school has boarding facilities was further subsumed under the very influential cost per day pupil variable, which is the only, heavily loaded constituent variable of the school index variable as can be seen from Tables 4.8 and 4.9 below.

TABLE 4.8

Final Constituent Variable of School Index Variable for English Literature

Variables	B	T
COSTDAY	.004	24.641
(CONSTANT)	.61	7.070

TABLE 4.9

Final Constituent Variable of School Index Variable Mathematics

Variables	B	T
COSTDAY	.003	16.911
(CONSTANT)	.67	8.858

For every $100 spent per pupil, the pupil's grade rises by either .4 or .3 points, in the case of English Literature and Mathematics, respectively.

APPENDIX 4-1

TABLE A4.1

Single Level Regressions on Individual Background Variables: Beta Coefficients and (R^2)[1]

Variables	English Lang.		English Lit.		Mathematics	
Sex(M)	.03*	-	.46	(1%)	.64	(2%)
Day Pupil	-1.34	(5%)	-1.87	(9%)	-1.42	(5%)
Age	- .37	(5%)	- .40	(5%)	- .24	(2%)
Ethnic Group (European=ref.):						
Ndebele	-1.52		-1.67		-1.01	
Shona	-1.28	(4%)	-1.80	(5%)	- .72	(1%)
Coloured	.92		- .15*		- .11*	
Favsch	- .07*	-	.41	(1%)	- .04*	-
Feepayer (other=ref.):						
Parents	- .01*		- .09*		- .08*	
Aunt a/o Uncle	- .18*		- .71*		- .47*	
Grandparents	- .57*	-	- .60*	(1%)	- .57*	-
Sister/Brother	- .34*		- .53*		- .07*	
Livewhom (Other=ref.):						
Father/Mother	.07*		.21		- .20*	
Aunt a/o Uncle	- .23*	-	- .49	(1%)	- .42*	-
Grandparent/s	- .60		- .54		- .59	
Livehome	.56	-	.53	-	.0009*	-
Liveprov	.62	(1%)	.78	(1%)	.16*	-
Father's Educ. (>Form V=ref.):						
No Schooling	-2.32		-1.80		- .87	
Up to Std.5	-2.24		-1.77		- .89	
Up to Std6/Gr7	-1.84	(7%)	-1.19	(7%)	- .91	(2%)
Up to Form V	-1.09		- .55		- .43	
Mother's Educ. (>Form V=ref.):						
No Schooling	-3.25		-1.68		- .30	
Up to Std.5	-2.92		-1.34		- .43	
Up to Std6/Gr7	-2.44	(8%)	- .66	(6%)	n/a	(1%)
Up to Form V	-1.72		.15		.18*	

TABLE A4.1 (CONT.)

Single Level Regressions on Individual Background Variables: Beta Coefficients and (R^2)

Variables	English Lang.		English Lit.		Mathematics	
Father's Occup. (FJOB3=ref.):[2]						
FJOB1	1.48		1.60		.94	
FJOB2	.67	(6%)	.55	(7%)	.29	(2%)
Mother's Occup. (MJOB3=ref.):						
MJOB1	1.34		1.64		.93	
MJOB2	.72	(5%)	.78	(6%)	.22*	(2%)
Livspace (per cap.) (>1.3rms=ref.) :						
≤ .4 rooms	-1.57		-2.19		-1.15	
≤ .6 rooms	-1.12		-1.67		- .99	
≤ .8 rooms	- .82	(4%)	-1.52	(7%)	- .79	(2%)
≤1.3 rooms	- .59		-1.35		- .76	
Radio	.98	(4%)	1.15	(5%)	.48	(1%)
TV	1.41	(8%)	1.41	(8%)	.81	(2%)
Electricity	1.24	(1%)	1.29	(8%)	.50	(1%)
Newspapers	1.00	(5%)	1.19	(6%)	.57	(1%)
Homework (>4 hrs.=ref.):						
≤ 1 hour/day	- .37		- .97		- .89	
2 hours/day	- .17		- .34		- .37	
3 hours/day	.09*	(1%)	- .09*	(2%)	- .27	(2%)
4 hours/day	.03*		- .30*+		- .35+	
Help from home	.51	(1%)	.80	(3%)	.18	-
Grade 7 Exam	.59	(23%)	.63	(24%)	.74	(34%)

[1] '*' denotes not significant at 90% significance level; '+' denotes that the direction of the relationschip is counterintuitive; '-' in pace of R^2 denotes "less than 1%".

[2] FJOB1: White Collar and Commercial Farmers
FJOB2: Blue Collar
FJOB3: Peasant Farmers, Informal Sector and Unemployed
(See Chapter 3.)

APPENDIX 4-2

TABLE A4.2

Single Level Regressions on Individual Class/Teacher Variables: Beta Coefficients and (R^2)[1]

Variables	English Lang.		English Lit.		Mathematics	
Class						
Class Size	-.08	(4%)	-.15	(12%)	-.07	(3%)
Textbooks per cap. (≥ 2 = ref.):						
≤ 1 per pupil	-.95		-.68		-.55	
> 1 and < 2	-.79	(4%)	-1.23+	(4%)	-.37	(1%)
Teachers' Texts (>6=ref.):						
No texts	-.52		-1.09		.02*+	
1-3 texts	-.18	(1%)	-.58	(4%)	-.10*+	-
4-6 texts	-.15*		-1.48		-.31	
Teacher						
Verbal Apt.	.07	(9%)	.07	(11%)	.007	-
Studying	-1.18	(6%)	-1.88	(15%)	-.27	-
Favsch	-.23	-	.41	(1%)	.21	-
Commitment	-1.03+	(4%)	-.84	(2%)	.27	-
Sex(M)	-1.50	(7%)	-2.05	(13%)	.16	-
Non-European	-1.92	(12%)	-2.12	(14%)	-1.69	(6%)
Age	.07	(9%)	.08	(10%)	.08	(7%)
Experience	.06	(3%)	.08	(6%)		
Qualifications (untrained=ref.):						
Standard Trd.	1.22		1.35		.21	-
Trainee	.59	(4%)	.53	(5%)	n/a	

[1] '*' denotes not significant at 90% significance level; '+' denotes that the direction of the relationschip is counterintuitive; '-' in pace of R^2 denotes "less than 1%".

APPENDIX 4-3

TABLE A4.3

Single Level Regressions on Individual School Variables: Beta Coefficients and (R^2)[1]

Variables	English Lang.		English Lit.		Mathematics	
PM Study	1.30	(8%)	1.87	(16%)	.91	(4%)
Academic Time	- .12+	(3%)	- .15+	(4%)	- .08+	(1%)
Admissions (not by interview/ exam=ref.)	-1.82	(8%)	-2.56	(15%)	-1.41	(4%)
Streaming	.70	(2%)	1.18	(6%)	.64	(2%)
School Size	.0002	-	-.00008*	-	- .0004	(1%)
Boarding Sch.	1.62	(11%)	2.25	(21%)	1.27	(6%)
PTR	- .10	(4%)	- .13	(7%)	- .09	(3%)
% African	- .003	(1%)	- .01	(14%)	- .003	(1%)
Day Fees	.01	(9%)	.01	(13%)	.009	(7%)
Flush Toilets	1.57	(9%)	2.06	(18%)	.89	(3%)
Adequate Desks	1.07	(5%)	1.57	(11%)	.74	(2%)
% F Teachers	.040	(8%)	.05	(10%)	.03	(3%)
% Eur. Tchrs.	.04	(13%)	.05	(24%)	.03	(10%)
Aver.Age Tchr.	.18	(18%)	.21	(23%)	.12	(7%)
Average No. Yrs. at this school	.56	(8%)	.72	(13%)	.36	(3%)
Average No. Yrs. Tching. Exper.	.24	(14%)	.28	(19%)	.17	(7%)
% Std.Training	.03	(9%)	.03	(10%)	.01	(2%)
% Untrained	- .03	(13%)	- .03	(14%)	- .01	(3%)
Urban	.97	(4%)	.96	(4%)	.31	-

TABLE A4.3 (CONT.)

Single Level Regressions on Individual School Variables: Beta Coefficients and (R^2)

Variables	English Lang.		English Lit.		Mathematics	
$ per cap. on TLS	.02	(5%)	.003*	-	.02	(2%)
$ per cap. on Prof. Salaries	.005	(20%)	.002	(3%)	.003	(7%)
Total cost per pupil	.004	(16%)	.004	(25%)	.003	(9%)
Gov't cost per pupil	.005	(13%)	.006	(16%)	.003	(4%)

[1] '*' denotes not significant at 90% significance level; '+' denotes that the direction of the relationschip is counterintuitive; '-' in pace of R^2 denotes "less than 1%".

APPENDIX 4-4

TABLE A4.4

Constituents of Class Index Variable for English Language Before Combining with Background and School Index Variables

Variables	β	T
EVERBAL	.06	13.709
EX (Male)	-.79	- 7.093
TEXT01 (≤1)	-.57	- 6.069
TEXT2 (>1)	-.18	- 1.625
CSIZE	-.04	- 4.780
(CONSTANT)	.47	1.013

Note: At this stage of the analysis, the verbal aptitude of the English teacher (EVERBAL) was covering in addition for the age, experience and qualifications of the teacher, similarly in Table A4.5.

APPENDIX 4-5

TABLE A4.5

Constituents of Class Index Variable for English Literature Before Combining with Background and School Index Variables

Variables	β	T
EVERBAL[1]	.01	2.262
EX (Male)	- .86	-6.611
CSIZE	- .07	-7.563
NONEUR	-1.07	-8.237
STUDY	-1.12	-9.455
FAVY	.41	4.199
(CONSTANT)	5.88	9.276

[1] See Note for Table A4.4. It is of interest to note that a negative influence on the pupil's achievement in English Literature is brought to bear if the teacher is engaged in a course of study. At an earlier stage, this was also true for English Language.

CHAPTER FIVE

What Matters to 'O' Level Achievement in English and Maths: An Analysis of the Linear Models Tested

The previous two chapters have described how the overall study was designed, how the variables were chosen, collected and coded, and how index variables at the three levels for the three subjects were constructed. In this chapter is presented a description and analysis of the different models which were tested as the 'O' level results of the students sampled were regressed on different variables. Tables 5.1-5.3 summarise the English Language, English Literature and Mathematics models, respectively.

The discussion will lead from an explanation of the particular model in question for English Language and then compare the results for English Language with those for the other two subjects.

MODEL A: The Variation of Grade 7 Intake Scores

The starting point for the different analyses is Model A which fits a constant term only, i.e. studies variation about an overall mean of the Grade 7 English Language intake score involving schools and students. It is a 2-level analysis with the class grouping at Form IV, which is not the class grouping when the students took the Grade 7 Exam, as this prior class grouping is not known.[1] There is a high intra-school correlation of 58%, i.e. there is a clustering of grades within schools. This would imply a strong selection factor at

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[1] Model A is the only model regressing the Grade 7 results and not the 'O' level results. Tables 5.1 through 5.3 therefore, should not be read from Model A across, but rather from Model B across, for comparative purposes.

TABLE 5.1 PART I
ENGLISH LANGUAGE MODELS

EXPLAN. VARIABLES		A	B	C	D	E	F	F*	Calc. at Aver. GR7E1
FIXED									
Constant		5.7	2.66	.18	.44	-.80	-2.64	-2.67	
		(0.4)	(.23)	(.22)	(.34)	(.29)	(.56)	(.55)	
GR7E1				.40	.29	.39	.40	.40	
				(.03)	(.11)	(.03)	(.03)	(.04)	
GR7E1SQ					.01				
					(.01)				
BKGRDE1						.43	.41	.41	
						(.08)	(.09)	(.09)	
CLSE1							.72	.73	
							(.21)	(.21)	
SCHLE1									
RANDOM									
School	Constant	3.3241	1.2205	.55657	.54577	.29106	.15205	.08586	.04277
		(.11)	(.44)	(.22)	(.21)	(.15)	(.12)	(.11)	(1%)
	Covar.							.016506	.191532
								(.02)	(5%)
	GR7E1							.016679	.009361
								(.011)	-
%		58%	22%	14%	14%	8%	4%	Tot. 7%:	.24366
Class		-	1.1435	.5178	.51477	.50025	.53676	.63536	
		-	(.23)	(.13)	(.12)	(.13)	(.15)	(.17)	
%		-	20%	13%	13%	13%	15%	17%	
Student		2.4494	3.2425	2.9462	2.9458	2.9501	2.8777	2.825	
		(0.0)	(.10)	(.10)	(.10)	(.12)	(.12)	(.12)	
%		42%	58%	73%	74%	79%	81%	76%	
Total		5.7735	5.6065	4.02057	4.00634	3.74141	3.56651		3.70402
No. Stud.		1960	2240	1882	1882	1395	1252	1252	
No. Schl.		32	32	32	32	32	29	29	

TABLE 5.1 PART II
ENGLISH LANGUAGE MODELS

EXPLAN. VARIABLES	G	H	I	J	K
FIXED					
Constant	-2.03	-2.31	-2.72	-2.12	-2.30
	(.63)	(.70)	(.47)	(.36)	(.54)
GR7E1	.39	.46	.39	.37	.46
	(.03)	(.05)	(.03)	(.03)	(.05)
GR7E1SQ					
BKGRDE1	.38	.36	.30	.31	.31
	(.09)	(.09)	(.09)	(.09)	(.09)
CLSE1	.37	.34	.26		
	(.24)	(.26)	(.22)		
SCHLE1			.63	.68	.48
			(.18)	(.13)	(.22)
SC1	.22	2.33			2.03
	(.37)	(.80)			(.82)
SC1xGR7E1		-.33			-.34
		(.11)			(.11)
SC2	.45	1.54			1.58
	(.28)	(.63)			(.56)
SC2xGR7E1		-.19			-.23
		(.10)			(.08)
SC3	.41	.31			.25
	(.29)	(.54)			(.54)
SC3xGR7E1		.01			.02
		(.08)			(.08)
SC4	1.97	4.12			3.84
	(.63)	(1.93			(1.94)
SC4xGR7E1		-.28			-.34
		(.22)			(.22)
SC5	1.04	2.08			3.04
	(.40)	(.74)			(1.15)
SC5xGR7E1		-.18			-.29
		(.10)			(.14)
RANDOM					
School	0.0	0.0	0.0	0.0	0.0
	-	-	-	-	-
%	-	-	-	-	-
Class	.52679	.65257	.58071	.58989	.62148
	(.12)	(.14)	(.13)	(.13)	(.13)
%	15%	19%	17%	17%	18%
Student	2.877	2.8137	2.8728	2.9148	2.836
	(.12)	(.12)	(.12)	(.12)	(.12)
%	85%	81%	83%	83%	82%
Total	3.40379	3.46627	3.45351	3.50469	3.45748
No. Stud.	1252	1252	1152	1234	1234
No. Schl.	29	29	27	29	29

TABLE 5.2
ENGLISH LITERATURE MODELS

EXPLAN. VARIABLES	A	B	C	D	E	F	G	H	I
FIXED									
Constant	5.7	2.54	-.57	.49	-.07	-1.62	-1.95	-1.44	-1.93
	(.04)	(.30)	(.27)	(.44)	(.54)	(.40)	(.37)	(.44)	(.43)
GR7E2			.48	.06	.13	.42	.42	.33	.41
			(.03)	(.14)	(.17)	(.04)	(.04)	(.06)	(.04)
GR7E2SQ				.04	.03				
				(.01)	(.01)				
BKGRDE2					.25	.25	.22	.21	.16
					(.09)	(.09)	(.09)	(.09)	(.10)
CLSE2						.38	.23	.22	.33
						(.13)	(.14)	(.14)	(.15)
SCHLE2									.24
									(.21)
SC1							.85	-.05	
							(.49)	(1.35)	
SC1xGR7E2								.15	
								(.18)	
SC2							.46	-.57	
							(.31)	(.80)	
SC2xGR7E2								.18	
								(.12)	
SC3							1.07	.19	
							(.31)	(.60)	
SC3xGR7E2								.16	
								(.09)	
SC4							1.21	-.001	
							(1.22)	(.002)	
SC4xGR7E2								1.69	
								(2.21)	
SC5							2.07	1.34	
							(.39)	(.74)	
SC5xGR7E2								.14	
								(.11)	
RANDOM									
School	3.2163	1.9885	.66257	.63964	.50151	.2278	0.0	0.0	.04996
	(.10)	(.67)	(.26)	(.25)	(.23)	(.18)	-		(.13)
%	58%	34%	18%	17%	14%	6%	-		1%
Class	-	.84162	.36382	.34015	.43951	.56632	.37201	.36001	.52527
		(.23)	(.12)	(.12)	(.15)	(.19)	(.11)	(.11)	(.19)
%	-	14%	10%	9%	12%	16%	12%	12%	16%
Student	2.3371	2.9807	2.7261	2.7119	2.7502	2.7673	2.7737	2.7614	2.797
	(0.0)	(.11)	(.11)	(.11)	(.13)	(.14)	(.14)	(.14)	(.15)
%	42%	51%	73%	73%	74%	78%	88%	88%	83%
Total	5.534	5.81082	3.75249	3.69169	3.69302	3.56142	3.14571	3.12141	3.37223
No. Stud.	1960	1547	1282	1282	994	887	887	887	782
No. Schl.	32	27	27	27	26	22	22	22	20

TABLE 5.3

MATHEMATICS MODELS

EXPLAN. VARIABLES	A	B	C	D	E	F	G	I	J
FIXED									
Constant	5.7	1.85	-1.57	.90	-.03	-3.68	-3.53	-3.46	-1.41
	(.04)	(.20)	(.19)	(.30)	(.32)	(.33)	(.39)	(.37)	(.47)
GR7M			.58	-.46	-.44	.61	.61	.61	-.25
			(.02)	(.10)	(.10)	(.03)	(.03)	(.03)	(.13)
GR7MSQ				.10	.09				.08
				(.01)	(.01)				(.01)
BKGRDM					.54	.54	.54	.49	.50
					(.07)	(.08)	(.08)	(.09)	(.08)
CLSM						.62	.65	.79	.57
						(.14)	(.19)	(.17)	(.14)
SCHLM								-.28	
								(.23)	
SC1							-.50		
							(.34)		
SC1xGR7M									
SC2							-.43		
							(.30)		
SC2xGR7M									
SC3							.05		
							(.33)		
SC3xGR7M									
SC4							.26		
							(.67)		
SC4xGR7M									
SC5							-.38		
							(.38)		
SC5xGR7M									
RANDOM									
School	3.5065	.52	.16391	.18286	.06941	-	0.0	.00948	-
	(.11)	(.34)	(.13)	(.12)	(.08)	-	-	(.08)	-
%	58%	9%	4%	5%	2%	-	-	0.3%	-
Class	-	2.031	.82956	.60027	.49756	.5630	.49795	.52037	.4878
	-	(.37)	(.17)	(.13)	(.12)	(.13)	(.12)	(.15)	(.12)
%	-	35%	22%	18%	16%	17%	16%	17%	16%
Student	2.5561	3.3058	2.7292	2.6006	2.5538	2.6633	2.6581	2.5464	2.583
	(0.0)	(.10)	(.09)	(.09)	(.09)	(.11)	(.11)	(.11)	(.11)
%	42%	56%	73%	77%	82%	83%	84%	83%	84%
Total	6.0626	5.8568	3.72267	3.38373	3.12077	3.2263	3.15605	3.07625	3.0708
No. Stud.	1960	2205	1838	1838	1725	1188	1191	1077	1188
No. Schl.	32	32	32	32	32	2-level	26	24	2-level

work in the secondary schools. Recalling some of the schooltype differences described in Chapter 3, it was found that some schools did continue to use the Grade 7 Examination as a selective measure, despite its downgrading to simply an indicative examination, as per Ministry of Education instruction. Therefore, besides amounting to an indirect selection factor, it also has continued to be used by some schools directly for selection purposes. Indeed, the mean Grade 7 scores by schooltype ranged from 5.2 for district council schools up to 7.9 for independent schools.[2] The level of pupil variation, 42%, illustrates that a similar, if smaller, proportion of the variance lies within schools (between pupils) as between schools.

Comparison

The models for the other subjects produced the same overall picture as regards the variation of the Grade 7 score involving schools and pupils. It is worth drawing attention to the rankings of the different schooltypes by mean Grade 7 score by subject for purposes of comparison with the rankings of the final models. Table 5.4 illustrates this.

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[2] As can be seen from Table 5.6 a much reduced sample resulted from the elimination of missing values as well as the constraints of the multilevel programme. The range of mean Grade 7 English Language scores by school (not schooltype) for those students surviving to the last models was even greater, from 4.3 to 9.0. It is interesting to note that no school's average Grade 7 score is below the pass level.

TABLE 5.4

Ranking of Schooltypes by Mean Grade 7 Score for English Language, English Literature and Mathematics

Rank	Schooltype	Mean GR7E1	Schooltype	Mean GR7E2	Schooltype	Mean GR7M
1	Independent	7.9	Independent	8.0	Independent	7.8
2	Group A	6.4	Group A	6.7	Gp A/Mission	6.1
3	Mission	6.2	Mission	6.0	Group B(rur)	5.9
4	Group B(urb)	5.8	Group B(urb)	5.7	Group B(urb)	5.7
5	Group B(rur)	5.6	Group B(rur)	5.6	Dist.Council	5.1
6	Dist.Council	5.2	Dist.Council	5.2	-	

MODEL B: The Variation of 'O' Level Examination Scores

A further base-line is constructed in Model B, regressing 'O' level results on a constant and thus giving a basic analysis of the overall variation between pupils, classes and schools. There emerges a different picture. The variation between schools is less for 'O' levels than it was for Grade 7. For English Language, whereas the intra-school variation at Grade 7 was 58%, for the 'O' level, it is only 42%. It is this variation for which an explanation will be sought in subsequent models that are developed. Of course Model B is a three level model because the pupils' results are being analysed in the actual classes from which they sat their 'O' level examinations. The between-pupil variation forms a large proportion of the total variance, 58%, larger in fact than the clustering that occurs through streaming and the effects of the same treatment factors within classes within schools.

That variance, which is the total intra-classroom correlation[3], is 42%.

Comparison

The picture for the other two subjects is not quite the same. For both English Literature and Mathematics, there is a drop in the total intra-school variation to 48% and 44% respectively, implying, as was the case with English Language, that grades are less homogeneous at the school level than was the case for Grade 7. However, the differences between the three subjects emerge when one compares the between-school variation. On the one hand, for English Literature, 34% of the variation in 'O' level achievement is due to between-school factors, whereas on the other hand, for Mathematics, only 9% of the variation in 'O' level achievement is similarly accountable. In other words, whereas for Mathematics, selection into a particular school accounts for little of the variation in 'O' level grades, for English Literature, the prior selection into a particular school is more significant.

MODEL C: Controlling for Grade 7 Intake Scores

Model C takes the analysis one step further: differences in Grade 7 intake are controlled for and the effects on the variation in 'O' level grades at the three levels are analysed. The results are dramatic. The between-pupil variation is reduced, the proportion of the variation accounted for rising from 58% to 73%. Controlling for Grade 7 scores confirms what is already known from Model A, that on

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[3] Intra-classroom correlation is used here to signify the correlation between different pupils in the same class. This is in order to distinguish it from the term intra-class correlation used in the sample survey literature, which designates the proportion of variance due to all higher level units. (See Goldstein, 1987, p.13.)

intake, pupils differ markedly in their achievement. Once controlled for, the between-school and between-classroom variation is reduced by more than half, the intra-classroom and intra-school correlations being reduced to 27% and 14%, respectively. This still quite preliminary step of controlling for some of the intake characteristics of the pupils, illustrates the large amount of variance between schools and classrooms accounted for by selection and which in a single level model would be confounded with school or classroom treatment differences. More than one quarter of the total variance in 'O' level English Language grades is explained by the prior achievement measured by the Grade 7 examination, 28%. The coefficient of the Grade 7 score is naturally highly significant.

Comparison

The models for English Literature and Mathematics are affected in much the same way. Indeed, the respective proportions of the total variation accounted for by the class and the student are virtually the same. However, whereas 28% of the total variance in English Language grades was accounted for by the prior intake score, for English Literature and for Mathematics, the proportions accounted for are 35% and 36% respectively. For Mathematics, even at this very early stage in the analysis, it is found that there are no significant between-school differences.[4]

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[4] As Goldstein points out, however, this does not necessarily imply a true zero between-school population variance, especially given the few schools in the sample-only 32 here (Goldstein, 1987,chapter 2).

MODEL D[*]: Testing the Quadratic of the Grade 7 Score for Inclusion

In Model D the square of the Grade 7 score was added to the model as a further explanatory variable. For English Language, the coefficient for this variable was not significant, so it was not included in any subsequent models.

