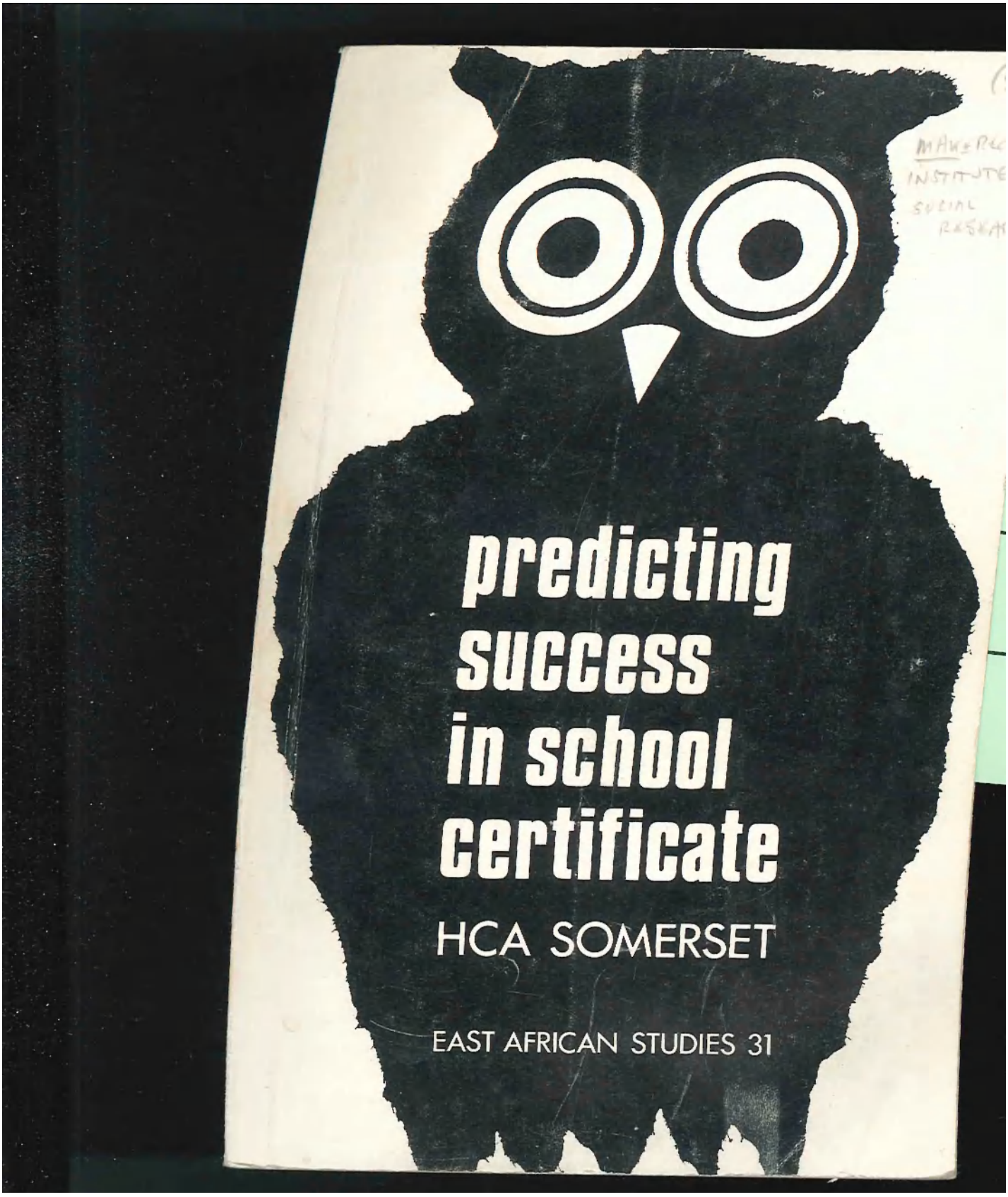
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Predicting success in School Certificate

PREDICTING SUCCESS IN SCHOOL CERTIFICATE

A Uganda Case Study

H. C. A. SOMERSET

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For Betty

with my love

Here between the hither and the farther shore
While time is withdrawn, consider the future
And the past with an equal mind.

T. S. Eliot *The Dry Salvages*

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Kiganjo, Kenya
October 1967

H. C. A. Somerset

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1

INTRODUCTION

This monograph reports the results of an enquiry into secondary school selection in Uganda. The secondary school entrance examination is the most important hurdle in the Uganda educational system. Candidates with the best marks are assured of four years' secondary education at a government-aided school, at the end of which they will sit the Cambridge Overseas School Certificate examination. A good School Certificate pass is rapidly becoming the minimum qualification for entry to most white-collar and technical occupations. Pupils with slightly lower selection examination marks may be accepted by primary teacher training colleges or technical colleges, but for most candidates failure to gain a secondary school place means the end of their formal education. Unsuccessful candidates who can afford the fees sometimes enrol at private secondary schools, which are unaided and usually run for profit, but teaching standards are generally low, and most pupils drop out after one or two years. Repeating the selection examination is not permitted.*

Until 1966, pupils sat the selection examination after eight years of elementary education. The elementary course was divided into two parts: a six-year primary school course, followed by a two-year junior secondary school course, leading to the secondary school selection examination.† The selection examination was usually known as the Junior Secondary Leaving Examination, or JSLE, and secondary schools were generally referred to as senior secondary schools, to distinguish them from junior secondary schools. At the beginning of 1967, primary schools and junior secondary schools were combined, and the full course was