For English Literature and Mathematics, Grade 7 squared was found to be a significant explanatory variable, thus uncovering a non-linear relationship. Although there were minor reductions in the three residual variances for English Literature, the effect of the inclusion of this variable on the Mathematics model was more puzzling. The between-school variance was raised, together with the between-pupil variance, though the intra-classroom correlation was reduced. The overall effect was a reduced residual variance, however, which one would expect. It is not obvious why the Mathematics model was so differently affected. It could simply be sampling variation, but it could also be related to the narrower distribution of 'O' level Mathematics grades, leading to a non-linear relationship with Grade 7. Whereas the range of grades is the same for all three subjects, from 0 to 7, and the mean grades for the English subjects are both about 2.5 and the median grades both 3, the mean grade for Mathematics

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[*] Model D is presented at this stage because it is logical to consider the explanatory variable, Grade 7^2, after considering Grade 7. In fact, however, this analysis was carried out after some of the subsequent models reported, which accounts for the absence from some of these later models of the significant variable Grade 7^2 for English Literature and Mathematics. Given the slight changes in the residuals as a result of the inclusion of this variable, it was not thought worthwhile to rerun all the subsequent models just for the sake of its inclusion.

is 1.8, with a median grade of 0. It could be that the improved specification of the Grade 7 score results in better estimations of the residual variances at the three levels. Indeed, the result of the inclusion of the Grade 7 quadratic term for Mathematics is that the proportion of the total variance explained by the intake score rises to 42%. For English Literature there is a more modest increase of 1% resulting from the inclusion of this variable.

MODEL E: Controlling for Pupil Background Characteristics

In Model E a background index variable is introduced, intended to measure the influence on the pupil's achievement of the pupil's home background. Chapter 4 detailed the construction of all the index variables. The constituents of the background index variable for English Language comprised the following pupil-level variables: sex, ethnic group, father's occupation, father's education (by proxy mother's occupation and education as well), and electricity (which also 'covers' for radio, TV and newspapers).* The result of the inclusion of this variable was a further, dramatic reduction - almost by half - in the school-level variance to 8% of the total variance. This is about one-third the level before any factors were controlled for in the equation. What this means is that some of the differentiation in achievement by school seen in the earlier models, was actually due to the previous selection into those schools on the basis of characteristics related to the pupil's home background and not due to achievement at 'O' level. Once these factors are controlled

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* The constituent variables and their coefficients are given here again, for ease of reference:

MEX .34;
ETH1 -1.07, ETH2 -.85, ETH3 .62;
FJB1 .86, FJB2, .37;
FED0 -.68, FED1 -.71, FED2 -.57, FED3 -.25;
ELECY .78

for, the differentiation in achievement between schools is not so great. This is hardly surprising. The coefficient of the background index variable for English Language is highly significant and positive. The result of its inclusion tells us that family background and the level of home amenities do matter to achievement in English Language and unless specifically controlled for would confound the identification of school or classroom-based factors which influence achievement. Again, as with controlling for Grade 7 intake, the pupil's background index variable helps to weed out those factors which do not relate directly to the school's input to the pupil's achievement, but are the 'givens' before any learning takes place. This variable accounts for a further 5% of the total variance in English Language grades at 'O' level. The intra-classroom correlation is further reduced to 21% and the pupil-level variance rises to 79% of the total variance- a figure that was reduced considerably itself by the inclusion of this variable. The proportion of the overall variance (Model B) accounted for is 33%.

What is interesting about the models from Model C onwards is that although there are changes in the intra-school and intra-classroom correlations with the inclusion of this and further variables, the class-level variance on its own does not fall below 13% of the total variance. There is little change between Model C and Model E in this variance[7], from one interpretation implying that classes are not formed on the basis of the variables covered by the background index variable, which stands to reason. Classes within Zimbabwean secondary schools are not segregated by sex, ethnic group or socio-economic class, the factors being measured by the constituent variables. This, of course, is not what was found

[7] These two models are compared, rather than D and E because the quadratic for the Grade 7 score tested in Model D was not found to be significant.

when the Grade 7 intake score was introduced. The dramatic drop in the class-level variance between Models B and C illustrated well how classes are indeed formed on the basis of these intake scores. Another interpretation might be that including the Grade 7 intake score, as it serves as a proxy for other pupil background characteristics, has already eliminated the variance due to these factors in Model C. This view would be supported by the observation that more often than not the top stream classes have the highest proportion of pupils the category FJOB1, the category comprising pupils whose fathers are in white collar jobs, or who are commercial farmers. It is of further interest to note that this was not the case with respect to the educational backgrounds of the pupils' fathers - but this reflects the newly widened educational opportunities opened to the majority African population. Many of the pupils sampled are the first generation of secondary school pupils in their families.

Comparison

For English Literature there is a much smaller reduction in the intra-school correlation and no reduction at all in the intra-classroom correlation between Models D and E[6], but an increase in the class-level variance taken on its own. It is difficult to interpret this surprising increase in the class-level variance when a significant variable such as BKGRDE2 is introduced because the side-effect of its introduction is the necessary elimination of all cases with any missing values, and this has resulted in the loss of one school and some 300 pupils in the sample.[7] It may be that this increase in the

[6] This is the relevant comparison for English Literature because both models contain the quadratic for the Grade 7 score which was found to be a significant variable in Model D.

[7] This changing sample size as one adds new variables also confuses the progression of subsequent models. It was thought desirable to use the fullest data set possible for

class-level variance relates only to the different sample under study and not explicitly to the effects of introducing the new pupil background index variable. This would stand to reason since it is only the class-level variance which is increasing, that is, the differentiation in achievement between classes in different schools is greater; the fact that the intra-classroom correlation remains constant illustrates that the differences in achievement between classes within a school do not change as a result of the inclusion of BKGRDE2. Indeed, there is an increase in the mean 'O' level grade from 2.24 to 2.34 for the reduced sample, so this may be the reason for the unexpected results here.

Models E for English Language and English Literature reveal that schools are more homogeneous in their English Literature achievement levels than for English Language. As for English Language, from Model E on, the proportion of class-level variance does not go below 12% of the total variance, a fact which will be discussed further below. The proportion of pupil-level variance rises only marginally to 74% of the total variance; this may further corroborate the fact that the earlier inclusion of the Grade 7 score accounted for the bulk of pupil background differences. The constituent variables of the background index variable for English Literature are the same as those for English Language with the exception of electricity.[10] The proportion of the total variance (Model B) explained is 36%.

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each analysis, rather than to use a reduced data set for all of the models in order to retain as much information as possible.

[10] The constituent variables of BKGRDE2 and their coefficients are as follows:
MEX -.17;
ETH1 -1.16, ETH2 -1.38, ETH3 -.36;
FJB1 1.13, FJB2 .46;
FEDO -1.13, FED1 -1.24, FED2 -.85, FED3 -.57

For Mathematics, the already small intra-school correlation becomes statistically non-significant by the inclusion of the background index variable, whose constituents are: sex, ethnic group, day/boarding pupil, hours of homework - not the same as those for the two English subjects[11]. What has been revealed here is a reduction in school-level differences in achievement and an increase in pupil-level differentiation. As with the other two subjects, the class-level variance from this model on, remains at an almost constant 16% of the total variance. The proportion of the overall variance (Model B) accounted for is 47%.

MODEL F: Controlling for Classroom/Teacher Characteristics

In this model a classroom/teacher index variable is added to the equation. In the case of English Language, this variable comprised the following constituent variables: the sex (and by proxy, the ethnic group) of the teacher, and the number of textbooks available per pupil, (but also covering for other variables such as class size and teacher's verbal aptitude which are omitted in combination with other school-level variables, as explained in Chapter 4.)[12] (Other variables of importance which were lost due to high correlations include the number of years of teaching experience and the number of

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[11] The constituent variables of BKGRDM and their coefficients are as follows:

MEX .88;
ETH1 -1.20, ETH2 -.87, ETH3 -.35;
DAY -1.55;
HOMEWORK .09

[12] The constituent variables of CLSE1 and their coefficients are as follows:

EX -1.28;
TEXT01 -.56, TEXT2 -.30

years at the particular school in question, the amount of homework given, and the age and qualifications of the teacher.) The effect of the inclusion of this additional index variable was to reduce the school-level variance to a small, statistically non-significant value for English Language and marginally to increase the class and pupil-level variances. The fact that the school-level variance is so greatly reduced in this model indicates that in earlier models the class-level variance was being confused with the school-level variance due to correlations between the class and school-level variables. The inclusion of the class index variable results in an increase to 36% of the overall variance explained, indicating that the class index variable has exposed class and teacher characteristics which are important in understanding why pupils in some classes achieve better results than in others. For instance, the availability of textbooks would seem to be an important factor related to the levels of achievement reached in English Language 'O' levels, as well as having a European teacher.

The reduction in the school-level variance due to the inclusion of the class index variable can be explained by referring back to Table 3.11 in Chapter 3 which illustrates the distribution of the different class/teacher variables covered by the index variable across the different schooltypes: Group B (rural) and district council schools have by far the youngest teachers with the least teaching experience as well as the fewest number of years at the particular school in question, and district council schools have the worst qualified teaching staff - only 32% are trained in the sample. Once these characteristics are controlled for, the school-level variance is reduced.

Comparison

For English Literature, the classroom/teacher index variable comprises the following constituent variables: the teacher's verbal aptitude score, the sex and ethnic group of the teacher, and class size.[13] The result of including this index variable is to lead to a fall in the school-level variance of more than half to 6% and its loss of formal significance. There is a larger rise in the class-level variance than for English Language but the intra-classroom correlation, i.e the percentage (school and class) is just marginally down, as happened for the other subject. This increase in the class-level variance implies that we probably have not yet identified all the classroom/teacher variables that matter in differentiating the inputs to pupils at the class level. The proportion of the total variance (Model B) now explained is 39%.

For Mathematics the constituent variables of the class/teacher index variable are: class size, the years of teaching experience of the teacher, the teacher's ethnic group and the number of textbooks per pupil.[14] A two-level model is used because (from a previous run) it was shown that the school-level variance was eliminated completely by the inclusion of this index variable. The results show that there is a small rise in the class-level variance, as occurred for the other

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[13] The constituent variables of CLSE2 and their coefficients are as follows:

EVERBAL .04;
EX -1.09;
CSIZE -.08;
NONEUR -.97

[14] The constituent variables of CLSM and their coefficients are as follows:

CSIZE -.02;
MEXPER .06;
NONEUR -1.14;
TEXT01 -.34, TEXT2 -.35

subjects, as well as a small increase in the pupil-level variance.[19] The proportion of the total variance (Model B) explained is 45%.

MODEL F*: Allowing GR7E1 to Vary Randomly Across Schools

In Model F*, instead of assuming that the Grade 7 intake score has a fixed coefficient, as has been the assumption in the previous models, the coefficient of the Grade 7 score was allowed to vary randomly across schools. Only in the case of English Language, however, were the additional two random coefficients at the school level non-zero. Table 5.1 (Part I) reports the results of Model F* for English Language. It can be seen that none of these school-level coefficients is formally significant, but the small sample size - only 29 schools - must be borne in mind. In order to compare Model F* with the other models, given that the school-level variances in Model F* are not fixed but vary according to the Grade 7 score, the school-level variances were calculated at the average Grade 7 score, as shown in Table 5.1 (Part I). The class-level variance then is an average for all the Grade 7 scores. Model F* looks more akin to Model E than Model F. The between-school variance is more considerable when the coefficient of the Grade 7 score is allowed to vary randomly across schools, 7% of the total variance. Between-school differences, therefore, are not primarily due to differences in Grade 7 intake scores. Between-pupil differences are

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[19] The fact that the proportion of variance explained by this model is less than in Model E can be understood by the absence of the quadratic for the Grade 7 score, for as will be seen in Model K which is the same as Model F but includes this variable, the proportion of variance explained rises to 48% of the total variance (Model B). The reason for including Model F, however, is in order to test the progression of models which do not include this quadratic, Models G and I.

reduced in Model F*. In Model F* 34% of the total variance (Model B) has been explained.

MODEL G: Testing Schooltype Differentiation

In Model G five schooltype variables are considered, using the district council schools as the reference point, before adding a school index variable to the equation, which is done in Model I. As a result of the inclusion of these variables, the school-level variance is eliminated completely from the equation for English Language. In addition, the coefficient of the class index variable is no longer formally significant. The pupil-level variance increases to 85% but the class-level variance remains at 15%, compared with Model F. The differences between the schooltypes in this model were found to be highly significant, with the ranking of schooltypes as follows: 1) Independent, 2) Mission, 3) Group B (urban), 4) Group B (rural), 5) Group A and 6) District Council. With the exception of the Group A schools which have moved down from second in the ranking of mean English Language 'O' level scores to fifth here, the order is the same as before. There is little difference, however, between the two Group B schooltypes. The fact that the school-level variance is 0.0 is an interesting result because it indicates that whilst schooltype differences in English Language achievement are significant, no differences can be detected between individual schools within schooltypes: this variance has been accounted for by the inclusion of the variables to this point.[16] In Model G 39% of the total variance (Model B) has been explained.

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[16] The same earlier proviso made, regarding this zero school-level variance possibly being accounted for by the small sample size must be noted here as well, however.

Comparison

Model G produces even more striking results for English Literature than for English Language, though in the same direction. The school-level variance is eliminated completely also for English Literature, but there is a reduction in the class-level variance, down from 16% to 12%, and a rise in the pupil-level variance, from 78% to 88%. The differences in class treatment up to this stage clearly have been overstated. The schooltype differences were found to be highly significant. Their ranking was as follows: 1) Mission, 2) Independent, 3) Group B (rural), 4) Group A, 5) Group B (urban) and 6) District Council. This is different from the raw ranking of mean English Literature 'O' level scores by schooltype (See Table 3.9); it is also quite different from the ranking of schooltypes for English Language. There is a rise in the proportion of the total variance (Model B) explained by this model, up from 39% in Model F to 46% here.

For Mathematics, where the school-level variance has already been eliminated, the introduction of these schooltype variables has hardly any effect and their coefficients are not found to be significant. The class-level variance has decreased slightly and the pupil-level variance increased slightly and with a 1% increase in the proportion of the total variance (Model B) explained.

MODEL H: Testing Whether Grade 7 Intake Scores are the Basis of the Schooltype Differentiation Uncovered

Model H introduces five variables representing the interaction between schooltype and the Grade 7 intake score. The differences between schooltype accounted for by the Grade 7 score are found to be highly significant for English Language.

The coefficient of the class index variable is still not formally significant, but this model is presented for purposes of comparison with the case of English Literature. The spread of the differences in the coefficients of these new interaction terms is much narrower than in the previous model. In order to compare the ranking by schooltype, the value of the schooltype/Grade 7 interaction terms is taken at the average Grade 7 score and the sum of this product plus the schooltype coefficient can then be compared across schooltypes as follows:

SC1	(Group A)	.42
SC2	(Group B urban)	.44
SC3	(Group B rural)	.37
SC4	(Independent)	2.50
SC5	(Mission)	1.04

This ranking is not very different from that in Model G. There is little difference between Group B (urban), Group B (rural) and Group A schools in this new ranking. The class-level variance has risen. In order to understand this, the interactions would have to be explored further.[17]

Comparison

For English Literature, the schooltype differentiation described in Model G is not found to be the result of the differences in the Grade 7 intake scores. The new interaction terms were not found to be significant. Recalling Model B, the proportion of variance attributable to the school level was greater than that for either of the other two subjects. It would appear that for English Literature, schooltype differences obtain, beyond those which are due to Grade 7 selection.

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[17] Given that the class index variable is no longer significant, this would be of dubious value.

Given the lack of significance of the schooltype differences found in Model G for Mathematics, Model H was not pursued for this subject. The variance due to differences in achievement at the school-level in Model B, of course, was much smaller for Mathematics than for the other two subjects, and as has been explained, was eliminated at an earlier stage than for the English subjects.

MODEL I: Controlling for School Characteristics

Model I is developed from Model F rather than from Models G or H. Although it is already known that the schooltype variables eliminate the school-level variance, the effect of the inclusion of the school index variable on the equation without these schooltype variables is not yet known. As with Model G, the school-level variance is eliminated by the inclusion of the school index variable which, for English Language comprises the cost per day pupil and the distinction between boarding and non-boarding schools.[10] The class-level variance is increased, no doubt due to the direct relationship between cost per day pupil and the effects of this variable on the provision of facilities at the class level. Indeed firmer evidence of this correlation between the two levels is obtained by examining the coefficients for the class and school index variables. The coefficient for the class index variable is reduced once the school index variable comes into play, so much so that it is no longer formally significant. In Chapter 4 when the constituent variables of CLSE1 and SCHLE1 were tested, such variables as class size and the verbal aptitude of the teacher had to be eliminated due to the high correlations with the variable, COSTDAY, cost per day

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[10] The constituent variables of SCHLE1 and their coefficients are as follows:

BOARDY .80;
COSTDAY .003

pupil. The remaining CLSE1 still contains the variable, number of textbooks per pupil, and this is directly correlated with the cost per day pupil. Therefore, it should not be surprising that it is not possible in Model I to fit both the class and school index variables. For this reason, Model I cannot be considered a valid model for English Language, and indeed, from the relative strengths of the coefficients for the two index variables, it would appear that the school index variable, rather than the class index variable, should be retained.

Comparison

For English Literature the inclusion of a school index variable which in the end comprised only the cost per day pupil,[19] did not greatly reduce the coefficient of the class index variable, as with English Language, but its own coefficient was not formally significant. The school and class index variables are correlated, as with English Language. The effect was to reduce the already insignificant school-level variance and the class-level variance, increasing the pupil-level variance to 83%. In general, then, Model I is not a valid model for English Literature, for the same reasons as for English Language.

For Mathematics, the effect of introducing the school index variable which again, comprised only the cost per day pupil[20], was to increase the coefficient of the class index variable but at the cost of producing an insignificant, and moreover, counterintuitive coefficient for the school index variable.

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[19] The constituent variable of SCHLE2 and its coefficient is:

COSTDAY .004

[20] The constituent variable of SCHLM and its coefficient is:

COSTDAY .003

The coefficient for SCHLM is negative, which would imply that the greater the cost per day pupil, the worse that pupil would perform on his 'O' level Mathematics exam. This is not entirely plausible. Once more, the correlation between the two index variables makes it impossible to include both of them in the same model and the inclusion of the school index variable will have to be rejected on the basis of the results of this model.

MODEL J (English Language): Eliminating CLSE1 in Favour of SCHLE1

Model J is only applicable to English Language. On the basis of the results of Model I in which SCHLE1 survived with a significant coefficient whereas CLSE1 lost its significance- the opposite of the case for English Literature and Mathematics - it was thought worthwhile to test the inclusion of only the school index variable and not the class index variable, to see the difference in effect on the coefficients. The coefficient for SCHLE1 is more significant than that for CLSE1 when taken separately, the T-test statistic for CLSE1 being 3.43 and for SCHLE1 being 5.23. The proportion of the total variance explained by Model J is 37%, compared with the 36% found for Model F. We can assume that the inclusion of one of the two index variables, CLSE1 or SCHLE1, will cover for the other.

The Final Models?: MODELS K for English Language and Mathematics; MODEL G for English Literature

Model K for English Language is like Model H, utilising the schooltype/Grade 7 score interaction terms, but given the correlation between the class and the school index variables and their relative strengths seen in previous models, the school index variable is utilised in preference to the class index variable. The schooltype differentiation accounted for by the Grade 7 intake is found to be highly significant, as was the case for Model H.[21] The school index variable is formally significant, unlike the case for the class index variable in Model H. The ranking of the schooltypes is very similar to that found in Model H, but there are greater differences between the three government schooltypes, the gap narrowing between independent and mission schools:

SC1 (Group A)	.06
SC2 (Group B urban)	.25
SC3 (Group B rural)	.40
SC4 (Independent)	1.90
SC5 (Mission)	1.40

There is not much difference in the proportions of variance accounted for at the pupil and class levels compared with Model J in which none of the schooltype variables were fitted. Although the school level variance has been explained - albeit with uncertain reliability, given the small size of the sample of schools - a relatively high proportion of the total unexplained variation in English Language achievement grades, attributed to the class level, is still left unexplained by the variables fitted to the model. With the necessary exclusion of missing values as new variables were fitted, three schools and nearly 1,000 pupils had to be eliminated from the sample under study, so in Model K 29 schools comprising 1,252 pupils are included. Thirty eight percent of the total variance (Model B) has been explained by Model K.

[21] Whereas for Model H the chi-square test statistic was 16.34 (with five degrees of freedom), yielding a confidence level of 99% for the differences by schooltype being accounted for by the Grade 7 intake score, for Model K the chi-square test statistic was 20.37 (with five degrees of freedom), yielding a confidence level of 99.9%.

Comparison

For English Literature, it would appear that Model G is the final model to be used. Model H illustrated that the schooltype differentiation found in English Literature was not due to differences in Grade 7 intake score. Model I ruled out the use of both class and school index variables, and the class index variable was clearly the stronger of the two, unlike the case for English Language. The quadratic term for the Grade 7 intake score is not included in this final model because although it was found to be significant in earlier Models D and E, once the schooltype variables were fitted, it no longer remained so.[22] The class-level variance left unexplained by Model G is still some twelve percent of the total unexplained variation in English Literature achievement grades. The school-level variance has been explained by the variables which have been fitted. Indeed, differences between schooltypes seem to override between-school differences, though, one must be cautious in drawing firm conclusions from such a small sample size. With the elimination of missing values, only 22 schools remain in the final sample under study, comprising 887 pupils. Forty six percent of the total variance in Model B is explained by this model.

Model K for Mathematics is really Model F to which the highly significant quadratic term for the Grade 7 intake score has been included. Just as its inclusion in Model D improved the explanatory power of the equation, so in Model K there is also some improvement as well. Forty eight percent of the total variation (Model B) has been explained by Model K. Models G and I ruled out both the schooltype and the school index variables, so it would seem that Model K is the final model for Mathematics. Like the other two subjects, a relatively

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[22] For the sake of simplicity, not all the models tested are reported here.

high proportion of the total unexplained variation, 16%, attributed to the class level, is left unexplained by Model K. 1,188 pupils remain in the final sample under study, from 26 schools, though it is a two-level model involving only pupils and classes.

Summary of 'Final' Models

Without going through a more detailed, variable by variable analysis, which will follow, what has the progression of models culminating in Model K to tell us about the differences in achievement on the 'O' level English Language examination? Firstly, and not surprisingly for studies of this kind, most of the variance in achievement is due to individual differences - 73% in Model C, after Grade 7 intake has been accounted for, rising to 82%, by Model K. The Grade 7 intake score plays a large part in accounting for between school differences. This can be seen in the reduction in the proportion of school level variance from 22% in Model B to 14% once this variable has been included. Additional pupil background factors reduce this 14% figure to only 8%, once the background index variable has been fitted. After these intake adjustments have been made (Model E) the class level variance is 13% of the total variance remaining. One might have thought that the introduction of the class index variable would have reduced this class level variance, but this is not the case, for from Model E on, this proportion increases, reaching 18% by the final Model K. Despite the introduction of various explanatory variables, this class level variance remains unexplained by the final Model K. The between school and between schooltype differences which can be observed in the earlier models can be explained through differences in Grade 7 intake scores between schooltypes. However, the significant differences between schooltypes are greatest between independent and mission schools on the one hand, and the remaining schooltypes on the other. The district council schools are not so far behind the government schooltypes as might habe been thought from the comparisons of average 'O' level grades by schooltype, as can be judged by the value at the average Grade 7 score of the sum of the coefficient of the schooltype/Grade 7 interaction term and the schooltype coefficient in Model K.

Comparison

For English Literature an even higher proportion of the variance is accounted for at the pupil level than for English Language, 88% by Model G, rising from the 73% figure in Model D, once Grade 7 intake has been accounted for. The Grade 7 intake score accounts for a great deal of the between school variance. Between Models B and C, the 34% figure is reduced to 18%. Once the background index variable has been added, this is further reduced to 14%, not as large a drop as for English Language. The class level variance, once all the intake adjustments have been made is 12% of the total variance (Model E). Even after the class index variable has been fitted, however, like English Language, rather than being reduced, this figure increases to some 16% of the total variance, illustrating the inadequate explanations provided by the class index variable. The class level variance is never reduced below 12% of the total variance, the figure it results in by Model G when all the variables have been fit. Much of the between-school differences can be explained by differences in the intake achievement scores of the pupils, but the between-schooltype differences override the between-school differences and are not similarly accounted for by the pupils' Grade 7 intake scores. There is considerable differentiation by schooltype, however, the smallest differences, rather surprisingly, being between Independent and Group B (rural) schools, the greatest differences being between the mission and district council schools.

For Mathematics, after adjustments for Grade 7 intake score, 77% of the total variance was accountable at the pupil level. This was increased to 84% by Model K. The Grade 7 intake score, as for the other subjects, accounted for a large proportion of the class level variance, reducing the figure from 35%, before any adjustments had been made, to 18% (Model D). The inclusion of the further intake adjustment, the background index variable, reduced the class level variance to 16% (Model E) and further reduced the between school variance. Inadequate explanations of the variance in Mathematics achievement at the class level are given by the class index variable. If one compares Model E with Model K there is not a lot of difference after the inclusion of the class index variable. Between school differences in Mathematics were much smaller than for the other two subjects, right from the start of the analysis, constituting only 9% of the total variance, before any adjustments had been made. Although the sample of schools is too small for it to be definitive, it would seem that once Grade 7 scores have been taken into account, there are no between school differences in Mathematics.

There is clearly much that is missing in the way of explanation for the class-level variance in all three subjects even after the different explanatory variables have been fit. In all three 'final' models, some 12-18% of the total variance is left unexplained.

Comparisons of the Proportions of the Total Variance Explained by Different Variables Across Subjects

Table 5.5 compares the proportion of the total variance explained by the different explanatory variables for the three subjects. Of course, this has to be viewed from the perspective that less than half of all the variance is explained in any case by the models, so it is really a proportion of the unknown and is used here only for purposes of comparison between examination subjects.[23]

TABLE 5.5

The Proportion of the Total Variance Explained by the Explanatory Variables for English Language, English Literature and Mathematics

Subject	Gr.7 Score	Gr.7² Score	Bkgrd. Index	Class Index	Schltype	Schltype x Gr.7	Total Variance
English Language	28%	-	5%	3%	3%	-1%	38%
English Lit.	35%	1%	-	3%	7%	-	46%
Maths	36%	6%	5%	1%	-	-	48%

The final model for English Language shows that more than a quarter of the variance explained in English Language 'O' levels is due to prior achievement, as measured by the Grade 7 examination. Another 5% of the total variance explained is accounted for by the pupil's own socio-economic background as measured by the background index variable for English Language, BKGRDE1. Three percent of the total variance explained is due to classroom or teacher effects as measured by CLSE1. Differentation by schooltype accounts for a further 3% of the total variance. Thirty-eight percent of the total

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[23] The order in which the variables are entered into the equations affects these proportions, of course, but the order was the same for all three subjects, so there is some legitimacy in the comparisons between subjects if less in the comparison between variables within the individual subject models.

variance in English Language 'O' level grades is explained by the fitted variables.

For English Literature, it can be seen from Table 5.5 that a larger proportion of the explained variance is due to prior achievement, as measured by the Grade 7 examination, than was the case for English Language. Thirty-five percent of the total explained variance is thus explained. This is raised by 1% when the quadratic for Grade 7 is added to the equation. The fact that the background index variable does not raise the explanatory power of the equation is hard to understand except in view of the large amount of variance explained by the Grade 7 exam score, particularly when the interaction term with schooltype is added. This opens up the possibility that the Grade 7 score is in fact covering for other individual background factors which are swamped by the Grade 7 effect. Schooltype differentiation accounts for a larger amount of the explained variance, 7%, relative to the other subjects. Classroom/teacher factors as covered by the index variable CLSE2 account for only 3% of the explained variance. Altogether, 46% of the variance is explained by Model K for English Literature.

For Mathematics, a similar proportion to English Literature, of the total explained variance is accounted for by Grade 7 intake scores, 36%, but the effect of fitting the quadratic for Grade 7 is more significant, increasing the variance explained by 6%, whereas it had only a marginal effect for English Literature. The effect of introducing the background index variable for Mathematics, BKGRDM is to raise the total variance explained by 5%. Classroom/teacher influences seem to play a relatively marginal role, adding only 1% to the proportion of the total variance explained. This total explained variance is some 48% of the total variance for Mathematics.

Missing Explanatory Variables and the Effect on Mean Outcomes of the Elimination of Missing Values (and the Consequent Reduction in Sample Size)

Having examined the progression of models, testing the introduction of different variables at each stage, how does one know whether the final models for each subject have been reached? If an important explanatory variable has been overlooked, the so-called 'final' models will be very misleading as to the determinants of achievement in each of the three subjects. In order to test whether other obvious explanatory variables should have been included, they were plotted against the standardised class-level residuals for each subject.[24] The full set of plots resulting from the variables tested for each subject can be found in Appendix 5.2. No patterns were uncovered to warrant the inclusion of additional variables in the 'final' models.

As stated, at each stage, the effect of the elimination of missing values - necessary for the multilevel model utilised- was a reduction in the sample size, together with an initial reduction in the overall sample due to the constraints of the model. This raises the question whether the changes in sample size from model to model would alter the mean outcomes and

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[24] The standardised class-level residuals of Model J for English Language and Model F for the other two subjects were used for these plots, that is before the schooltype/Grade 7 interaction terms were added to the two English subjects and using the school, rather than the class index variable for English Language. The strong correlation between the class and school index variables makes the inclusion of either one sufficient for testing. If patterns were to have been uncovered in the final models, they would also have shown up in the models tested. The class-level residuals were used, of course, because the school-level variances had already been eliminated by this stage.

therefore the results of the analyses. In Table 5.6 the effect on the mean 'O' level grades by schooltype for each subject is analysed. For English Language the elimination of missing values by stage IV exaggerates the differences in achievement between Group A and Mission schools, and they have switched places in terms of their ranking. For English Literature, although there is no change in the ranking by mean grade by schooltype, the Independent and Mission schools are closer in mean scores than in the original sample by the time stage IV has been reached. For Mathematics, despite there being no change in the ranking by schooltype, the differences in achievement between schooltypes are collapsed. This merely reflects what has already been seen in the analyses: that schooltype as well as between-school differences for Mathematics achievement are much less significant than for the English subjects.

TABLE 5.6

The Effect on Mean Grades by Schooltype of the Reduction in Sample Size Due to Model Constraints and the Elimination of Missing Values (Number of Cases)

English Language

Schltype	I	II	III	IV
A (Urban)	3.38 (403)	3.46 (312)	3.11 (163)	3.07 (116)
B (Urban)	2.62 (1133)	2.77 (366)	2.82 (349)	2.69 (197)
B (Rural)	2.07 (461)	2.09 (385)	2.09 (378)	2.17 (266)
Independent	5.70 (152)	5.70 (152)	5.75 (61)	5.89 (44)
Mission	3.30 (385)	3.29 (319)	3.24 (292)	3.57 (165)
Dist.Council	1.49 (706)	1.49 (706)	1.52 (639)	1.66 (464)
ALL SCHOOLS	2.62 (3240)	2.62 (2240)	2.42 (1882)	2.46 (1252)

KEY

I Total - All Cases
II Reduced Sample - Due to Constraints of Multilevel Model
III Elimination of Cases having no Grade 7 Intake Score
IV III plus Elimination of Cases having Missing Values for Constituent Variables of Background or Class Index Variables

TABLE 5.6 (Cont.)

English Literature

Schltype	I	II	III	IV
A (Urban)	3.01 (190)	3.34 (148)	3.38 (71)	3.53 (58)
B (Urban)	2.17 (551)	2.36 (188)	2.41 (180)	2.40 (148)
B (Rural)	2.13 (341)	2.21 (284)	2.20 (278)	2.21 (205)
Independent	5.66 (152)	5.66 (152)	5.02 (48)	5.00 (3)
Mission	3.30 (354)	3.48 (299)	3.44 (275)	3.91 (169)
Dist.Council	0.88 (476)	0.88 (476)	0.93 (430)	0.97 (304)
ALL SCHOOLS	2.39 (2064)	2.51 (1547)	2.24 (1282)	2.24 (887)

Mathematics

Schltype	I	II	III	IV
A (Urban)	1.90 (402)	2.04 (310)	2.00 (162)	2.24 (136)
B (Urban)	1.43 (1123)	1.35 (366)	1.38 (349)	1.62 (220)
B (Rural)	1.72 (439)	1.72 (365)	1.74 (358)	1.75 (245)
Independent	5.09 (162)	5.09 (162)	5.37 (57)	5.15 (53)
Mission	2.10 (382)	2.07 (316)	2.06 (290)	2.29 (185)
Dist.Council	1.21 (686)	1.21 (686)	1.25 (622)	1.56 (352)
ALL SCHOOLS	1.75 (3194)	1.84 (2205)	1.69 (1838)	1.97 (1191)

Analysis of Outliers

The scatterplots of the standardised class-level residuals against the predicted values of the 'O' level grades enable one to identify any outliers in the final models. The analysis of outliers can indicate exceptional classes-whether good or bad - the underlying causes of which may be traceable to certain treatment effects.[23] These three scatterplots - one for each subject - are found in Appendix 5.1. No outliers were detected for the Mathematics model which means that the predictions based on the variables included in the final model for Mathematics fit well the actual grades achieved by different classes on the 'O' level examination.

One outlier was uncovered for English Language, and one for English Literature. Both classes did exceptionally well, given their predicted mean scores. Each outlier will be examined in turn.

English Language

In trying to discover what accounts for the exceptionally good 'O' level English Language grades achieved by the first outlier, a small district council school having only one Form IV class, the values of the pupil background, class/teacher and school-level variables were compared with the averages for district council schools as well as for all schooltypes.[24] What is surprising is that upon examination, nothing stands out to make the Form IV class in this school particularly

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[23] For further discussion see (Cook and Weisberg, 1982).

[24] Comparisons with the averages for district council and other schooltypes may be made by referring to Tables 3.9, 3.11 and 3.12.

exceptional. The mean Grade 7 score in English Language is average for district council schools, 5.23. It is taught by an untrained teacher with average verbal aptitude score though with four years teaching experience, more than the average for district council schools, though less than the seven years average for all schools. He is also slightly older than the average age for his district council school colleagues, at 25, but younger than the average English teacher at all schools. There are 53 texts for the 43 pupils, so more than one per pupil. The number of hours spent on academic subjects per week is less than average, 19 hours. The pupils are assigned five hours of homework per week, which is less than average for district council schools, but average for all schools. The school fees are among the lowest for all schools, $61 per year, and the per capita expenditure on textbooks, library and stationery, $35, is lower than average. The proportion of trained teachers in the whole school is high for district council schools, at 50%, but lower than the average for all schools. The teacher pupil ratio is worse than average, 1:29 as opposed to the average for district council as well as all schools of 1:27. Finally, the pupils' fathers' educational levels are lower than average for district council as well as all schools.

Whether one considers the variables fit in the model[27] or other variables which might explain the pupils' achievement, there is little that one can point to as being the reason for the high performance. Yet, whereas the predicted mean English Language 'O' level grade for the class was 1.88, the actual mean grade achieved by the class was 4.27. The standardised

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[27] The variables fit comprise: Grade 7, Grade7/schooltype interaction, the sex and ethnic group of the pupils and their fathers' educational and occupational backgrounds, whether they have electricity at home, whether the school is a boarding school and the average cost per day pupil.

class-level residual for this class was 2.84 (.43). Examination of the pupil-level residuals does not help with any explanation: it is not the effect of a couple of pupils accounting for the large residual. Although it was predicted that all of the class would fail the examination, in fact all but one passed.

One way of possibly interpreting this puzzling result is to assume that the pupils, with the help of the teacher, must have cheated! Indeed, further investigation could prove this to be the case. However, a preferred explanation would be that the variables fitted in the final model for English Language do not account for this outlier. Perhaps the teacher employed a unique teaching style which had a positive impact on the pupils' achievement. The limitations of this study are highlighted in our inability to explain this outlier. Without classroom (and examination) observations, this is one of the missing pieces to the puzzle still not explained by the present research project.

If one assumes that this class was a legitimate outlier and the pupils did not achieve high examination scores through cheating, here is a low cost, 'effective' school, though it is not possible to draw conclusions on the basis of one outlier. It may be that the crucial factors in this case include such things as the availablility of minimally adequate numbers of textbooks and a teacher, albeit untrained, who can learn through experience.

English Literature

Turning to English Literature, there was only one outlier, the top stream in a large urban Group B school. Whereas the predicted mean 'O' level grade in English Literature was 2.4, the actual mean grade for the class was 5.0. The standardised class-level residual for this class came to 2.87 (.45). The school did not have a particularly favourable provision relative to other Group B urban schools or all schooltypes. The overall teacher-pupil ratio was 1:28, whereas for its type, the average was 1:25. The school had a high proportion of untrained teachers relative to other Group B urban schools: one-quarter of the teachers had no formal teaching qualifications, two and a half times the average for its schooltype. The per capita expenditure on textbooks, library and stationery was very low by all standards, only $14 per pupil, as against an average for all schooltypes of $42 and for Group B urban schools of $31. This low expenditure was paralleled by low professional salary costs and low overall recurrent costs, again, by all standards. The cost per day pupil was $360 per year, against an average of $453 for its schooltype and $422 for all schools.

Analysis of classroom provision does not hold out many clues to help explain the exceptional achievement of its pupils. There was a low number of texts available for the 38 pupils, only 57 altogether. Only one hour of homework was assigned per week by the teacher - perhaps due to the shortage of texts, one might surmise. The teacher was very young - 22 years - and inexperienced - only two years of teaching experience - as well as being untrained. The teacher in question taught the two top streams and there is little to distinguish between the two classes, except for the socio-economic background of the pupils. Whereas 50% of the pupils in the outlier class had fathers in occupational category FJB1, 33% in the second stream had fathers in this category. Similarly, whereas half of the pupils in the top stream had fathers who had been to secondary school (in category FED3), none of the pupils' fathers in the second stream had gone as far in their education. Yet, both classes had intakes of among the highest achievement levels, averaging on the Grade 7 English Literature exam scores of 6.7 for the top stream and

7.0 for the second stream. With only these differences, however, whereas the mean 'O' level grade achieved by the top stream outlier class was 5.0, the mean grade for the second stream was only 1.0.

It is difficult to explain the reasons for this class being an outlier, again, whether taking the variabales fit in the model[29] or other variables not included. It is clear from the results in general, that despite low costs of education, high achievement levels in English Literature can be obtained, a conclusion indicated also by examination of the outlier class in English Language. One is struck by the fact that this outlier class is the top stream in a large school. This may be the most important factor. The already proven academic ability (via their Grade 7 scores) of top stream pupils no doubt conditions the teacher's attitude towards them, as does this achievement nurture the pupils' own expectations. However, it may be that without observational studies, the most important contributory factors to the pupils' achievement are being missed. For instance, it may be that this particular teacher is highly organised and has worked out a rota for the use of texts, and together with high levels of motivation on the part of the pupils, is able to achieve exceptionally good grades. One is again brought back to the need for observational studies to complement the identification of more physical inputs to education.

It is clear that no single factor can be attributed to the success of these two outlier classes in the two English subjects. It is hoped that in the analyses which follow, some

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[29] The variables fit comprise: Grade 7, Grade7/schooltypes interaction, the sex and ethnic group of the pupils and their fathers' educational and occupational backgrounds, the sex, ethnic group and verbal aptitude of the teacher and the class size.

of the factors included directly or by proxy in the index variables play a part in the explanation. Although it would be helpful if one could end up with a catalogue of 'effective' inputs to education, the picture that one must draw of the factors that foster achievement in 'O' level English Language or Literature is more complicated than a mere designation of the important variables. Whilst this research can tell us what things are more or less important in terms of quantifiable inputs, it will never fully explain the pattern of results achieved by different classes. It serves more as a first slice of the cake rather than constituting a finished 'piece de resistance', and without further classroom observational studies reporting on the actual interaction which takes place between pupils and teachers, more will not be uncovered definitively.

Ranking of Schools: The Analysis of Class-Level Residuals

Because the school level variance has been eliminated by the inclusion of class level variables and the schooltype/Grade 7 interaction terms in the final models, it is not possible, as is customary, to rank the schools according to their school level variances (Goldstein, 1987, Chapter 2). However, it is still possible to rank classes using the class level variance, although it is more awkward, for different classes within the same school are not necessarily ranked consecutively. These class level residuals represent how much better or worse a particular class has performed after all the controls have been made, so in our case, the ranking of each class after the adjustments necessary to control for background and intake differences, as well as additionally controls for those class level factors in each subject which were found to be significant in predicting achievement.

The ranking by class level residuals can be compared with the ranking by actual and predicted scores by examining Tables A5.3a through A5.3c in Appendix 5.3. It is instructive to compare these alternative rankings with the more appropriate ranking using the class level residuals, for it illustrates the misleading use of unadjusted examination results in school comparisons. Ranking by predicted scores is entirely dependent on the fitted variables and therefore does not represent a ranking based on the full variance but only the proportion which is explained by the model. Although this sort of ranking is an improvement on the ranking of raw, unadjusted mean scores, the ranking based on the residual variances is of greater interest, for it is the ranking <u>after</u> adjusting for the explanatory variables, i.e. <u>about</u> the predicted values, and reflects the total variance.

Tables 5.7 through 5.12 present the rankings according to the class level residuals. Because of the large number of classes, only the top and bottom 20% are ranked in these tables, rather than the full complement.[29]

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[29] The following key to schooltypes can be applied to all these tables:

1-4	Group A
5-8	Group B (urban)
9-12	Independent
13-16	Group B (rural)
17-20	Mission
22-35	District Council

In addition, these tables have been marked to show those outliers which were uncovered by plotting particular variables against the standardised class level residuals. The key to these characteristics is as follows:

O+	Positive outlier
H	High predicted achievement
prof+	High per capita expenditure on professional salaries
tls+	High per capita expenditure on textbooks, library and stationery

TABLE 5.7

Ranking of Classes by Class-Level Residuals for English Language: the top 20%

Rank	Class		Class Level Residual	Actual Mean Grade
1	29	O+; sd7+; cl7+; sch7+	1.88	4.3
2	3.1		1.44	5.2
3	6.3	sd7+	1.07	4.8
4	24.1		1.06	3.0
5	2.1		1.06	5.3
6	4.1		.90	5.3
7	8.1	prof+; exper+	.87	4.3
8	1.1	fjb1+	.84	4.2
9	12.1	H; prof+; sd7+; sch7+; cl7+	.75	6.3
10	13.1		.70	3.2
11	7.7		.68	4.3
12	5.8		.67	5.0
13	30		.67	2.4
14	5.9		.66	3.4
15	7.6		.65	4.3
16	7.8		.63	4.3
17	18.1		.56	5.2
18	6.1		.56	4.0
19	5.1		.52	3.6

cl7+; cl7-	High/low class average Grade 7
sch7+	High school average Grade 7
sd7+; sd7-	High/low s.d. of class Grade 7
fjb1+	High proportion of FJB1 in class
exper+	High no. yrs. teaching experience

TABLE 5.8

Ranking of Classes by Class-Level Residuals for English Language:the bottom 20%

Rank	Class	Class Level Residual	Actual Mean Grade
75	28.1	-.60	0.8
76	6.11	-.63	0.0
77	2.2	-.65	2.0
78	8.5 cl7-;prof+	-.68	1.4
79	9.1 tls+;prof+;cl7+	-.71	3.0
80	25.1	-.74	0.7
81	2.3	-.74	2.0
82	2.4	-.79	1.8
83	34.2 tls+	-.85	1.6
84	5.6	-.85	0.9
85	23.1	-.86	0.0
86	5.4	-.89	0.9
87	15.2	-.93	1.5
88	7.4	-1.09	1.2
89	22.1	-1.16	0.2
90	6.10	-1.27	0.3
91	3.5	-1.30	1.0
92	6.9	-1.33	0.3
93	1.4	-1.48	2.4

TABLE 5.9

Ranking of Classes by Class-Level Residuals -- for English Literature: the top 20%

Rank	Class	Class Level Residual	Actual Mean Grade
1	6.1 O+;sch7+;sd7+	1.12	5.0
2	8.1 cl7+;prof+;exper+	.87	3.6
3	24.1	.69	2.4
4	22.3 H	.62	2.2
5	5.2	.61	3.6
6	1.3	.58	4.2
7	2.1 H	.54	5.2
8	16.2 tls+	.54	2.7
9	4.1 H;cl7+;sch7+	.53	5.3
10	19.1	.51	4.8
11	15.1	.51	3.3
12	16.1	.46	2.8

TABLE 5.10

Ranking of Classes by Class-Level Residuals for English Literature: the bottom 20%

Rank	Class	Class Level Residual	Actual Mean Grade
49	25.1	-.48	0.5
50	35.1	-.48	0.5
51	18.2	-.49	3.3
52	8.3 prof+	-.50	1.1
53	28.1	-.51	0.2
54	19.2 fjbl+	-.53	3.2
55	1.2	-.54	2.0
56	8.2 prof+;exper+	-.58	1.2
57	5.9	-.66	4.3
58	14.3	-.77	1.4
59	1.1 sd-;fjbl+;cl7+	-.86	2.5
60	15.3	-.95	0.9

TABLE 5.11

Ranking of Classes by Class-Level Residuals for Mathematics: the top 20%

Rank	Class	Class Level Residual	Actual Mean Grade
1	19.1	1.39	5.1
2	3.1	1.13	4.9
3	14.2	1.13	2.5
4	34.1 tls+	1.09	4.6
5	1.1 fjbl+	1.08	5.2
6	14.1	0.85	2.0
7	29	0.81	2.6
8	28	0.81	2.0
9	7.8 exper+	0.80	3.9
10	5.1	0.74	2.2
11	14.3	0.74	2.2
12	7.9	0.68	4.9
13	34.2 tls+	0.66	3.4
14	2.2	0.62	3.8

TABLE 5.12

Ranking of Classes by Class-Level Residuals
for Mathematics: the bottom 20%

Rank	Class	Class Level Residual	Actual Mean Grade
55	8.2 prof+	-.50	1.1
56	3.4	-.52	0.8
57	15.3	-.53	0.4
58	1.2	-.55	0.8
59	4.2	-.57	1.0
60	2.3	-.58	1.4
61	19.2 fjb1+	-.65	1.5
62	2.4	-.68	0.3
63	8.4 prof+	-.69	0.3
64	3.2	-.71	1.5
65	7.5	-.74	0.0
66	13.2	-.91	0.0
67	3.5	-.92	0.3
68	18.2	-1.11	0.4

What makes the classes listed above as being in the top 20% more effective than others at the same school or, indeed, the 'average' classes in the sample? In order to answer this question, the characteristics of these three sets of classes deemed to be most effective in each subject will have to be examined.

First of all it would be interesting to note whether any of the same classes are in the top 20% for more than one subject. Although any such classes would have different teacher variables, the pupils comprising the classes would be the same. In fact, there are eleven such classes spread over the range of schooltypes: 1.1(E1,M), 2.1(E1,E2), 3.1(E1,M), 4.1(E1,E2), 5.1(E1,M), 6.1(E1,E2), 7.8(E1,M), 8.1(E1,E2), 19.1(E2,M), 24.1(E1,E2), 29(E1,M). All consist of the top stream where there is more than one class per school, but examination of the values of the different variables for this set of classes does not produce any consistent pattern regarding the presence of certain characteristics across the grouping.

English Language

For the classes found to be 'effective' in English Language, the plots found in Appendix 5.2 of particular variables vs. the standardised class-level residuals were examined and the outliers on these plots were compared with the list of 'effective' schools to see whether there was any pattern. There was no consistency in the results. There was a correspondence between a few of the 'effective' schools and certain of these outliers, e.g. two of the 'effective' classes had higher than average professional salary expenditure per capita, but there was nothing conclusive to be found across the range of classes.

The values for this set of classes on a wider set of variables at the class and school levels were then compared, and again, there was not much which would distinguish the group of effective classes from the rest of the sample. The effective English Language classes were drawn from a similar number of day and boarding schools though a majority was urban; about half had evening study facilities; just under half had higher than average professional salary costs per pupil; seven out of the nineteen classes had fathers in a professional or commercial farming occupation; about half of the fathers had reached secondary school. And so the results went on over the following, additional variables: average values for the class index variable, CLSE1, average number of hours homework, average proportion European or female teachers, average verbal aptitude score of the teachers, and average numbers of texts available. The only skewed results for this set of classes concerned the teachers' qualifications: a majority had trained teachers. In addition, the majority of the 'effective' classes had higher than average Grade 7 scores. Also of interest is the fact that a minority of the classes had smaller than average class sizes; similarly only three of the nineteen classes spent higher than average per capita amounts on textbooks, library and stationery, and only seven of the nineteen spent more than the average on overall per capita expenditure.

Looking at the group of 'effective' English Language classes by schooltype, they are divided as follows: 4 Group A, 9 Group B urban, 1 Independent, 1 Group B rural, 1 Mission, and 3 District Council. The low representation of Independent and Mission school classes is notable.

To summarise, it does not appear that in the case of English Language such things as above-average, overall per capita expenditure or above-average expenditure on textbooks, etc. make the difference between more and less effective classes. Nor is a class size of fewer than 38 pupils a significant factor in determining an 'effective' class. The factors that do stand out - though not all that decisively, include having a trained teacher, having higher than average Grade 7 achievement scores in one's class, and being in an urban location. This last factor no doubt operates in several ways: in conditioning the pupils who attend the school in the first place, in reinforcing the use of English in their daily lives, and in merely representing more favourable amenities, such as the available of electricity as well as more reading material than would be the case in the rural areas. Clearly, aside from these factors, it is not possible to say any more from the data available about why these nineteen classes were found to be more effective than others at English Language 'O' levels.

<u>English Literature</u>

To isolate any distinguishing features of the set of 'effective' English Literature classes, the outliers on the plots of variables vs. standardised class level residuals were examined. There were no obvious patterns. For example, one of the classes was picked out for having a high per capita expenditure on textbooks, library and stationery, but this was not carried across the group of effective classes.

An examination of the same variables as described above for English Language was also carried out in order to see whether there was any consistency in the values for this set of classes. The set of 'effective' classes in English Literature is distinguished by some of the same variables as the set for English Language. Most of the classes had above-average class sizes, but below-average expenditure on textbooks, library and stationery as well as overall per capita expenditure, and likewise below-average per capita expenditure on professional salaries. Also like the case of English Language, three-quarters of the classes had higher than average Grade 7 scores. Three-quarters of the teachers of this set of classes were trained, as for English Language. In addition, most of the classes had percentages of fathers in category FJB1 which were below-average. Besides these results examination of the remaining variables proved equivocal. The picture is not very different from that for English Language.

Mission and Independent schools are underrepresented in the distribution of 'effective' classes in English Literature, as was found with English Language. The distribution is as follows: 3 Group A, 3 Group B urban, 0 Independent, 3 Group B rural, 1 Mission, and 2 District Council schools.

Mathematics

For Mathematics, the picture is also similar. Testing the set of effective classes against the outliers on the plots in Appendix 5.2 of the standardised class-level residuals against certain variables proved inconclusive. There was no pattern across the set of classes.

In testing the set of classes against the same variables used for the other two subjects, similar results were reached, also. Firstly, all of the teachers of the set of effective classes were trained. Further, higher than average overall expenditure, or expenditure on textbooks, library and stationery, or on professional salaries was not in practice for the set of 'effective' classes in Mathematics. Larger than average class sizes characterised the majority of the classes. In addition, in only two out of the fourteen classes did pupils have access to less than one text per pupil. All the remaining variables proved equivocal.

Just as with the other two subjects, Mission and Independent schools are again underrepresented in the distribution of 'effective' schools in Mathematics. The distribution by schooltype is as follows: 3 Group A, 3 Group B urban, 0 Independent, 3 Group B rural, 1 Mission and 4 District Council schools.

For all three subjects, there is a set of variables which predominantly characterises what is not essential in order for a class to be 'effective'. Higher than average expenditure, whether in general, or whether in particular, on textbooks or teachers, does not seem to be a determining factor. Neither does a class size below 38 make for an 'effective' class. Nor does the fact that the majority of the pupils' fathers are professionals or commercial farmers tend to favour the 'effective' classes. On the other hand, trained teachers do seem to matter, as does a higher than average Grade 7 intake score for the 'effective' classes.

Classes that Pass: The Effect of Streaming within Schools

An attempt has been made to try to understand over the whole gamut of classes distributed across the range of schools sampled, why some are more effective than others. The analysis of which classes within different schools achieve mean passes in the three different 'O' level examinations is a further investigation which needs to be carried out. The focus will be on the effect of ability streaming within schools.

For English Language, 37 out of the total of 93 classes surviving to Model K achieved mean passes. That is 40% of the classes. 30 of these 37 classes were either the top streams in their schools, the top half of all the streams in their schools or comprised just one of the streams, all of which passed in a school. On a stricter definition of being in the top stream, one-stream schools will be excluded and only those streams in the top half of all streams in the school will be included. On this stricter definition, 22 of the 37 classes were in the top streams, or some 60% of all the classes achieving mean passes in English Language.

For English Literature, 22 of the 60 classes which survived to the final Model G had mean passes. This is 37% of the total number of classes. 20 of these 22 classes were in the top streams of their schools, on the looser definition. 13 of these 22 were in the top streams, again about 60% on the stricter definition.

For Mathematics, 17 of the 68 classes surviving to Model K had mean passes, 25% of the total number of classes. 16 of these 17 classes were the top streams in their schools on the looser definition, and 13 out of these 17 were in the top streams on the stricter definition, or 76% of all those classes having mean passes.

Streaming clearly has an effect on achievement. The chances of passing in any one of the three subjects is clearly much greater if the pupil is in one of the top ability streams.

The implications of the findings presented in this chapter will be drawn out in Chapter Seven, after the analysis which follows in Chapter Six of the costs of secondary education at different types of schools.

APPENDIX 5.1

Plots of Predicted Values Against Standardised Class Level Residuals of 'Final' Models

TABLE A5.1

List of Plots

FIGURE A5.1a

Plot of Predicted Values for English Language 'O' level Grades Against Standardised Class Level Residuals (Model K)

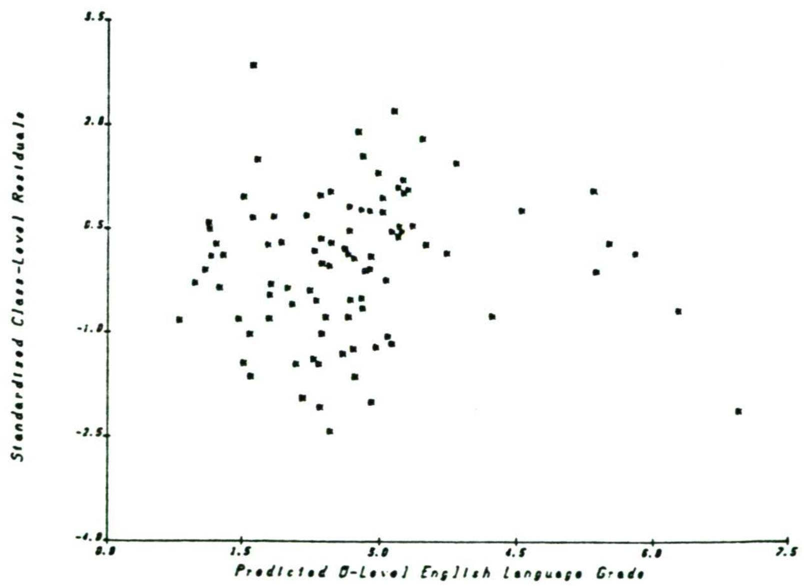


FIGURE A5.1b

Plot of Predicted Values for English Literature 'O' level Grades Against Standardised Class Level Residuals (Model G)

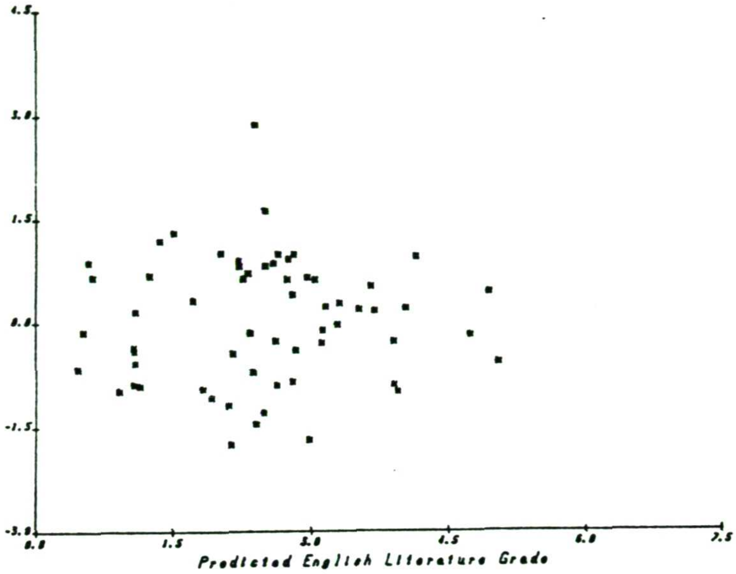
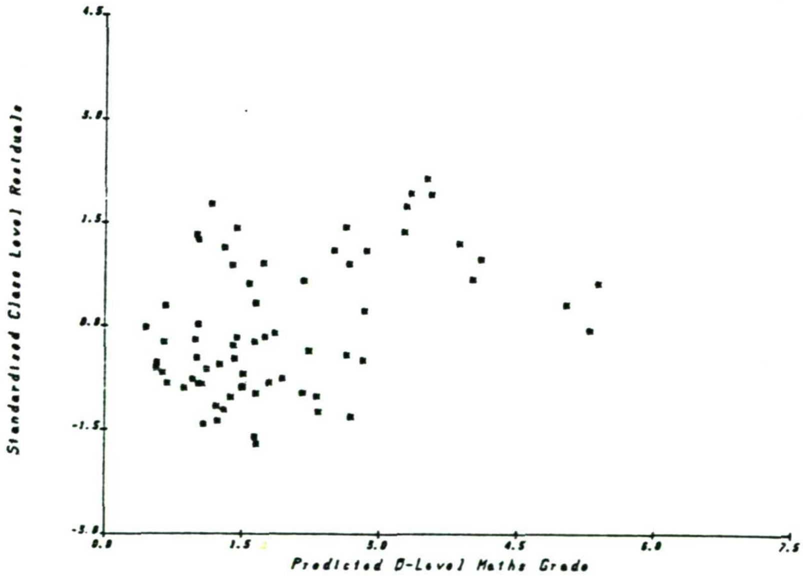


FIGURE A5.1c

Plot of Predicted English Literature 'O' Level Grades Agaginst Standardised Class Level Residuals (Model K)



APPENDIX 5-2

Plots of Explanatory Variables Tested Against Standardised Class Level Residuals

TABLE A5.2

List of Plots

(a) English Language, b) English Literature, c)Mathematics)

FIGURE A5.2/1a

Plot of Standard Deviation of GR7E1 within Classes Against Standardised Class Level Residuals: English Language

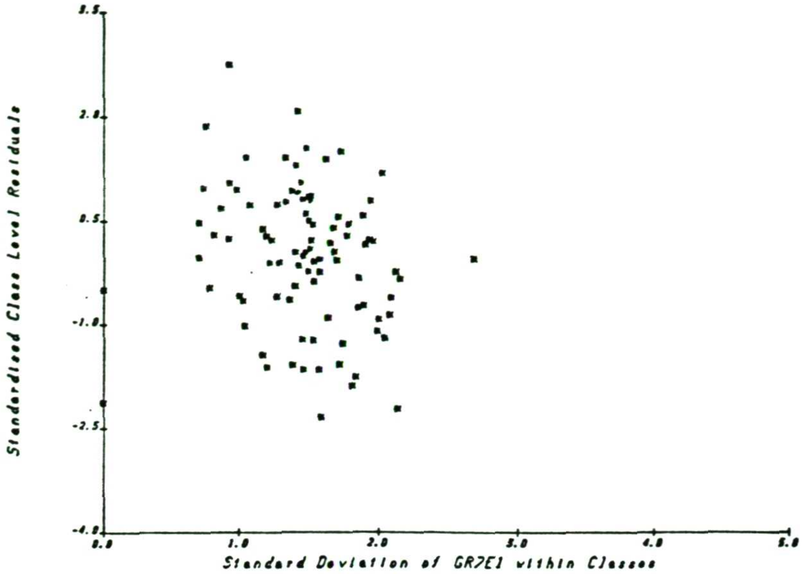


FIGURE A5.2/1b

Plot of Standard Deviation of GR7E2 within Classes Against Standardised Class Level Residuals: English Literature

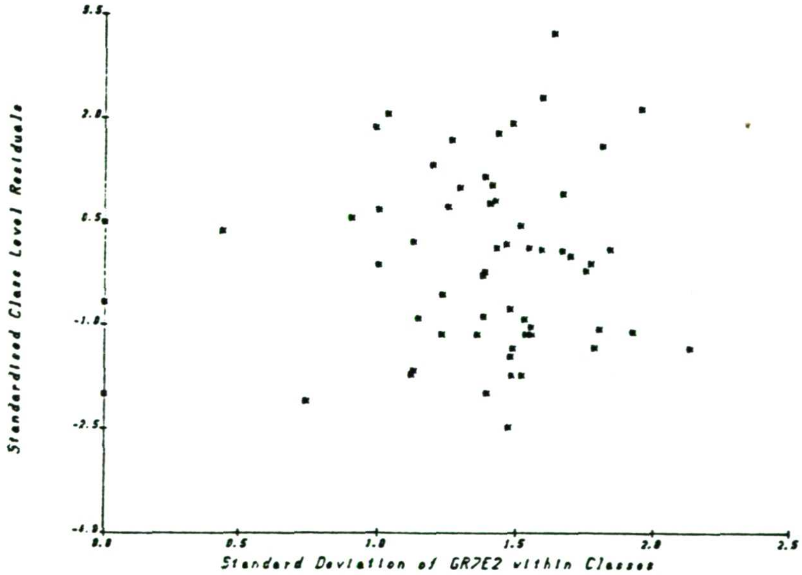


FIGURE A5.2/1c

Plot of Standard Deviation of GR7M within Classes Against Standardised Class Level Residuals: Mathematics

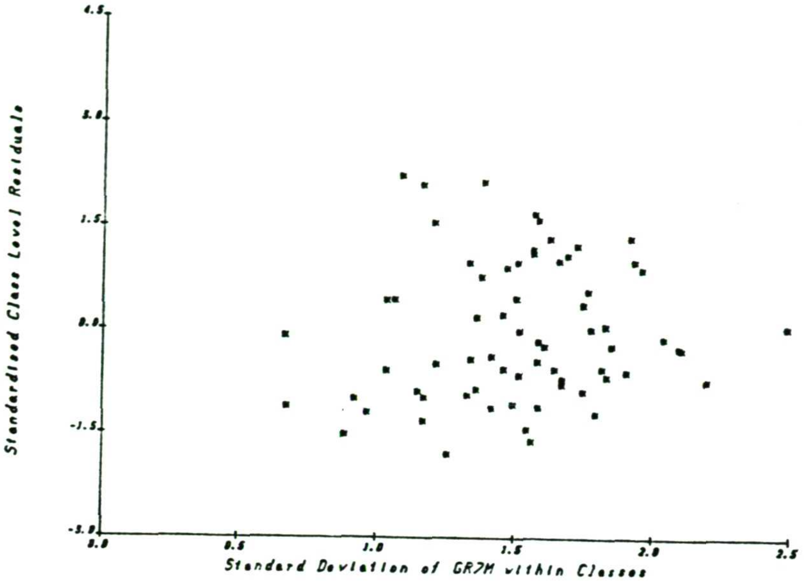


FIGURE A5.2/2a

Plot of Average GR7E1 by Class Against Standardised Class Level Residuals: English Language

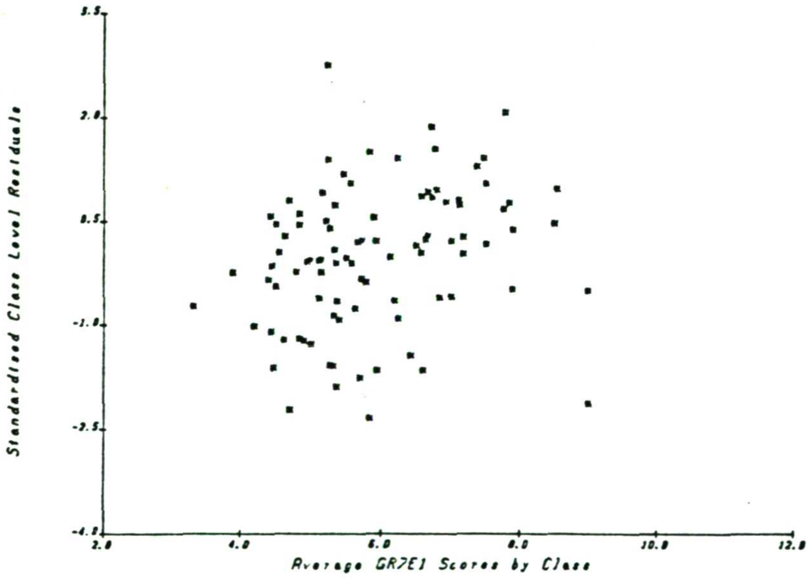


FIGURE A5.2/2b

Plot of Average GR7E2 by Class Against Standardised Class Level Residuals: English Literature

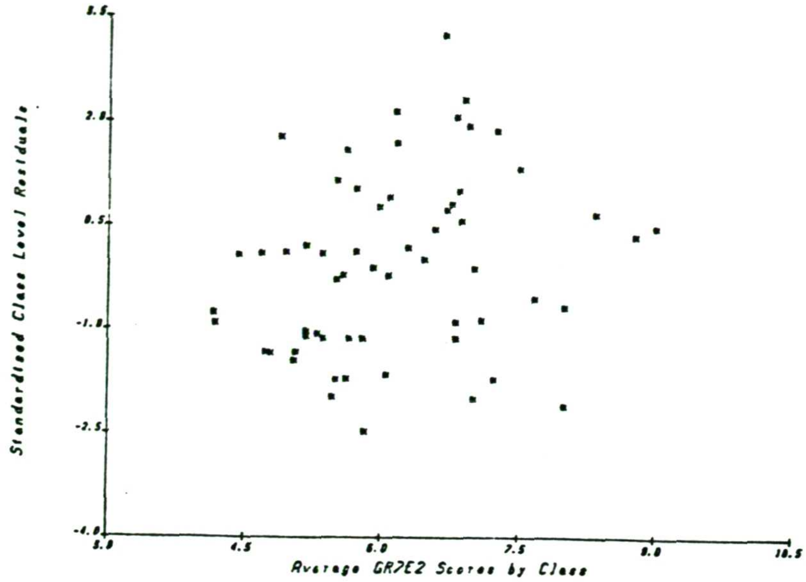


FIGURE A5.2/2c

Plot of Average GR7M by Class Against Standardised Class Level Residuals: Mathematics

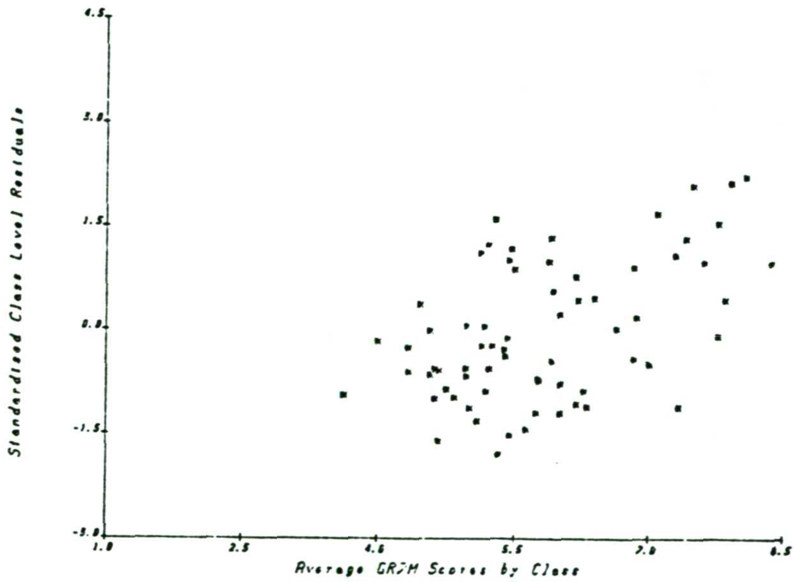
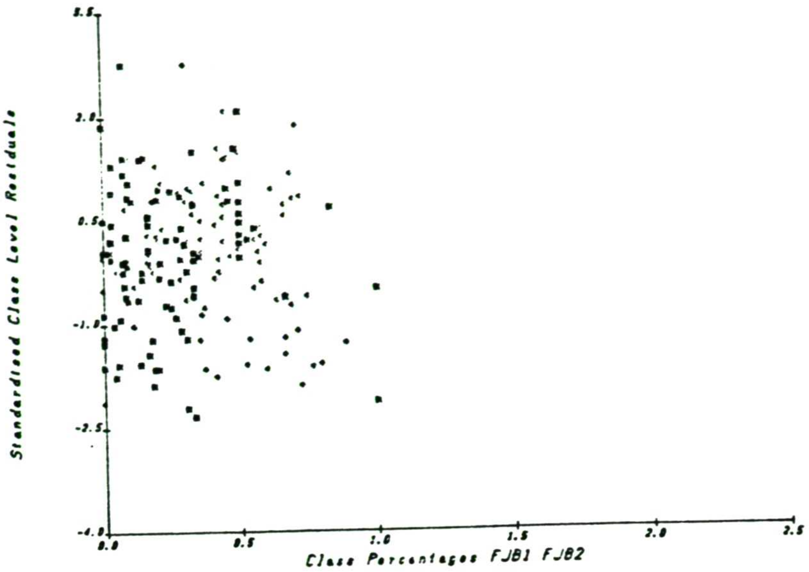


FIGURE A5.2/3a

Plot of Percentage of Class Whose Fathers are in Occupational Categories FJB1 and FJB2 Against Standardised Class Level Residuals: English Language

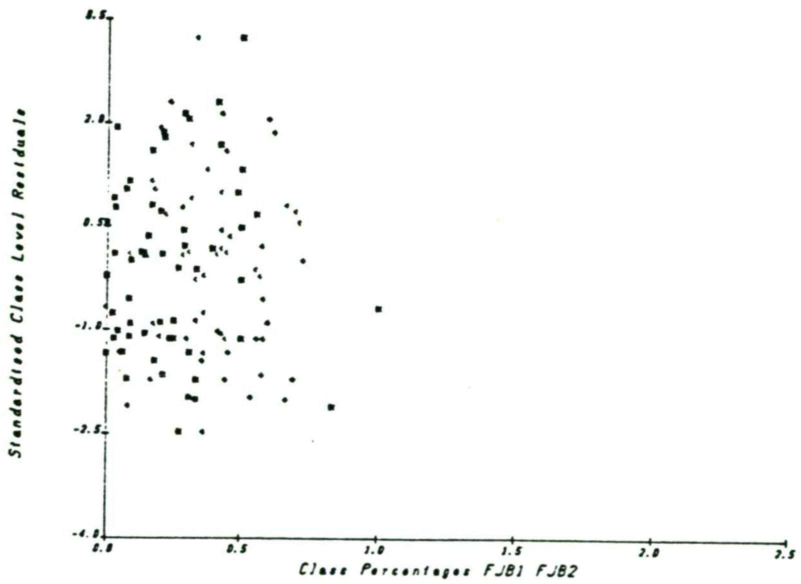


■ FJB1

◆ FJB2

FIGURE A5.2/3b

Plot of Percentage of Class Whose Fathers are in Occupational Categories FJB1 and FJB2 Against Standardised Class Level Residuals: English Literature



■ FJB1

◆ FJB2

FIGURE A5.2/3c

Plot of Percentage of Class Whose Fathers are in Occupational Categories FJB1 and FJB2 Against Standardised Class Level Residuals: Mathematics

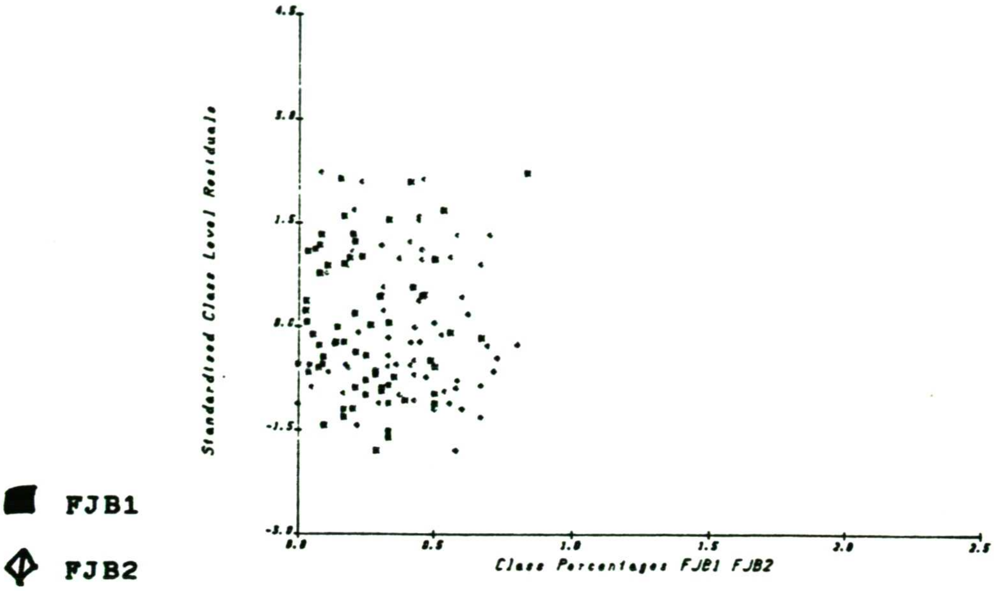


FIGURE A5.2/4a

Plot of Years of Teaching Experience Against Standardised Class Level Residuals: English Language

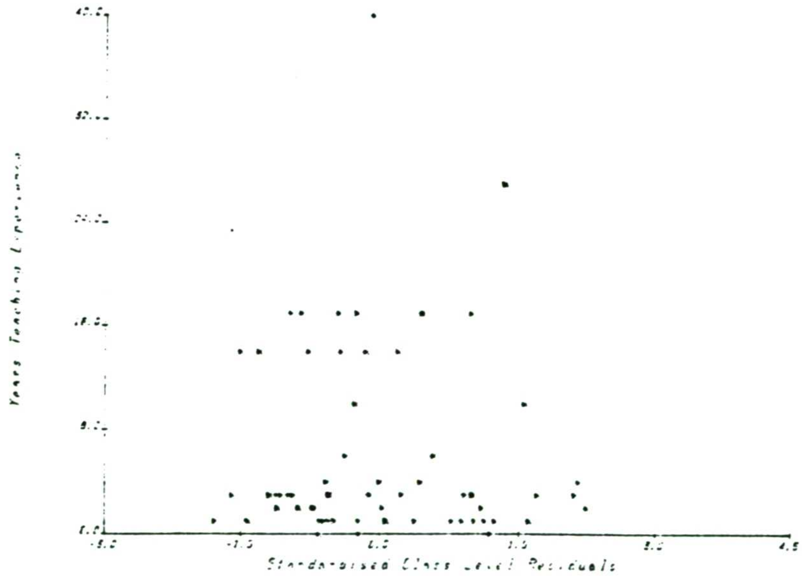


FIGURE A5.2/4b

Plot of Years of Teaching Experience Against Standardised Class Level Residuals: English Literature

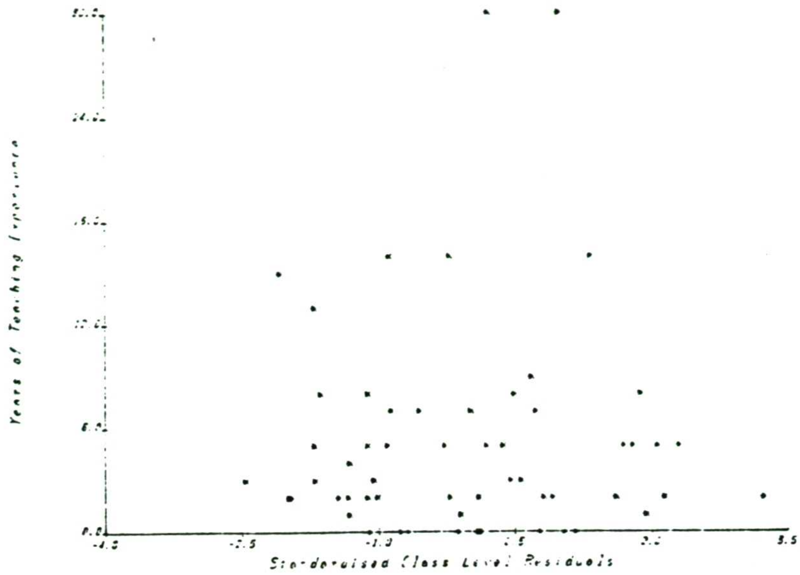


FIGURE A5.2/4c

Plot of Years of Teaching Experience Against Standardised Class Level Residuals: Mathematics

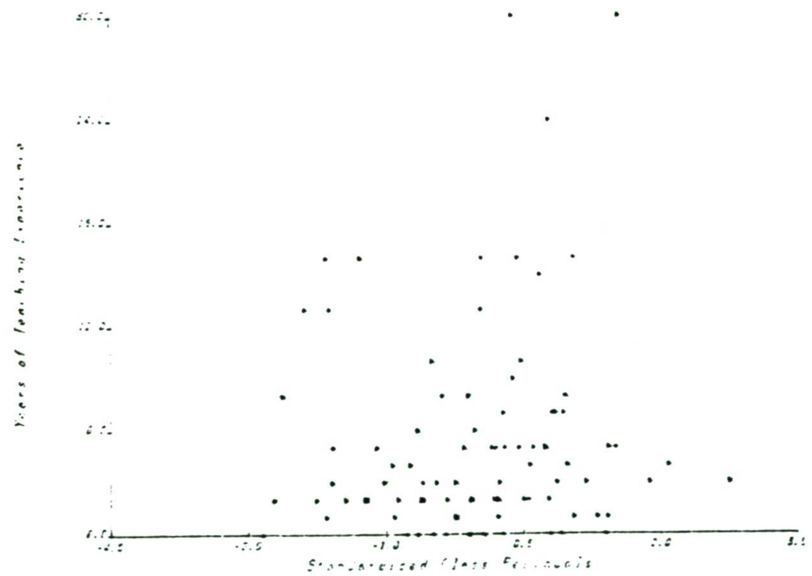


FIGURE A5.2/5a

Plot of Average GR7E1 by School Against Standardised Class Level Residuals: English Language

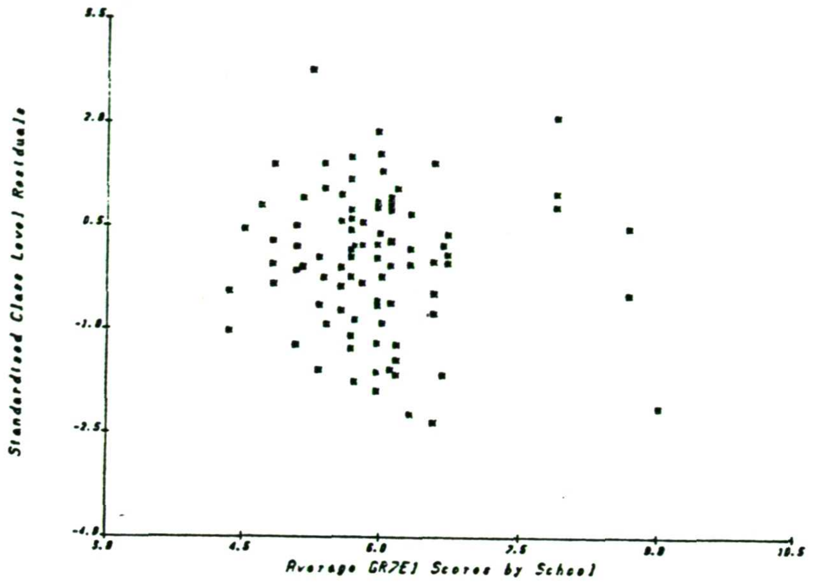


FIGURE A5.2/5b

Plot of Average GR7E2 by School Against Standardised Class Level Residuals: English Literature

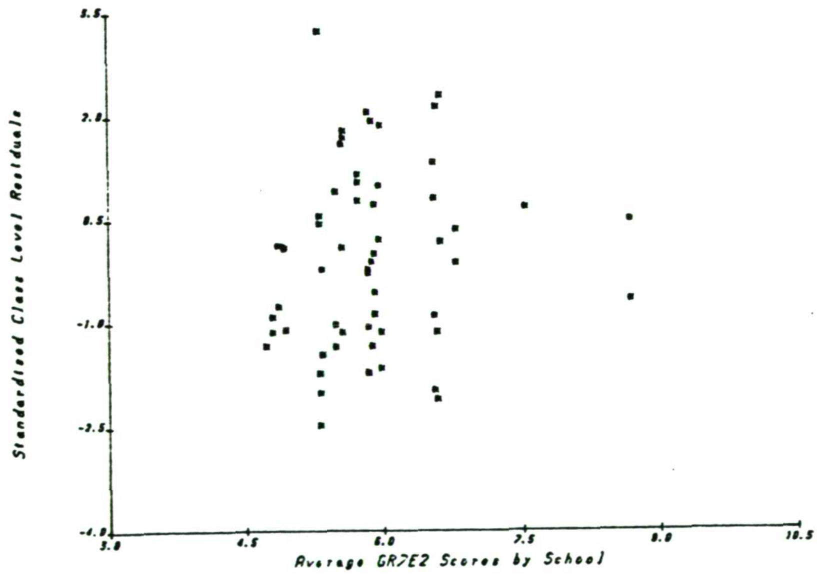


FIGURE A5.2/5c

Plot of Average GR7M by School Against Standardised Class Level Residuals: Mathematics

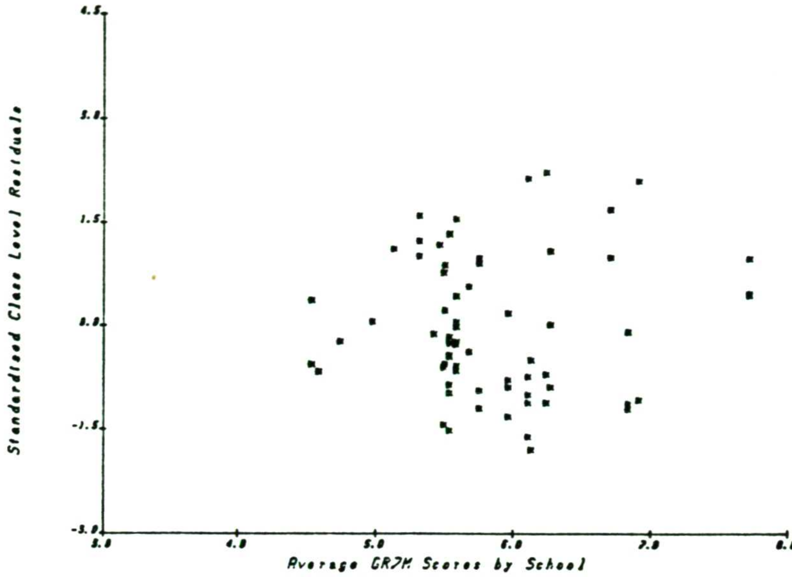


FIGURE A5.2/6a

Plot of Class Size Against Standardised Class Level Residuals: English Language

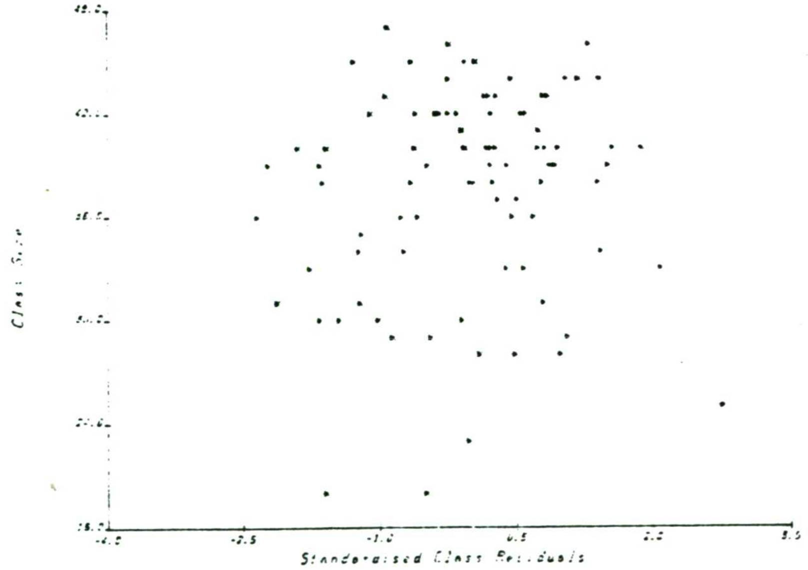


FIGURE A5.2/6b

Plot of Class Size Against Standardised Class Level Residuals: English Literature

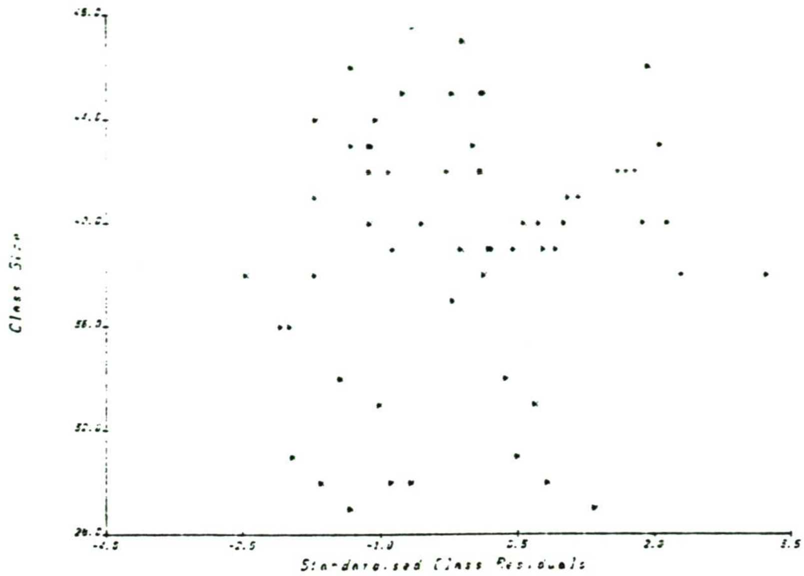


FIGURE A5.2/6c

Plot of Class Size Against Standardised Class Level Residuals: Mathematics

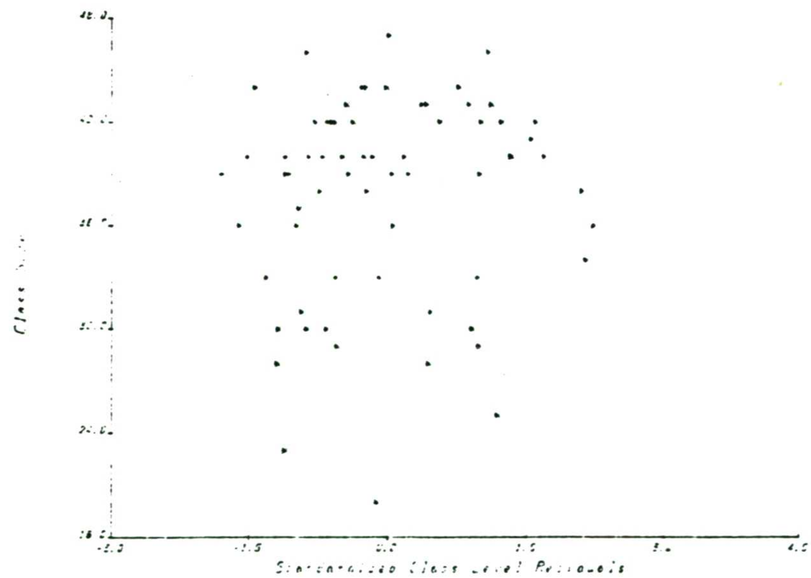


FIGURE A5.2/7a

Plot of Teacher's Verbal Aptitude Score Against Standardised Class Level Residuals: English Language

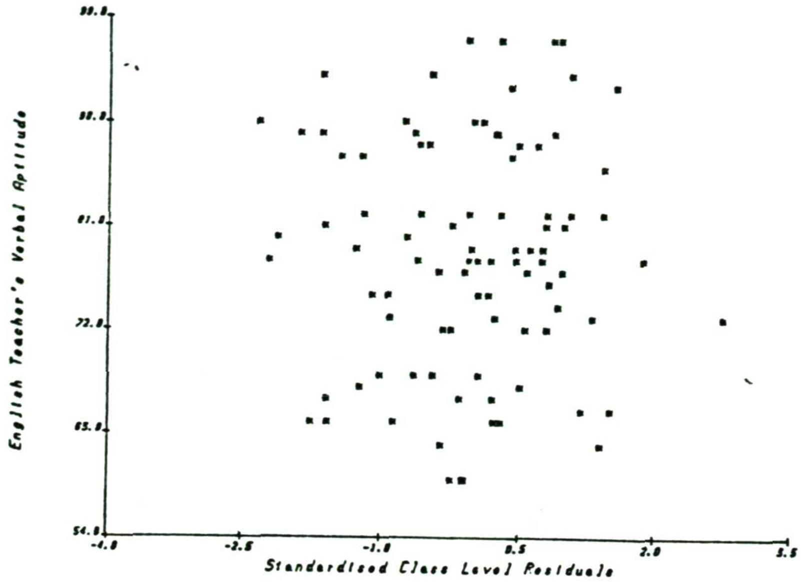


FIGURE A5.2/7b

Plot of Teacher's Verbal Aptitude Score Against Standardised Class Level Residuals: English Literature

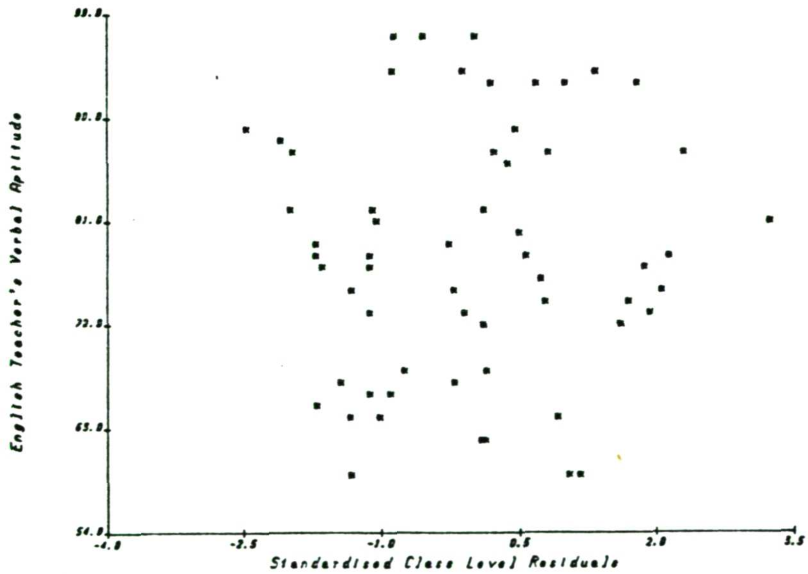


FIGURE A5.2/7c

Plot of Teacher's Verbal Aptitude Score Against Standardised Class Level Residuals: Mathematics

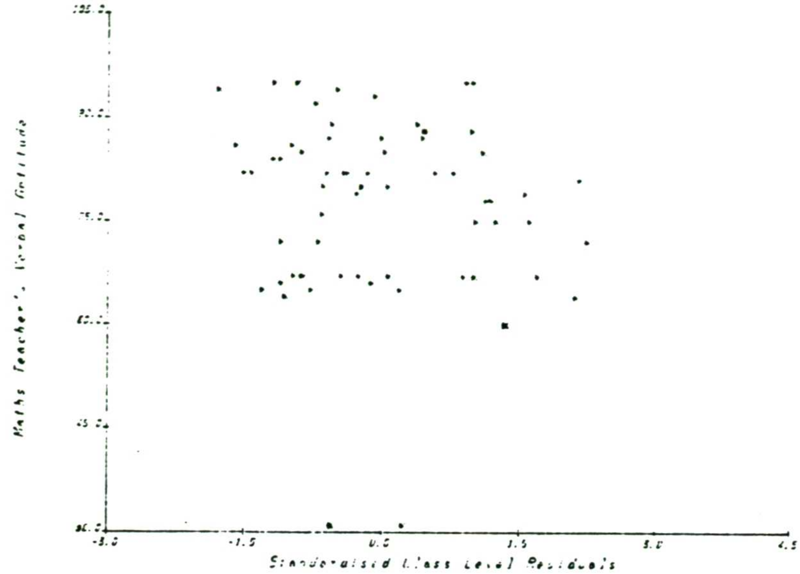
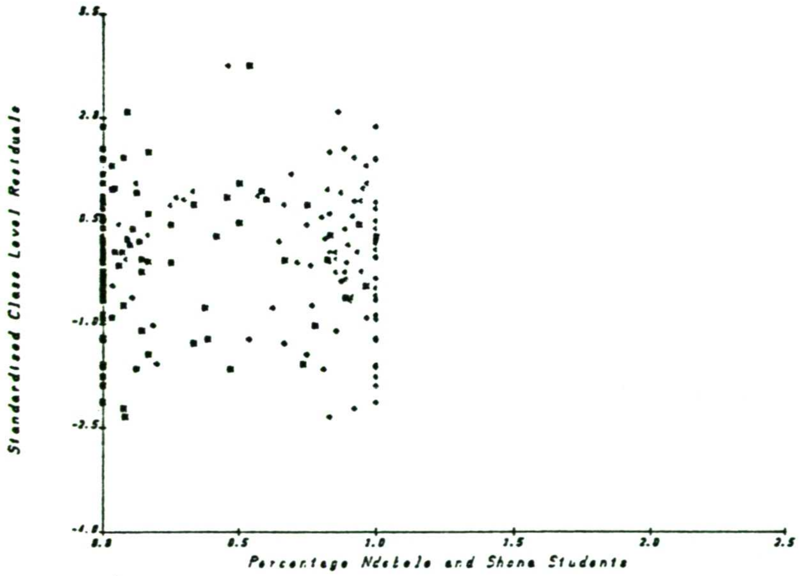


FIGURE A5.2/8a

Plot of Percentage Ndebele and Shona Pupils by Class Against Standardised Class Level Residuals: English Language

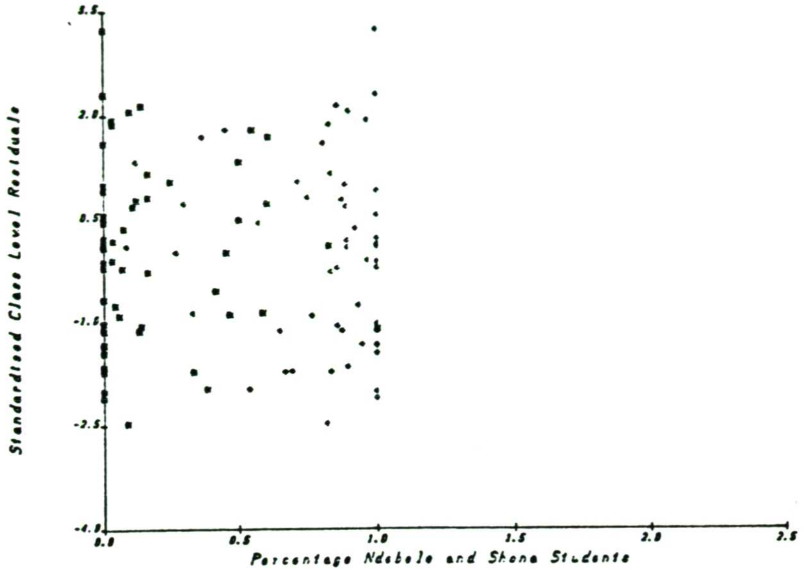


■ Ndebele

◆ Shona

FIGURE A5.2/8b

Plot of Percentage Ndebele and Shona Pupils by Class Against Standardised Class Level Residuals: English Literature

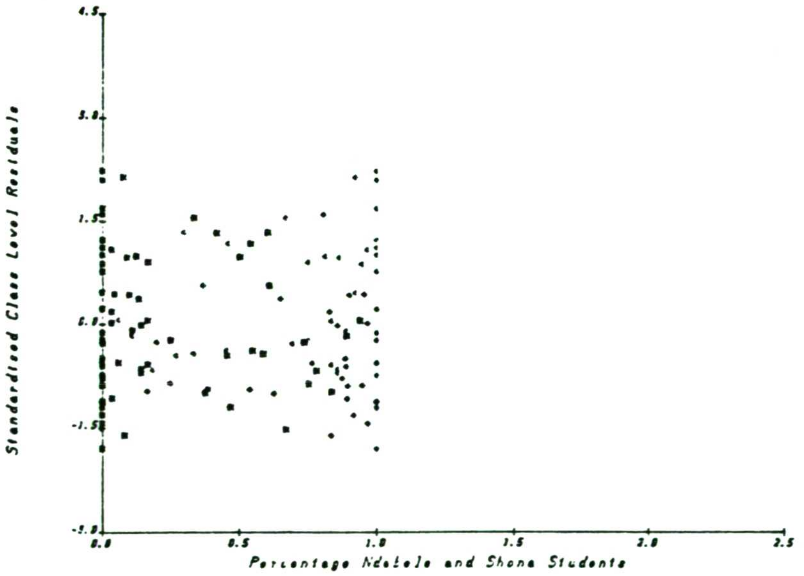


Ndebele

Shona

FIGURE A5.2/8c

Plot of Percentage Ndebele and Shona Pupils by Class Against Standardised Class Level Residuals: Mathematics



Ndebele

Shona

FIGURE A5.2/9a

Plot of Average Per Capita Professional Salary Expenditure by School Against Standardised Class Level Residuals: English Language

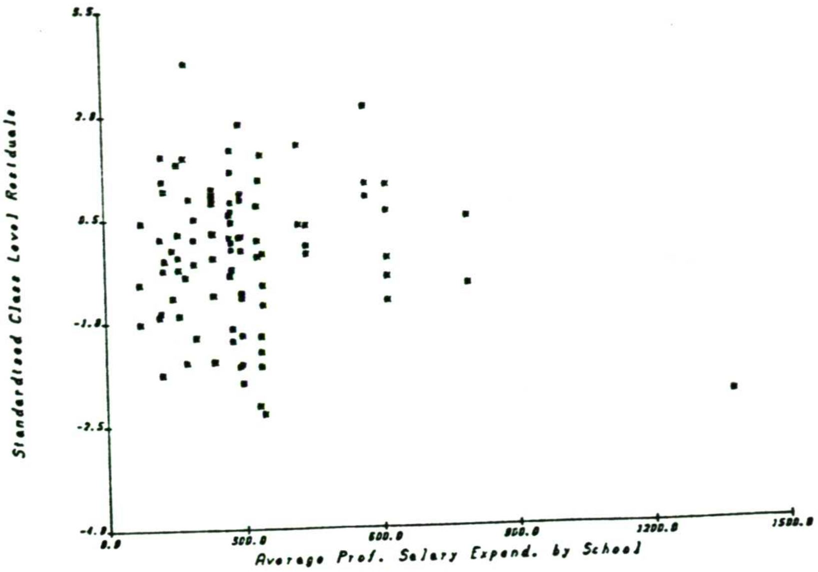


FIGURE A5.2/9b

Plot of Average Per Capita Professional Salary Expenditure by School Against Standardised Class Level Residuals: English Literature

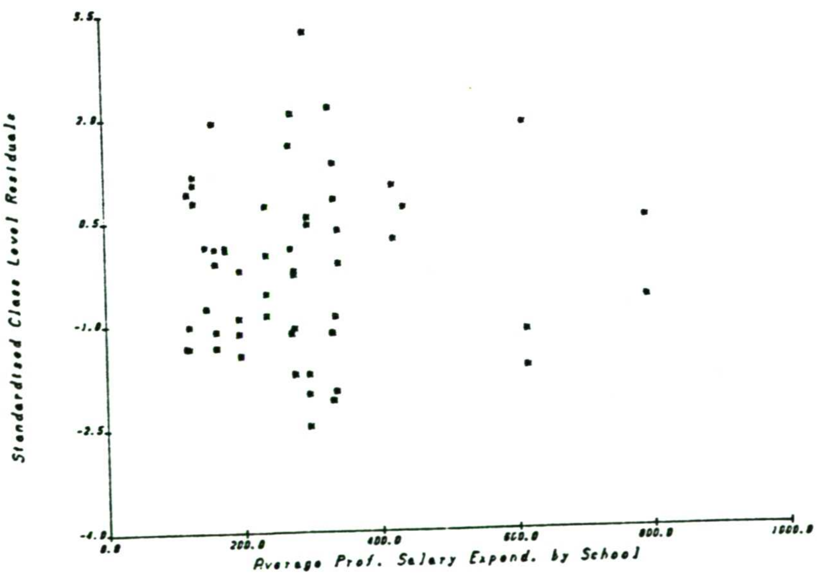


FIGURE A5.2/9c

Plot of Average Per Capita Professional Salary Expenditure by School Against Standardised Class Level Residuals: Mathematics

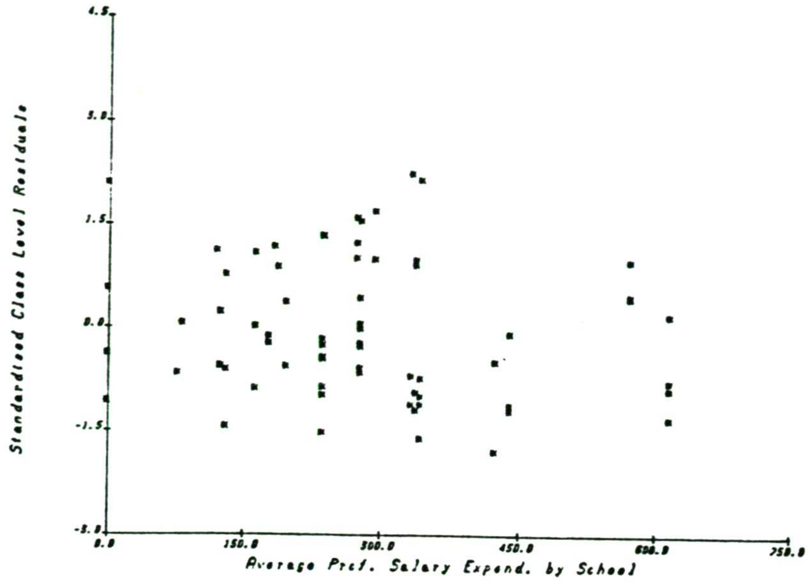


FIGURE A5.2/10a

Plot of Average Per Capita Textbook, Library and Stationery Expenditure by School Against Standardised Class Level Residuals: English Language

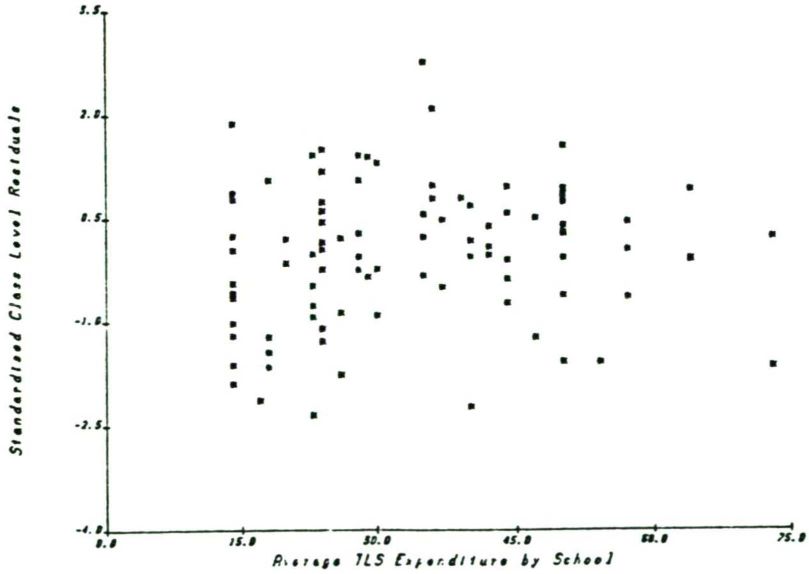


FIGURE A5.2/10b

Plot of Average Per Capita Textbook, Library and Stationery Expenditure by School Against Standardised Class Level Residuals: English Literature

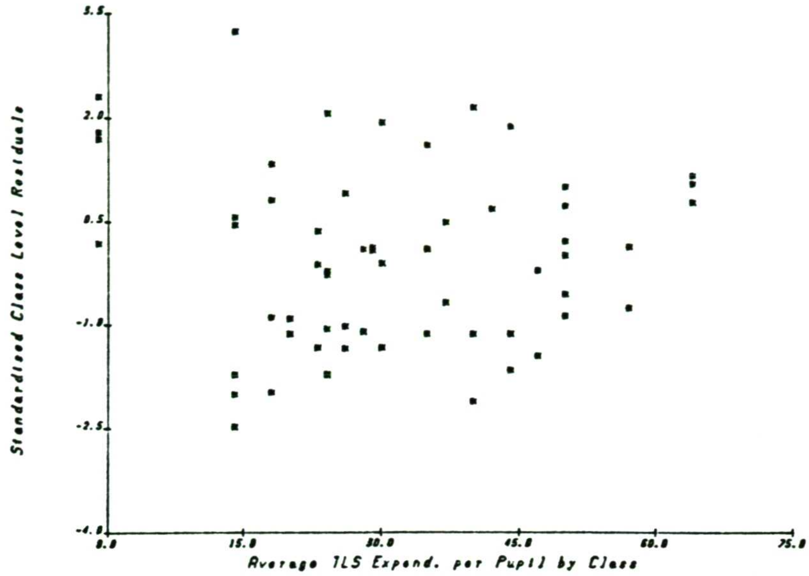


FIGURE A5.2/10c

Plot of Average Per Capita Textbook, Library and Stationery Expenditure by School Against Standardised Class Level Residuals: Mathematics

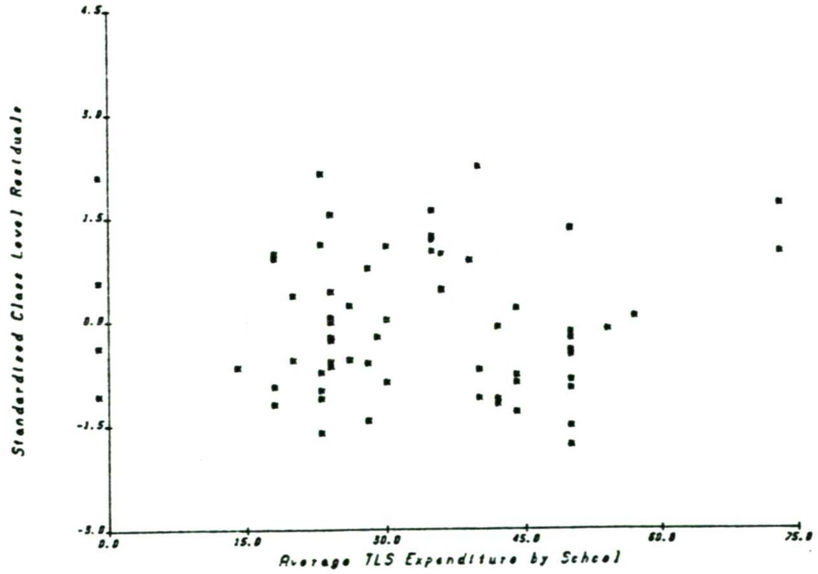


FIGURE A5.2/11a

Plot of Percentage of Class Whose Fathers are in Educational Categories FEDO, FED1, FED2 and FED3 Against Standardised Class Level Residuals: English Language

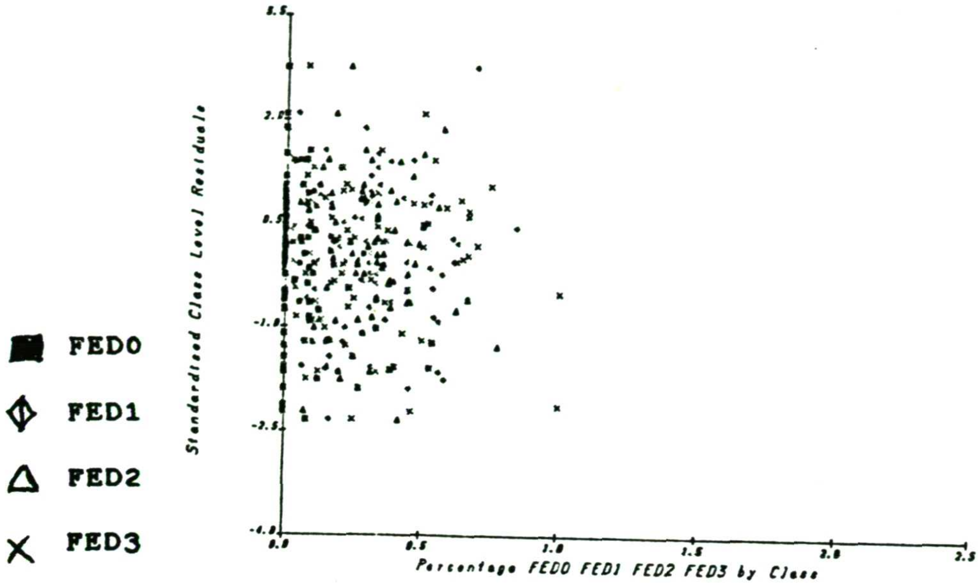


FIGURE A5.2/11b

Plot of Percentage of Class Whose Fathers are in Educational Categories FEDO, FED1, FED2 and FED3 Against Standardised Class Level Residuals: English Literature

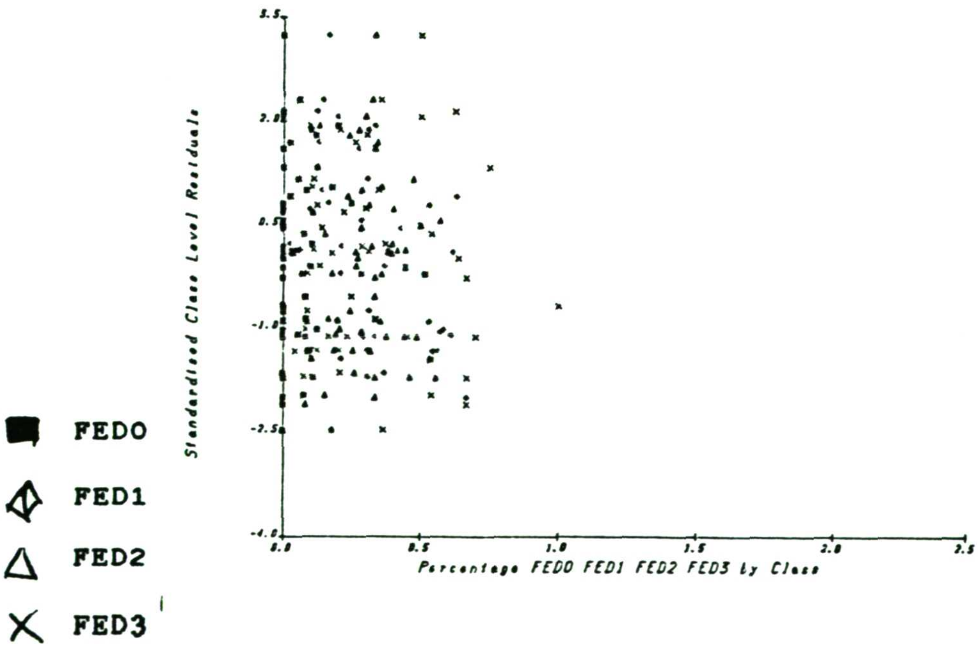
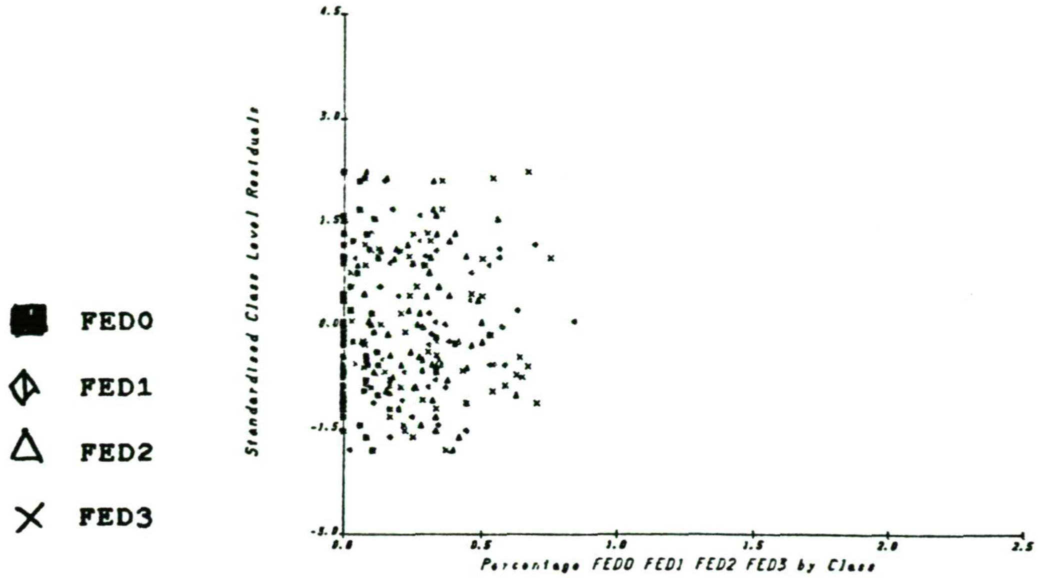


FIGURE A5.2/11c

Plot of Percentage of Class Whose Fathers are in Educational Categories FEDO, FED1, FED2 and FED3 Against Standardised Class Level Residuals: Mathematics



APPENDIX 5.3

Comparison of Predicted Mean Scores by School with Actual Mean Scores for English Language, English Literature and Mathematics

Tables A5.3a through A5.3c present the rankings by actual and predicted mean grades for each school in each subject. The comparison between actual and predicted results for each subject yield the following statistics. Two-thirds of those schools in the predicted top 20% for English Language achieved a similar top ranking in practice. One-third of those in the bottom 20% for predicted scores were also in the bottom 20% of actual mean scores. For English Literature all of the predicted top 20% achieved a similar ranking, and three out of the four schools predicted to be in the bottom 20% did so poorly as to be so ranked. For Mathematics, half of those schools in the predicted top 20% actually achieved such ranking in practice, but fewer than half in the predicted bottom 20% were ranked in the bottom 20% for their actual mean scores.

TABLE A5.3a

Ranking of Schools by Actual and Predicted Mean English Language 'O' Level Grades

School	Actual Mean Grade	Rank	Predicted Mean Grade	Rank
1	2.77	10	2.74	11
2	2.56	11	3.12	6
3	3.22	7	3.05	7
4	5.00	3	3.79	5
5	2.50	12	2.48	13
6	2.14	16	2.57	12
7	3.25	6	3.04	8
8	3.13	8	2.95	10
9	3.00	9	6.95	1
11	5.67	2	5.95	2
12	5.90	1	5.39	3
13	2.47	13	2.01	16
14	2.30	15	2.37	15
15	2.05	18	2.38	14
16	1.89	19	1.87	17
18	4.37	4	4.38	4
22	1.23	25	1.73	18
23	0.00	28	1.51	23
24	2.05	17	1.40	26
25	1.46	24	1.59	21
26	1.49	22	1.65	19
27	1.47	23	1.22	27
28	0.78	26	1.46	25
29	4.27	5	1.61	20
30	2.35	14	1.51	24
31	1.64	21	1.13	28
33	0.43	27	0.91	29
34	3.00	9	3.04	9
35	1.75	20	1.57	22

TABLE A5.3b

Ranking of Schools by Actual and Predicted Mean English Literature 'O' Level Grades

School	Actual Mean Grade	Rank	Predicted Mean Grade	Rank
1	2.73	11	3.43	7
2	3.69	6	3.47	6
3	3.67	7	3.50	5
4	5.25	1	4.23	3
5	1.63	16	1.97	15
6	3.05	9	2.41	10
7	3.23	8	2.97	9
8	2.18	12	2.16	14
11	5.00	2	4.96	1
14	2.00	13	2.24	12
15	1.86	14	2.33	11
16	2.78	10	2.17	13
17	3.75	5	3.36	8
18	3.94	4	4.30	2
19	4.04	3	4.03	4
22	1.35	17	1.19	16
24	1.85	15	1.06	18
25	0.87	20	1.12	17
26	1.10	18	0.90	20
27	0.94	19	0.86	21
28	0.23	22	0.92	19
35	0.26	21	0.81	22

TABLE A5.3c

Ranking of Classes[1] by Actual and Predicted Mean Mathematics 'O' Level Grades

Class	Actual Mean Grade	Rank	Predicted Mean Grade	Rank
1.1	5.20	5	3.55	7
1.2	0.80	48	1.64	30
1.3	0.86	46	1.50	36
2.1	5.00	7	4.10	4
2.2	3.80	14	2.85	12
2.3	1.36	38	2.15	24
2.4	2.50	22	1.22	49
3.1	4.92	8	3.33	9
3.2	1.50	36	2.68	15
3.3	6.00	1	1.49	38
3.4	0.79	49	1.50	37
3.5	0.27	56	1.63	34
4.1	5.22	4	5.28	2
4.2	1.00	44	2.32	20
4.3	0.00	58	1.37	44
5.1	4.50	12	3.26	11
5.2	2.10	27	1.57	35
5.5	0.00	58	0.57	66
5.6	0.00	58	0.63	65
5.7	0.82	47	0.99	59
5.8	1.25	40	1.44	39
5.9	1.00	44	1.41	41
5.10	0.43	52	0.45	68
7.1[2]	0.30	55	1.02	55
7.2	0.00	58	0.86	61
7.3	0.43	52	0.65	64
7.4	0.62	51	1.00	57
7.5	0.00	58	1.23	48
7.6	2.27	25	2.63	17
7.7	1.90	31	2.21	22
7.8	3.89	13	2.62	19
7.9	4.90	9	3.86	6
8.1	3.00	18	2.83	13
8.2	1.13	42	1.78	27
8.3	1.33	39	1.93	25
8.4	2.73	19	1.30	45
12.1	5.86	2	5.37	1
12.2	5.26	3	5.02	3
12.3	4.60	11	4.01	5
13.1	2.40	24	1.72	29
13.2	0.00	58	1.08	52
13.3	0.00	58	0.68	62

TABLE A5.3c (Cont.)

Ranking of Classes by Actual and Predicted Mean Mathematics 'O' Level Grades

Class	Actual Mean Grade	Rank	Predicted Mean Grade	Rank
14.1	2.00	29	1.00	58
14.2	2.52	21	1.16	50
14.3	2.17	26	1.30	47
15.1	3.34	17	2.66	16
15.2	1.77	33	1.85	26
15.3	0.42	53	1.06	53
17.2	2.66	19	2.16	23
17.3	1.45	37	1.63	33
18.1	2.44	23	2.81	14
18.2	0.38	54	1.65	31
19.1	5.12	6	3.51	8
19.2	1.52	35	2.30	21
22.1	0.82	47	1.25	46
22.2	0.62	50	1.11	51
22.3	1.89	32	1.64	32
23	1.61	34	1.74	28
24	1.17	41	1.40	42
28	1.97	30	1.02	54
29	2.64	20	1.43	40
30	2.05	28	1.39	43
31	1.03	43	1.02	56
33	3.50	15	0.96	60
34.1	4.64	10	3.28	10
34.2	3.38	16	2.49	18
35.1	0.88	45	0.66	63
35.2	0.10	57	0.56	67

[1] The final model for Mathematics is a two-level model involving classes and students, so it is not possible to rank schools, as specification assumes that all the classes belong to a single school.

[2] Reverse order streaming was practiced by School 7.

CHAPTER SIX

The Costs of Secondary Education at Different Types of Schools

In Chapter Five it was found that the most 'effective' classes in all three subjects generally were not found in schools spending higher than average amounts on recurrent expenditure per capita. However, besides analysing certain key expenditure items such as professional salaries and textbooks, library and stationery (TLS), no further breakdown was attempted in the detailed analysis. In this chapter the different constituent costs of the total recurrent expenditure per capita at different types of schools will be presented, so that the reasons for the disparity in school costs can be clarified. It will indicate those areas in which high levels of expenditure need not occur for the classes to be 'effective' in terms of the 'O' level results of their students in English Language, English Literature and Mathematics.

The recurrent costs of the individual schools surveyed were derived from a variety of sources described in Chapter Three. Income was detailed separately from expenditure and an effort was made to exclude capital income and expenditure from the accounts. The two summary figures reported in Table 6.2, however, do not tally, nor do the individual schools' accounts given in Appendix 6.1. This is due, no doubt, to incomplete reporting.

Comparison of School Expenditure: 1982 and 1985

In general, information on the cost of education at individual schools is not collected by the Ministry of Education, except in the case of Government schools. A survey of individual school costs, however, was carried out by the Ministry in 1982[1]. This survey indicated the tremendous disparities between rural and urban schools in the share of total costs borne by parents, as well as the disparities in overall running costs. Parents in rural areas were paying more for the education of their children than parents in urban areas, and the government's contribution to the educational costs of these rural pupils was smaller than for urban pupils. Given the fact that rural incomes are generally lower than urban incomes, the extent of the discrimination against the rural areas was that much greater. The comparison with the results of the present research can be seen in Table 6.1.

TABLE 6.1

Comparison of Parental and Government Contributions to Recurrent Expenditure Per Capita by Schooltype, 1982 and 1985 ($)

	A	B(u)	Indep.	B(r)	Miss.	D.C.
Govt. Contribution						
1982	584	413	490	464	306	257
% Total Cost[1]	88%	92%	32%	93%	74%	82%
1985	552	437	526	239	359	174
% Total Income[1]	77%	80%	38%	74%	54%	69%
Parental Contribution						
1982	88	36	1126	36	169	110
1985	178	104	800	79	158	73
TOTAL EXPENDITURE						
1982	666	449	1539	499	416	313
1985	598	456	1228	246	639	215

[1] The percentage figures for 1982 and 1985 are not directly comparable. In 1982 one has a figure for the percentage of the total expenditure provided by government, whereas in 1985 one has a figure for the percentage of the total income provided by government. As one can see from Table 6.2 the total income and the total expenditure do not always tally.

[1] "Report on Results of Survey of Costs at Different Types of Schools in Zimbabwe, 1982", A.R. Riddell, Ministry of Education and Culture, mimeo, May 1983.

As can be seen, changes have been brought about since 1982 to limit the disparity in parental costs between rural and urban schools, but the disparity in government contributions to overall running costs is even greater between schooltypes than it was in 1982, reflecting an even heavier reliance on untrained teachers in the rural areas, including the rural government schools.

Average Per Capita School Income and Expenditure by Schooltype

Table 6.2 presents a breakdown of the average per capita income and expenditure by schooltype. The figures for boarding income and expenditure are given as well as those applicable to day students.

TABLE 6.2

Breakdown of Average Per Capita School Income and Expenditure[1] by Schooltype, 1985

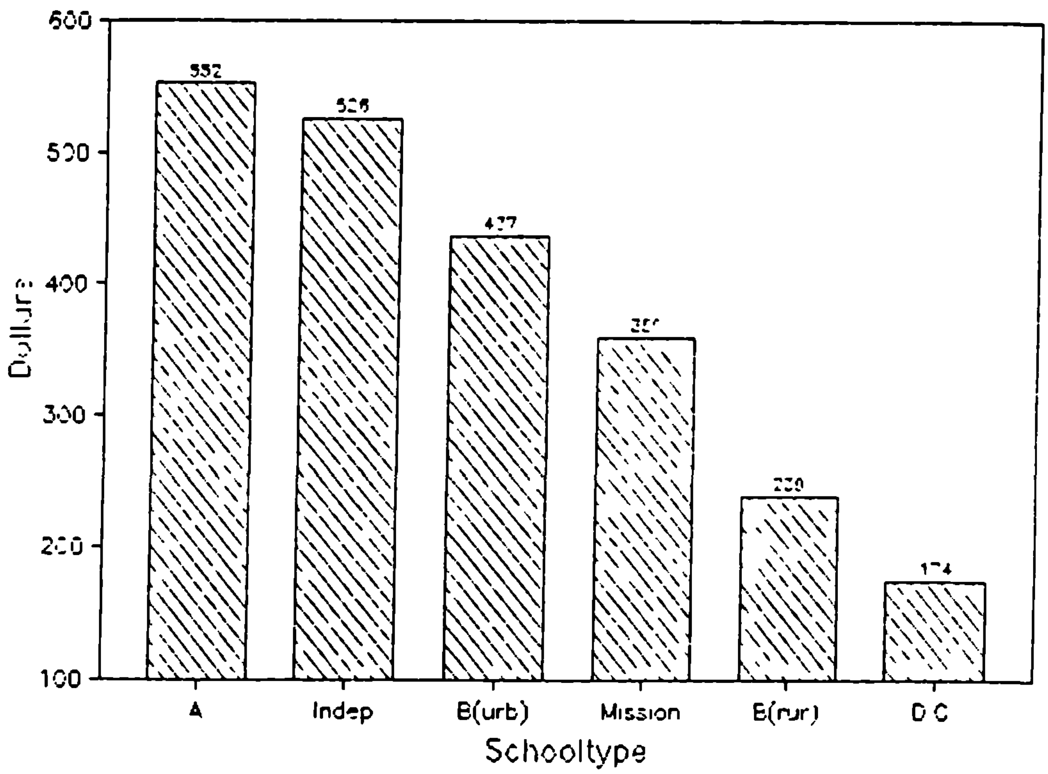
	A	B(u)	Indep.	B(r)	Miss.	D.C.
INCOME						
Govt. Contrib.(Day)	552	437	526	239	359	174
Govt.Share: % Income	77	80	38	74	54	69
Govt. Contrib.(Bding)	941	795	22	N/A	25	23
Boarding Income	1257	1124	923	N/A	306	263
TOT. INCOME (DAY)	753	541	1345	317	592	247
EXPENDITURE						
TLS Expenditure	31	33	81	39	108	39
PROF Expenditure	362	356	913	174	393	162
NON-PROF(day) Expend.	116	20	64	15	35	N/A
TUITION Expenditure	203	87	295	67	143	50
ADMIN. Expenditure	33	13	31	12	20	4
BOARD Expenditure	1037	882	995	N/A	274	176
TOT. EXPENDITURE (DAY)	598	456	1228	246	639	215

[1] It is not clear why, except in the case of the mission schools, expenditure is always less than income. It could be that the total expenditure was not reported adequately on the forms provided, or that indeed all monies are not spent.

Government contributions to per capita day running costs are three times as great for the government Group A schools as they are for the district council schools. Given the disparity in total school incomes between schooltypes and the small amount accruing to district council schools, the smaller percentage of total income accounted for by government should also be noted. Independent schools receive five times as much per head in total income as district council schools, government Group A schools, three times as much. Yet, whereas it would be expected that a smaller share of total income would be contributed by government in the case of mission and independent schools, the smaller share for district council schools, which are often the only secondary schools pupils have the opportunity to attend in the rural areas, is more surprising. The relative sizes of government contributions to different schooltypes' per capita recurrent costs of day students can readily be grasped from Figure 6.1.

FIGURE 6.1

Government Contribution Per Capita (Day) by Schooltype

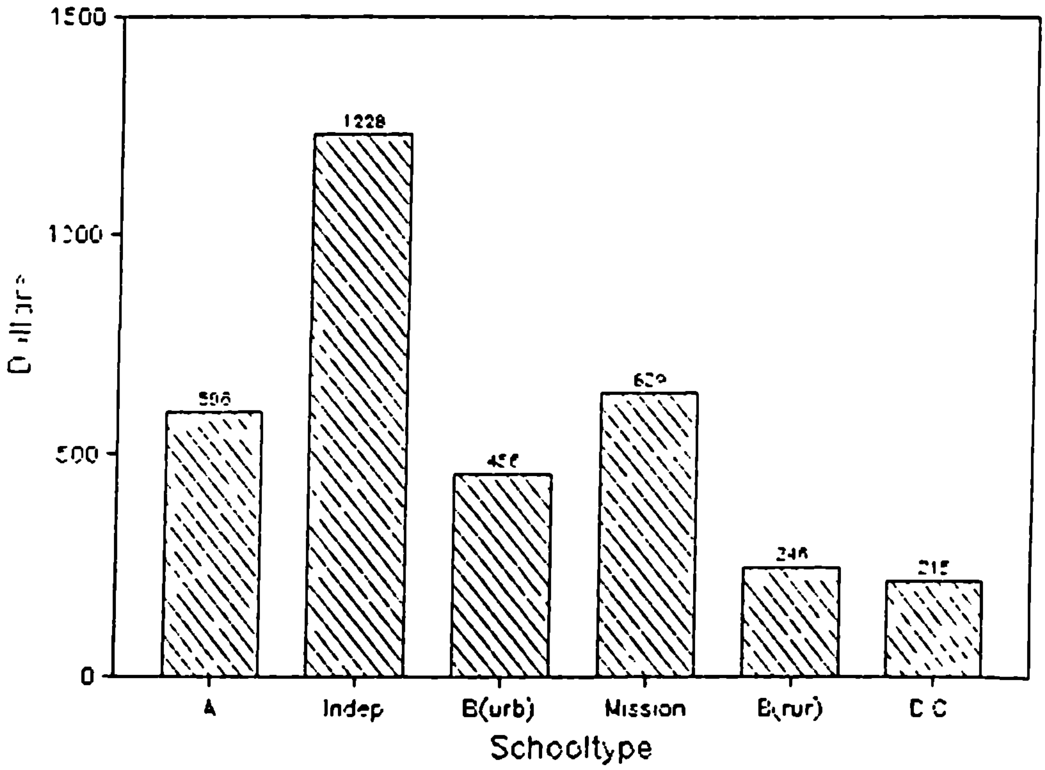


On the boarding side, only nominal contributions are made by government to private schools, $22.50 per pupil. On the other hand, government provides between 70 and 75% of the total boarding income per capita in the case of government schools, an amount in addition to the tuition expenses of between $795 and $941 on average.

Examination of the major items of school expenditure gives a better picture of the sources of disparity between schooltypes. Looking at total expenditure in the second half of Table 6.2, first of all, there is nearly a 6:1 differential between the amount spent on each pupil in independent, as opposed to district council schools, on average. Even if one doesn't take into account the highly expensive independent schools, the disparity between government Group A schools and district council schools is also great. Group A schools on average expend three times as much on each pupil as district council schools. The relative sizes of the total expenditure per capita on day pupils can be seen in Figure 6.2.

FIGURE 6.2

Total Expenditure Per Capita (Day) by Schooltype

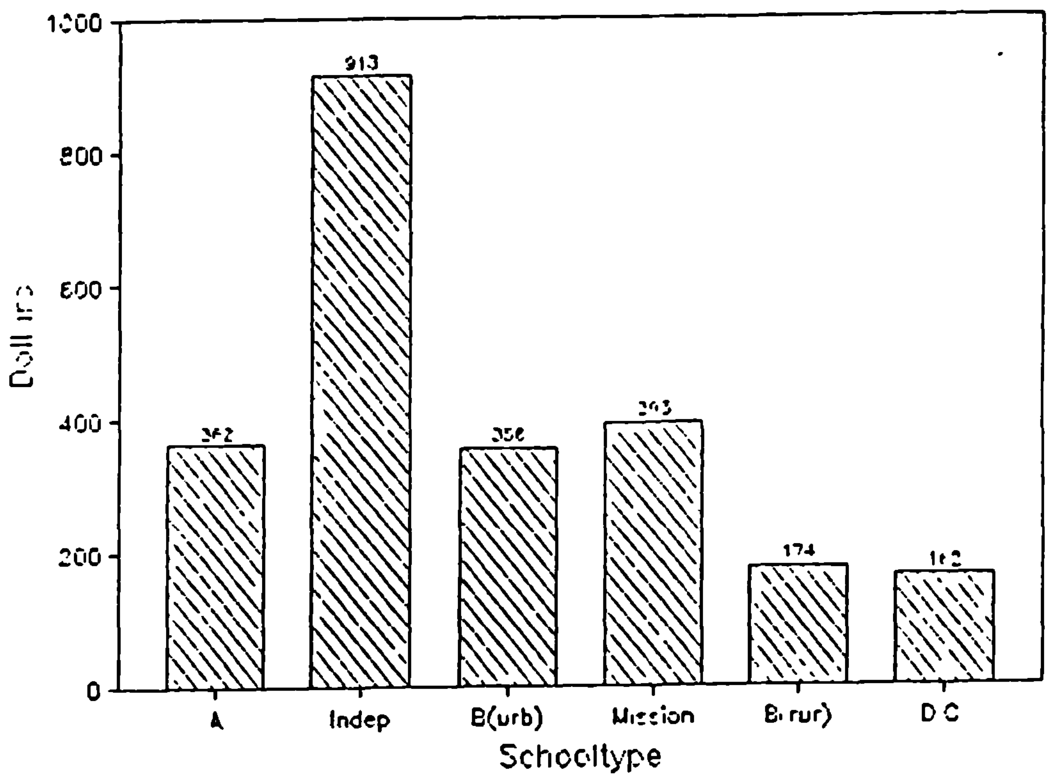


Whereas there was a considerable difference between the total expenditure per pupil in 1982 between Group B (rural) schools and district council schools, in the present survey the total expenditure at the two types of schools is almost on a par.

The breakdown of these figures for total expenditure indicate the differences between schooltypes in the uses put to these monies. It is interesting that expenditure on textbooks, library and stationery (TLS) is at about the same level for four of the schooltypes, excluding the independent and mission schools. Expenditure varies from between $31 and $39 a head, for all government and district council schools, whereas expenditure at mission and independent schools is considerably more, at $108 and $81 per pupil, respectively. This is probably a reflection of the fact that parents pay for their children's texts individually, rather than the case of the other schools in which the amount spent on textbooks represents a replenishment of stock used communally and shared out.

FIGURE 6.3

Professional Salaries Expenditure Per Capita by Schooltype



The amount spent on professional salaries explains the bulk of the disparities between schooltypes in total expenditure per capita. As can be seen from Figure 6.3, there are essentially three different levels of expenditure, with Group B (rural) and district council schools at the bottom, followed by Mission, Group B (urban) and Group A schools, and with independent schools in a class of their own, given the additional teachers generally employed at these schools.

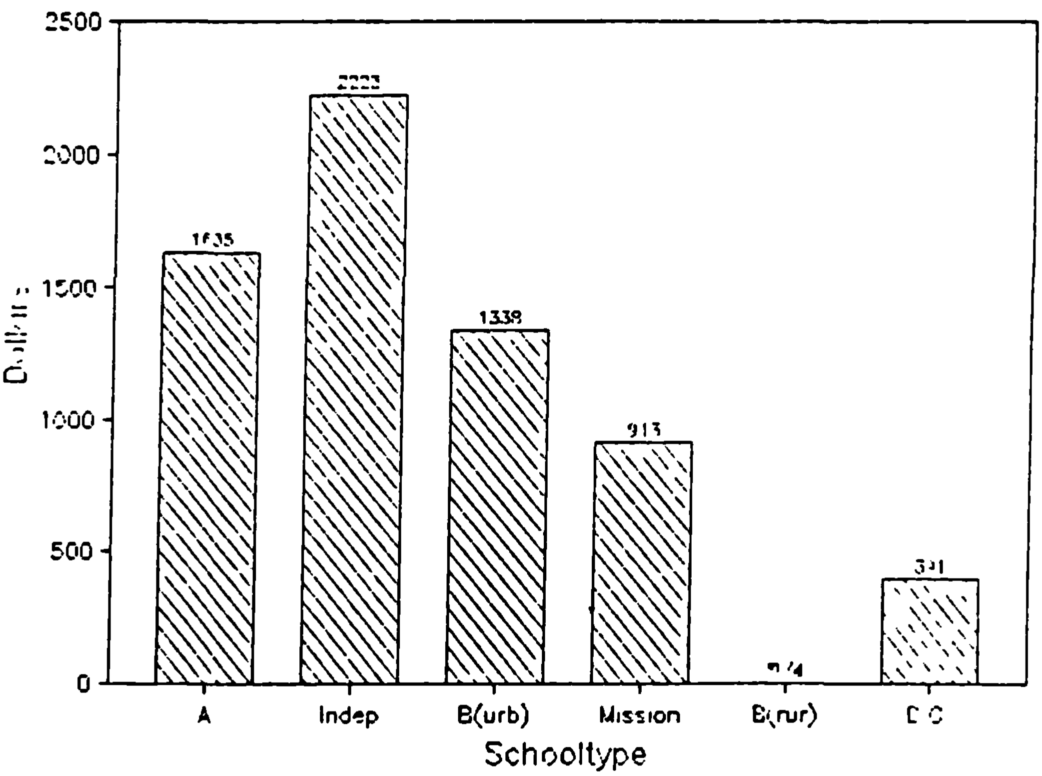
Another substantial constituent of overall expenditure per capita at some of the schooltypes is the amount spent on non-professional staff, e.g. gardeners, and messengers, i.e. staff unrelated to boarding duties. Whereas none of the district council schools in the sample employed any non-professional staff and small numbers of such staff were employed at Group B and mission schools, Group A schools spent nearly twice as much as the independent schools on such salaries and wages, some $116 per pupil. Here government is clearly discriminating between schooltypes in the differential provision of such staff for government foots the bills of these non-professional staff.

Tuition expenses have been itemised separately from boarding expenses and encompass all of the recurrent costs of running the school, with the exception of professional salaries. Included are such things as textbooks, science equipment, sports equipment and equipment for practical subjects, water, electricity and sanitation, maintenance of buildings, furniture and the school grounds, transport, post and telecommunication services, as well as non-professional salaries. Here, the Group B (urban) schools join the district council and Group B (rural) schools with the lowest tuition expenditure per capita, mission and Group A schools following, and with the independent schools having much heftier tuition expenses. The Group A schools are set apart from the Group B (urban) schools by the absolute as well as comparatively larger amount spent on non-professional staff.

The differences in administrative expenditure between schooltypes are not very great, although district council schools do come out at the bottom for this item and Group A schools are on a par with the independent schools at the top. Generally, a proportion of the per capita grant made by the government to the district council is deducted for the council's own administration of its schools, but no additional staff is involved. This is different from the case of the large secondary schools in which there are non-teaching heads, whose salaries, for these purposes, have been allocated to overall administrative expenditure. Similarly, in addition to teachers being paid allowances at government schools for supervisory duties, secretaries are also employed, which adds to the administrative costs.

FIGURE 6.4

Total Cost Per Boarding Pupil by Schooltype



The variation in per capita boarding expenditure at different schooltypes is considerable. Two figures are available for comparison, first boarding expenses taken on their own, exclusive of other tuition expenses, and the total expenditure on each boarding pupil. The difference between the two figures illustrates that although the boarding component of the overall cost of each boarding pupil is slightly larger for Group A as compared with independent schools, the overall cost of each boarding pupil at the independent schools is significantly greater than that for the Group A schools, some $600 more per capita in annual costs on average. These differences in total costs per boarding pupil can be seen in Figure 6.4.

In large part, the differences in these costs are attributable to the amenities provided. For instance at one school $116 per pupil was spent on provisions in a year, whereas at another, $328 per pupil was the cost of feeding that pupil during the year. Similarly whereas laundry services are provided at some schools, amounting to as much as $50 per pupil per year, at others, the pupils are expected to do their own laundry. Likewise, the employment of additional staff on the boarding side increases the per capita cost of each boarding pupil. Some schools have substantial numbers of additional cooking and cleaning staff employed to cater for those living at the school.

The Recurrent Expenditure Patterns of the 'Most Effective' Classes

Having looked at the average constituent costs by each schooltype, what are the recurrent expenditure patterns of the schools in which the top five 'most effective' classes are found (viz. Tables 5.7, 5.9 and 5.11), Table 6.3 compares the average costs of major expenditure items in the five 'most effective' classes for each subject with the average for all schooltypes.

TABLE 6.3

Average Cost of Major Items of Recurrent Expenditure in Schools Having 'Most Effective' Classes Compared with Averages for All Schooltypes ($)

	English Language	English Literature	Maths	Average All Sch.
TLS Expenditure	24	27	67	46
PROF Expenditure	267	297	320	307
TUITION Expenditure	85	67	144	108
TOT. EXPENDITURE (DAY)	365	366	480	432

It is of interest to note that the average cost of all the major items of expenditure for the two English subjects are below the average cost for all schools, whereas the opposite is true for Mathematics.

Anomalies in Individual Schools' Costs

Greater detail in comparative costs between individual schools can be obtained by consulting Appendix 6.1 which gives the constituent costs for each school by schooltype. Some schools can be picked out within their schooltype as having higher than average costs in certain areas. For instance, school 4 expends an extraordinarily high amount on non-professional salaries, some $249 per capita whereas the other three schools in this category spend between $35 and $102 per capita on such expenditure. Similarly, school 9 expends a particularly large amount on professional salaries due to the fact that it hires as many additional teachers as are already provided by the government. Yet, such above-average expenditure does not necessarily indicate especially effective classes, for school 9 does not feature in the top 20% of any of the three subjects, though school 4, with all its messengers and gardeners does appear to be particularly 'effective' in the two English subjects!

A different pattern of expenditure which is not particularly striking from an examination of the tables in Appendix 6.1 is that within the category of district council schools. In all the schools, one can see the disparity between total income and expenditure. The division in the accounts submitted between recurrent and capital expenditure is not exact, and so some of the discrepancy is no doubt for this reason. In addition, in the case of the government schools, allocations are not always spent, and so available income is not necessarily expended income. However, in the case of the district council schools which generally have much more straightforward accounts, the discrepancy between income and expenditure is more telling, and is underlined by other statistics which have been collected in this exercise. It can be shown that within particular district councils, income from parents towards their children's school costs have not been expended at those particular schools, but, rather, have been redistributed among the schools within the district council's jurisdiction. These discrepancies are large: in one case less than one third of the monies collected went towards tuition expenses at that particular school, and in another case a third more than was collected was expended at that particular school. This could be judged quite a sensible policy if gross disparities between district council schools existed, but as these schools are all fairly deficient in educational resources, robbing Peter to pay Paul has more sinister connotations for it absolutely deprives the school receiving the lesser proportion of its income.

The implications of the disparities between schooltypes in overall running costs will be taken up in the final chapter which will draw the strings through the different presentations in each chapter in order to complete a picture of school effectiveness in Zimbabwe.

APPENDIX 6-1

Breakdown of Average Per Capita School Income and Expenditure by Individual School and Average for Schooltype and All Schools

	Government Group A Schools				Average
	1	2	3	4	
Government Income per capita (day)	426	523	499	758	552
Government/Total Income (%)	83	74	80	70	77
Government Boarding Income p.c.	N/A	1040	1068	714	941
BOARD Income per capita	N/A	1384	1430	958	1,257
TOTAL INCOME PER CAPITA (day)	512	770	613	1116	753
TLS Expenditure per capita	40	18	23	42	31
PROF Expenditure per capita	331	336	341	438	362
NON-PROF (day) Expend. per capita	35	102	76	249	116
TUITION Expenditure per capita	101	179	121	410	203
ADMIN Expenditure per capita	12	19	30	72	33
BOARD Expenditure per capita	N/A	1216	1150	744	1,037
TOTAL EXPENDITURE PER CAPITA (day)	444	534	493	919	598

	Government Group B (urban) Schools				Average
	5	6	7	8	
Government Income per capita (day)	351	372	331	692	437
Government/Total Income (%)	80	80	74	85	80
Government Boarding Income p.c.	N/A	N/A	795	N/A	
BOARD Income per capita	N/A	N/A	1124	N/A	
TOTAL INCOME PER CAPITA (day)	437	466	442	818	541
TLS Expenditure per capita	24	14	50	44	33
PROF Expenditure per capita	276	297	235	615	356
NON-PROF (day) Expend. per capita	14	8	30	26	20
TUITION Expenditure per capita	52	47	120	130	87
ADMIN Expenditure per capita	16	15	14	6	13
BOARD Expenditure per capita	N/A	N/A	882	N/A	
TOTAL EXPENDITURE PER CAPITA (day)	344	360	368	752	456

	Independent Schools			Average
	9	11	12	
Government Income per capita (day)	519	577	481	526
Government/Total Income (%)	20	50	45	38
Government Boarding Income p.c.	23	23	19	22
BOARD Income per capita	1182	1115	472	923
TOTAL INCOME PER CAPITA (day)	2257	1025	752	1,345
TLS Expenditure per capita	171	37	36	81
PROF Expenditure per capita	1375	793	570	913
NON-PROF (day) Expend. per capita	130	38	25	64
TUITION Expenditure per capita	491	263	132	295
ADMIN Expenditure per capita	N/A	33	28	31
BOARD Expenditure per capita	1117	1392	477	995
TOTAL EXPENDITURE PER CAPITA (day)	1866	1089	730	1,228

	Government Group B (rural) Schools				Average
	13	14	15	16	
Government Income per capita (day)	186	348	210	210	239
Government/Total Income (%)	73	80	72	72	74
Government Boarding Income p.c.	N/A	N/A	N/A	N/A	
BOARD Income per capita	N/A	N/A	N/A	N/A	
TOTAL INCOME PER CAPITA (day)	253	434	290	291	317
TLS Expenditure per capita	28	35	30	64	39
PROF Expenditure per capita	129	272	161	132	174
NON-PROF (day) Expend. per capita	15	25	9	11	15
TUITION Expenditure per capita	53	76	53	86	67
ADMIN Expenditure per capita	N/A	3	N/A	21	12
BOARD Expenditure per capita	N/A	N/A	N/A	N/A	
TOTAL EXPENDITURE PER CAPITA (day)	182	351	213	239	246

	Mission Schools				Average
	17	18	19	20	
Government Income per capita (day)	268	430	367	369	359
Government/Total Income (%)	N/A	59	49	N/A	54
Government Boarding Income p.c.	35	23	21	21	25
BOARD Income per capita	N/A	359	252	N/A	306
TOTAL INCOME PER CAPITA (day)	N/A	634	550	N/A	592
TLS Expenditure per capita	N/A	50	166	N/A	108
PROF Expenditure per capita	N/A	422	363	N/A	393
NON-PROF (day) Expend. per capita	N/A	35	N/A	N/A	N/A
TUITION Expenditure per capita	N/A	23	263	N/A	143
ADMIN Expenditure per capita	N/A	16	24	N/A	20
BOARD Expenditure per capita	N/A	269	278	N/A	274
TOTAL EXPENDITURE PER CAPITA (day)	N/A	626	651	N/A	639

	District Council Schools					
	22	23	24	25	26	27
Government Income per capita (day)	150	189	186	207	157	171
Government/Total Income (%)	67	78	74	72	78	73
Government Boarding Income p.c.	N/A	N/A	N/A	N/A	N/A	N/A
BOARD Income per capita	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL INCOME PER CAPITA (day)	223	240	249	288	202	235
TLS Expenditure per capita	26	54	29	47	57	28
PROF Expenditure per capita	123	176	176	197	148	161
NON-PROF (day) Expend. per capita	0	0	0	0	0	0
TUITION Expenditure per capita	26	54	31	47	59	43
ADMIN Expenditure per capita	18	1	3	1	2	0
BOARD Expenditure per capita	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL EXPENDITURE PER CAPITA (day)	167	232	209	245	209	204

	District Council Schools (cont.)						
	28	29	30	31	33	34	35
Government Income per capita (day)	129	192	196	91	86	303	205
Government/Total Income (%)	61	74	79	57	60	45	75
Government Boarding Income p.c.	N/A	N/A	N/A	N/A	N/A	23	N/A
BOARD Income per capita	N/A	N/A	N/A	N/A	N/A	263	N/A
TOTAL INCOME PER CAPITA (day)	213	259	247	160	142	478	274
TLS Expenditure per capita	23	35	39	57	14	73	20
PROF Expenditure per capita	119	182	186	81	76	292	195
NON-PROF (day) Expend. per capita	0	0	0	0	0	0	0
TUITION Expenditure per capita	23	46	39	57	36	161	30
ADMIN Expenditure per capita	1	0	1	0	0	7	0
BOARD Expenditure per capita	N/A	N/A	N/A	N/A	N/A	176	N/A
TOTAL EXPENDITURE PER CAPITA (day)	144	228	226	137	113	461	225

	District Council Average
Government Income per capita (day)	174
Government/Total Income (%)	69
Government Boarding Income p.c.	
BOARD Income per capita	
TOTAL INCOME PER CAPITA (day)	247
TLS Expenditure per capita	39
PROF Expenditure per capita	162
NON-PROF (day) Expend. per capita	
TUITION Expenditure per capita	50
ADMIN Expenditure per capita	3
BOARD Expenditure per capita	
TOTAL EXPENDITURE PER CAPITA (day)	215

	OVERALL AVERAGE
Government Income per capita (day)	318
Government/Total Income (%)	68
Government Boarding Income p.c.	375
BOARD Income per capita	854
TOTAL INCOME PER CAPITA (day)	496
TLS Expenditure per capita	46
PROF Expenditure per capita	307
NON-PROF (day) Expend. per capita	29
TUITION Expenditure per capita	108
ADMIN Expenditure per capita	13
BOARD Expenditure per capita	770
TOTAL EXPENDITURE PER CAPITA (day)	432

CHAPTER SEVEN

Conclusions and Implications

This research was begun with the aim of uncovering those factors which account for the most effective secondary schools in Zimbabwe. The results are different from those expected from a simple examination of the differences in examination grades between schooltypes. For instance, to judge from their English Language 'O' level results, it would appear that there is not much difference between government Group A schools and mission schools, However, once account has been taken of the pupils' previous achievement and family background, the effect of the actual school and classroom inputs at Group A schools make them more akin to the Group B urban and rural secondary schools and the district council schools, than the mission schools.

A number of factors which contribute, to different degrees, to the overall "effectiveness" of Zimbabwe's secondary schools have been uncovered.. At the same time, despite a penchant for producing a recipe for school effectiveness which would be of unquestionable value to educational policymakers, this research has not produced a precise list of educational inputs which when stirred together, produce effective schools. In common with most research, and particularly that in which new methodologies are applied, further questions are raised by the results, indicating further research which needs to be carried out to achieve better the broader aims of the study.

This final chapter brings together the different lines of argument that have been pursued in the previous chapters. It summarises the results of the school effectiveness study, relating back to the points raised in the literature review in Chapter Two and draws out the implications for Zimbabwe of the conclusions of the study as well as the implications for further research in this field.

Past and Present Choices

Choices were made at Independence concerning the direction in which educational development was to take in Zimbabwe. It was decided early on, for instance, that while parents would still have to pay for their children's secondary school education, 100% transition from Grade 7 to Form I would be facilitated by a rapid expansion in the number of secondary schools in the country. At the same time, other choices, or decisions, were not taken, which has meant that vestiges of the past have had to be lived with. For instance, whereas at Independence it would have been possible politically to restructure teachers' salaries, because this decision was not taken, the financial commitments required by the enormous expansion in the numbers of teachers have constituted the major burden of recurrent government educational costs.[1] Similarly, alongside the burgeoning new secondary schools which have been founded since Independence, (comprising new urban government schools in the high density areas, new rural government secondary schools and the more numerous, new, district-council-run secondary schools), independent schools have been allowed to continue to operate and many new ones established, attracting the most

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[1] For instance a recommendation of the Commission of Inquiry into Incomes, Prices and Conditions of Service which reported in June 1981 was that "the principle of paying for the qualification needs to be balanced by the principle of the rate for the job so that the wide discrepancies in salaries for people teaching the same grade are narrowed." (Riddell, 1981, p.123)

qualified teaching staff and therefore receiving higher government subsidies than these newer schools.[2]

Although the disparities in the provision of education to different racial groups have been removed since Independence, other disparities, well-catalogued in Chapter Three, still remain. Unlike some other newly-independent countries which sought to restrict educational expansion in order to ensure the maintenance of what might have been very high standards for a select minority, Zimbabwe decided to open the gates fully at the start, and so the qualitative costs of keeping up with the rapidity of such growth in educational provision necessarily has been a focus of the Ministry of Education.

The array of choices that could have been made at Independence is now much smaller; the political possibilities of radical transformation are not as great; interest groups have become entrenched, certainly teachers among them. Similarly, parents whose children have been afforded an academic education, would be loath to accept the reintroduction of selection into academic and vocational streams, unless the prospects for each grouping were mutually promising. Neither has Zimbabwe escaped the dilemma of educated unemployment, so that the "diploma disease" (Dore, 1976) is unlikely to leave her unscathed.

These and other themes will have to be reflected in whatever scenarios are put forward as a result of this research. Before reaching that stage, however, a summary of the conclusions reached is in order. First will be interwoven the findings of Chapter Five and Chapter Six, against the backdrop

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[2] This is due to the fact that government foots the bill of all teachers employed at private schools according to the same stipulated teacher pupil ratios, regardless of type of school.

of the original rankings by schooltype described in Chapter Three.

The Rankings of Different Schooltypes: What do they mean?

The rankings of the different schooltypes by average 'O' level results presented in Chapter Three (Table 3.9) represent the popular and widely-held view of which schools are the best in Zimbabwean society: independent schools at the top, followed by Group A and Mission schools, the urban and rural Group B schools next in line, and the district council schools at the bottom. As was discussed in detail in Chapter Three, however, these rankings also reflect the disparities between schooltypes in terms of pupil backgrounds, teachers' qualifications and more generally levels of educational provision. Pupils at the Group A and independent schools have the most well-educated parents, in the top jobs, with the highest levels of home amenities, and in addition, the pupils' prior achievement, as measured by the Grade 7 Examination, is also the highest of all the schooltypes. Group A and independent schools have the best resources, in terms of the most experienced, fully-qualified teachers, and the government contributes the largest amounts of money to these schools as well. In contrast, the district council schools, sometimes joined by the Group B (rural) schools, are worst off in relation to all these factors.

Chapter Six further corroborated the above rankings by detailing the different expenditure incurred at different schooltypes. The disparities in total expenditure were found to be of the order of 6:1 between independent and district council schools, and lower down the rungs, Group A schools still spend three times as much as district council schools on recurrent educational expenditure. The bulk of the disparities are found to be due to the very different levels of expenditure on professional salaries between schooltypes. Yet, they are also reflected across other items of expenditure as well, such as on textbooks, library and stationery, not to mention overall tuition expenditure.

Is the implication of these findings that unless district council schools are afforded the amenities of the independent or Group A schools that they will forever be on the bottom rung in terms of educational achievement? That is certainly one interpretation, and one which has great popularity, but as has been shown in Chapter Five, it would be quite incorrect, firstly, because these rankings do not take into account the influences brought to bear by the pupils' backgrounds and prior achievement, and secondly, because different educational inputs are not equally significant in their affect on educational achievement. The analyses in Chapter Five show that once one has controlled for prior achievement and the pupils' backgrounds, between-school differences are very small for achievement in Mathematics, and there are no significant differences between schooltypes once one controls for different class-level amenities. For English Language, between-school differences are found to be larger than for Mathematics after introducing the initial controls, but schooltype differences are found to be attributable to the disparities in Grade 7 intake scores, once either the class or school-level amenities have been controlled for. For English Literature, between-school differences are greater than for the other two subjects after the initial controls, but even after subsequent controls are made for class-level amenities, schooltype differences remain which are not attributable to the pupils' prior achievement.

The new, and of course more accurate rankings which emerge from the analyses carried out in this research differ in certain respects from the popular rankings given to the different schooltypes on the basis of examination results in the absence of any controlling factors, as can be seen from Table 7.1.[3]

TABLE 7.1

The Differences in Ranking () by Schooltype between Average 'O' Level Grades by Schooltype and the Coefficient for the Effect of Schooltype Differentiation in the Final Models for English Language and English Literature[2]

Schooltype	English Language		English Literature	
	'O' Level	Schltype/ Grade 7[1]	'O'Level	Schltype
Independent	5.7 (1)	1.90 (1)	5.7 (1)	2.07 (1)
Mission	3.3 (3)	1.40 (2)	3.3 (2)	1.21 (2)
Group A	3.4 (2)	0.06 (5)	3.0 (3)	0.85 (4)
Group B (urban)	2.6 (4)	0.25 (4)	2.2 (4)	0.46 (5)
Group B (rural)	2.1 (5)	0.40 (3)	2.1 (5)	1.07 (3)
District Council	1.5 (6)	0.00 (6)	0.9 (6)	0.00 (6)

[1] Calculated at the average Grade 7 score, 5.8.
[2] It is not possible to rank schooltypes in Mathematics achievement, due to the small differentiation between them. (See Chapter Five for discussion.)

For English Language, the results in Group A schools are much closer to those for the district council schools in the bottom ranking, whereas one would have expected them to be in second place with the mission schools, on the basis of the average English Language 'O' level grades by schooltype. Average 'O' level grades for mission and Group A schools in English Language were 3.4 and 3.3, respectively. However, judging the effect of the schooltype/Grade 7 differentiation at the

[3] See Model K for English Language and Model G for English Literature in Tables 5.1 and 5.2, respectively, in Chapter Five.

overall average Grade 7 score of 5.8, whereas the coefficient for mission schools was 1.40, for Group A schools it was only 0.06, in other words, barely different from the district council schools' reference point.

For English Literature, there is also a surprising difference in the ranking of schooltypes resulting from the final model. Group B (rural) schools are found to be much closer to mission schools than would have been supposed from the ranking by average 'O' level grades in English Literature. Whereas average grades were 3.3 for mission schools and 2.1 for Group B (rural) schools, the coefficient representing the effect of the schooltype differentiation in the final model is 1.21 for mission schools and 1.07 for Group B (rural) schools.

These new rankings do not in themselves answer all the questions raised by this research. However, they do indicate how misleading 'league' tables of different schools can be in the absence of controlling factors. To appreciate the significance of the results of this research, one has to evaluate the different affects on achievement of the variables which have been used in the final models for each subject.

Influential Variables Affecting Achievement at 'O' Level in English Language, English Literature and Mathematics

English Language

Before one even considers classroom/teacher and school level variables with the potential of possible policy manipulation, one has to consider the components of achievement variance in English Language which are accounted for by the prior selection into particular schools and classes. This is the variance which single level models fail to differentiate from the parameter variance. In the case of English Language, the inclusion of the pupil's Grade 7 score and the background index variable accounts for 33% of the total variation in English Language 'O' level grades. Looking at Model E (Table 5.1) as a new base-line, one can see that the total variance is distributed between the three levels as follows: 8% is due to between-school differences in English Language achievement, 13% to between-classroom differences (within the same school- 21% between classrooms in different schools), and 79% due to between-pupil differences. Jumping ahead to the final Model K, between-school differences in achievement are accounted for by the variables comprising the school index variable: whether or not the school was a boarding school, and the highly aggregated variable, the recurrent cost per day pupil. Schooltype differences are accounted for by Grade 7 intake scores distributed unevenly across the schooltypes.

As explained in Chapter Four, due to the high correlations between the class and the school index variables, it can be assumed that the school index variable covers for the following variables which should be viewed as of importance in determining English Language achievement: class size, the number of texts available to each pupil, the verbal aptitude of the teacher, her/his qualifications, age, experience, and ethnic group. Just the same, only an additional 5% of the total variation in English Language 'O' level achievement is accounted for by the school and class level variables listed above. It is of significance that with the addition of these variables, it is possible to explain only 38% of the total variation in English Language 'O' levels. A large proportion, 18%, of what is unexplained, is attributable to unmeasured class level inputs.

English Literature

There are more substantial between-school differences in English Literature than for English Language once the variance due to prior achievement and pupil background variables has been taken into account. Looking at Model E (Table 5.2), 36% of the total variation in English Literature 'O' level results is accounted for by these two variables which reflect the pupil's selection into a particular school. Yet 14% of the remaining variance is still attributed to between-school differences as yet unaccounted for. In addition, 12% of this variance is due to between-classroom differences (in the same school - 26% in different schools). Jumping ahead again to the final Model G, these between-school differences in achievement, in the main, are accounted for by the class index variables: the verbal aptitude of the teacher (also covering for her/his qualifications), the sex and ethnic group of the teacher, and the class size. Schooltype differences, however, override the differences between individual schools, and unlike English Language, these are not attributable to differences in the Grade 7 intake score. It is of interest that while an additional 3% of the variation is explained by the inclusion of the class index variable, the schooltype differentiation accounts for yet a further 7% of the total variation, resulting in 46% of the variation explained by the variables included in the final Model G. As for English Language, 12% of the remaining, unexplained variance is due to unmeasured class-level inputs.

Mathematics

The models for Mathematics achievement at 'O' level present a striking contrast to those for the English subjects, largely because so much of the variation is explained by the pupils' background and previous achievement. In Model E 47% of the total variation is explained and all but a fraction of the between-school variance. The inclusion of the class index variable contributes only a further 1% toward explaining the total variation and as with the other two subjects, there is an intractable class-level variance of 16% which is not explained by the fitted variables, whether in Model E or in the final Model K. The variables included in the class index variable consist of: the class size, the experience and ethnic group of the teacher, and the number of texts available to each pupil.

Summary

As it is difficult to grasp the full meaning of the above figures in a few short sentences, an example will be presented to help to bring home the implications of these final models. Table 7.2 illustrates the different predicted achievement for two pupils as a result of their attending different schools at the top and the bottom of the school ranking. One pupil is an average pupil at a district council school, with the average values for Grade 7 scores and background index variables, and the second is an average pupil at an independent school, again with the average values for this schooltype on intake achievement and background.

TABLE 7.2

Differences in Predicted 'O' Level Grades from Attendance at Different Schooltypes

	Predicted 'O' Level Grades (Differences)			
	Average D.C. School Pupil		Average Indep.School Pupil	
	at D.C.	at Indep.	at Indep.	at D.C.
Eng.Lang.	1.6	4.7 (+3.1)	5.8	3.4 (-2.4)
Eng.Lit.	1.0	3.2 (+2.2)	4.8	2.6 (-2.2)
Maths	-0.7	0.5 (+1.2)	0.4	-0.8 (-1.2)

As the table shows, the effect of school and classroom variables is considerable, greatest for English Language, and least for Mathematics. Besides the observation concerning the different grades achieved by the same pupil due to the different educational inputs available at different schooltypes. Table 7.2 also illustrates the much smaller differences between schooltypes, once background factors have been taken into account. Whereas the raw, predicted English Language 'O' level grades for the average pupil at a district council school and an independent school were 1.6 and 5.8, respectively, the predicted grades for the same average pupils for these two schooltypes once they had changed schools were 4.7 and 3.4, respectively. The original 4.2 point difference is reduced to 1.3 points.

While the variables that are included in the final models for each subject give an indication of those educational inputs which significantly influence pupil achievement at 'O' level, the results of the analysis in Chapter Five concerning the most 'effective' classes, as determined by the class-level residuals, gives us further information on these important variables. One might have thought, in the case of English Language, for instance, that because the cost per day pupil is the major constituent of the fitted school index variable, that low cost schools could not be effective. However, examination of the list of the most effective classes in English Language shows that this clearly is not the case. These classes were characterised by the fact that the majority was taught by trained teachers, they had higher than average Grade 7 intake scores, most had larger than average class sizes (i.e. greater than 38 to a class), and finally, that overall expenditure at the schools in which these classes were found was lower than average, particularly in relation to expenditure on textbooks, library and stationery.

These same variables also emerged in the case of the most effective classes in English Literature and Mathematics. For English Literature, there was the additional factor that these classes had lower than average percentages of fathers in the top occupational category, (FJB1, comprising professionals and commercial farmers); for Mathematics, it was also significant that in the majority of classes pupils had access to at least one text per pupil.

Finally, it was found that ability streaming is an influential factor in determining the most effective classes in all three subjects. As detailed in Chapter Five, the majority of classes which achieve average passes at 'O' level are either the top streams in their schools, in the top half of all the streams in their schools, or comprise just one stream, all of which passed in a particular school.

The Implications of this Study's Findings for Zimbabwe

In Chapter One the overall deterioration in the pass rates since Independence was detailed. These figures have been corroborated in this study, and one must ask whether, despite the license that the rapidity of the educational expansion gives Zimbabwe, it is a healthy situation for such a small minority of the thousands of children sitting the 'O' level examinations to pass. For the population as a whole, in 1985 only 13% of the pupils passed in at least five subjects with a grade of C or better. In this study, the figures are for passes in each of the three individual subject areas. Depending on the subject, between 22% and 25% of the sampled pupils passed with grades of C or better in the three subjects examined. On the other hand, 39% of those sitting the English 'O' level failed the examination, 45% in the case of English Literature, and 62% in the case of Mathematics. Between 60% and 75% of the classes in this study failed to achieve mean passes.

Different ways of addressing this growing problem can be envisaged depending on whether the same overall educational system is maintained or the further selection at Form II, that has been mooted, is put into place. Assuming the former, several implications follow from this study. If one had to whittle down the whole set of variables to the three most significant school and classroom factors in influencing pupil achievement at 'O' levels in the three subjects under study, one would have to list the following: trained teachers, minimally adequate numbers of textbooks and the class's own level of intake achievement. Given the disparities in these three variables across the gamut of schooltypes, as well, of course, as common sense, it should not be surprising that they seem to matter most.

The disparities in government expenditure across different schooltypes need to be addressed seriously with respect to these variables. It is ironic that those schools which receive the least government expenditure per capita, the Group B (rural) and the district council schools, not only have the lowest numbers of trained teachers and available texts, but also have lower subsidiary expenditure at their schools. In other words, besides the government having certain choices it can make regarding more equal expenditure on the items which matter most, it can also choose to spend less on other items of questionable educational influence, on which some government schools receive more besides. For instance, it is particularly notable that Group A schools in this study, on which are spent an average of $116 per pupil in non-professional expenditure - nearly twice the amount per capita as at independent schools - rank so low in the two English subjects, relative to schools which have so much less expended on them and in general have fewer resources (which as has been seen in the previous models, accounts for lower pupil achievement). Similarly, it seems quite wrong that in general, government boarding expenditure should be so heavily subsidised in the case of government schools, when parents would otherwise have to finance the welfare costs of their children were they at school locally or indeed at private boarding schools.

There are various ways for government to address these disparities. With respect to trained teachers and textbooks, particularly in the case of the newer schools, there could operate a sliding scale of per capita and salary grants, in some way equated so that inability to attract sufficient numbers of trained teachers would result in more extensive per capita grant credits which could then be applied to the purchase of additional textbooks, if these were lacking, or toward building teachers' accommodation, etc. By this means government expenditure would be stacked in favour of those schools attempting to build up their resources, and not as at present, rewarding those schools which are relatively privileged. Given the anomalies in district council educational expenditure touched on in Chapter Six, such a system, no less than the present one, would require closer monitoring to ensure its effectiveness for individual schools.

It would seem from the list of most effective schools - in all three subjects - that the government has a certain amount of leeway in terms of the class sizes it affords at secondary level, for above average class sizes, i.e. greater than 38 pupils per class, were common. Further, although expenditure on trained teachers and textbooks has been emphasised, it should also be pointed out that below average overall expenditure was the norm for the majority of 'effective' classes in all three subjects, so other economies should be possible. Immediately what springs to mind, certainly in the case of the more well-provided schools, is whether the pupils could not take over more of the daily maintenance tasks, in addition to what many schools do in raising funds that can help lower overall costs in 'education with production' projects. As has been explained in Chapter Six, beyond differences in professional salary costs, the reason for the overall disparities in recurrent expenditure are the differences in the level of amenities at different schooltypes. No doubt savings could be made in non-educational expenditure by taking on lower standards and with greater pupil participation in everyday tasks, particularly at boarding schools. There must be lessons to be learnt from the low per capita boarding expenditure at the mission schools sampled. Of course, this policy alternative is coloured by choices that were not made in this direction at Independence and so present expectations of pupils and parents are likely to come into conflict with any sudden, new, non-academic requirements made of pupils.[4]

It should be noted that greater expenditure on secondary Mathematics education is likely to be necessary to improve the effectiveness of the overwhelming majority of classes which fail the 'O' level examination. This is in comparison with the English subjects which, from the evidence of this research, are more sensitive to class level inputs which make a difference to pupil achievement than is the case for Mathematics. It is significant, for instance, that all of the 'effective' classes in Mathematics had trained teachers.

The practice of ability streaming is another area for potential policy manipulation, given the results of this study which show that the top ability streams stand to achieve much better examination results than the lower streams of any school - put more forcefully, that lower stream classes don't

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[4] Although the ZIMFEP schools have operated in this manner and they were intended originally to be 'models' to be emulated more widely, this is far from the case today.

stand much chance at all of achieving mean passes in any of the three subjects, and particularly Mathematics. This is further corroborated by the fact that the majority of 'effective' classes in all three subjects have above average Grade 7 intake scores. This raises the second alternative: if instead of a continuation of the present, highly academically-orientated educational system, selection were to be reintroduced to effect vocational and academic streams after Form II, or at some other stage. Support for such an alternative is strengthened by the evidence of this research on the influence of the pupil's background and previous achievement on her/his 'O' level results. Although virtually the same core syllabus is presently being taught, no matter the schooltype, largely on the grounds of fairness, it must be asked whether, indeed, it is fair to have everyone offered an equal chance at failing an examination never intended for the majority of a population. Perhaps that sounds as though the question has been stood on its head, but the forbearance of many parents whose children really are not afforded anything like an equal chance at an 'O' level pass, despite their being offered a secondary education, is truly remarkable, particularly in view of the personal, financial sacrifices being made to cover their tuition fees, examination fees, and even physically building their classrooms. Whether this alternative is politically feasible, however, would need further discussion.

One question that remains unanswered at the end of this research concerns the unexplained class-level variance in all three final models. On the one hand the research has pointed to such factors as trained teachers being a significant influence on pupil achievement, but on the other hand, the research says nothing on how trained teachers effect that significant influence. Although for Zimbabwe, many questions about the relative importance of different influences on pupil achievement at 'O' level examinations in three subjects have been answered, just as the effect of these different variables at different levels of the educational system have been identified, there is one particular area which is not touched on and which further research alone could probe. Observational studies in the classroom are the obvious next stage of work that is required on the effectiveness of secondary schools in Zimbabwe, drawing on the base-line which has been uncovered in the present study.

Reflections on Previous Research into School Effectiveness

This research is very different from previous studies into school effectiveness in Third World countries due to the multilevel methodology employed, the features of which have been described in Chapter Two, and the fact that it accounts for the pupils' intake achievement. Not having to make such unrealistic assumptions about the educational reality one is trying to analyse, due to the restrictions of single level models, the conclusions of this research are likely to be more reliable than those utilising single level regression models without the hierarchy and resultant clustering of real classrooms and schools. This is not to say, however, that as a result of the methodology, the conclusions of this research are completely different from all previous studies. Most of the conclusions, in fact, are confirmations in the Zimbabwe case, of factors found significant in many previous studies. There is one important aspect in which this is not so, however.

A case has been made for a different model of educational achievement in Third World countries from that in industrialised countries, due to a number of factors including the alleged, lower class differentiation in so-called less-developed countries and the fact that 'modern' education is dysfunctional in terms of the values of traditional society. This alternative model states that pupils' background influences, related to their socio-economic status, are less important influences on pupil achievement than the schools, classrooms and teachers to which they are exposed. This position no doubt arises from a legitimate desire not to assume that models of educational achievement developed from research carried out in industrialised countries, can be transported to the very different social, political and economic environments of Third World countries. The view, as described in Chapter Two, and put forward notably in the writings of World Bank economist Stephen Heyneman, has been widely accepted, and one is constantly seeing references to the position in literature concerned with Third World school effectiveness.

The present emerges with quite different evidence concerning the major influences on pupil achievement at secondary level in Zimbabwe, however. By far the largest proportion of the total variation in 'O' level achievement, in all three subjects studied, is accounted for by the pupils' previous attainment and socio-economic background. It is certainly questionable the extent to which the child's previous attainment also covers in part for the influence of the child's socio-economic background, but taken together, there is no question that these two factors are the primary influences on pupil achievement in Zimbabwe.

Referring back to Tables 5.1 to 5.3 in Chapter Five which present the variance components analysis of the different models used in this research, one can compare the changes in the intra-classroom correlation, i.e. the differences between classes in different schools, after the inclusion of the background index variable and after the inclusion of the class index variable. In other words, starting with Model C[*] in which previous attainment has been controlled for, one can compare the changes in the intra-classroom correlation between Models C (or D) and E, and then between Models E and F. Table 7.3 illustrates this below.

TABLE 7.3

Comparison of the Reductions in the Intra-Classroom Correlation After the Inclusion of the Background Index Variable and After the Inclusion of the Class Index Variable, for English Language, English Literature and Mathematics 'O' Levels

Subject	Adding the Background Index Variable	Adding the Class Index Variable
English Language	-26%	-13%
English Literature	- 4%	-16%
Mathematics	-28%	-13%

Interestingly, only in the case of English Literature is the influence of the class index variable greater than that for the background index variable. But this is not to say that in the case of this subject, school and classroom factors outweigh the importance of background factors, as the pupil's prior attainment has already been controlled for in Model D, and together with the background index variable, 36% of the total variation in English Literature achievement is thereby accounted for. However, it is an interesting result, presaged even by the biased, single level regressions carried out in the stage leading up to the construction of the class index

[*] Model D, of course, is used in the case of English Literature and Mathematics, due to the inclusion of the quadratic of the Grade 7 score.

variable. The greater explanatory power of these variables for English Literature, compared with English Language and Mathematics could already be seen at this earlier stage. (See Table A4.2 in Appendix 4.1.) The greater influence of the inclusion of the background index variable on the intra-classroom correlation for the other two subjects, however, after controlling for initial attainment, is clear.

Not only does this study corroborate the earlier, general finding, mainly from research in industrialised countries, concerning the relative importance of background vs. school/classroom factors in influencing pupil achievement, but several other findings are also the same for this Zimbabwean study. Given the equivocal nature of much previous research as a whole on particular classroom or school variables, only a few, more generally accepted points will be made.

The occupation and educational level reached by the pupils' fathers, in combination, are explicitly included in the final models for both English subjects as significant influential variables, unlike the case of Mathematics. The advantages of children of non-manual social classes on verbal tests in industrialised countries (e.g. Douglas, 1964, 1968; Fogelman, 1983) is reflected in the results of this research.

Although background factors seem to matter more in the case of Mathematics than English subjects in this study, a finding similar to one of the findings of the ILEA Junior School Project concerning Reading and Mathematics (ILEA, 1986), the background referred to is not the socio-economic status of the pupil as much as his initial attainment, as can be seen from the progression of models tested and the constituent variables of the background index variable for Mathematics. It would seem that less influence can be brought to bear on pupil achievement in Mathematics through different class/teacher or school factors than is the case for the two English subjects, notably English Literature, where classroom factors are especially significant. This may seem a bit of a chicken and egg concoction, because of the correlation between pupil background and initial attainment, but it would seem that a distinction between the two subject types is being uncovered in the case of Zimbabwe, just as it has been in England. To the extent that initial attainment and social background are correlated, the effect of streaming reinforcing social selection, another finding of earlier research such as Douglas', is also corroborated in this study.

Further, this study's finding, that there is greater between-school variation for the English subjects than for Mathematics, was the same as Mazhero's finding for Zimbabwe (Mazhero, 1986) and similar to the finding of the ILEA Junior School Project (ILEA, 1986) which found wider variation in Reading than in Mathematics.

There is much which this research has been able to conclude regarding the significant factors accounting for the broad differences in achievement between the six major secondary schooltypes in the newly-independent Zimbabwe. Certain directions have been indicated for potential policy manipulation to satisfy the quality/quantity constraints of the rapid educational expansion which continues to take place. The application of a multilevel methodology to the case of Zimbabwe will hopefully encourage other researchers to adopt more appropriate statistical techniques in their studies of Third World educational effectiveness, for while the critiques of the application of ordinary least squares regression analysis to problems of education have been voiced for some time, it is a recent phenomenon that a new methodology has become available. Inasmuch as this study has aimed to produce concrete policy alternatives for Zimbabwean educational planners, it is best seen as a starting point, indicating the base-line for further, more intensive research within classrooms, but in which the broad parameters have now been clearly set.

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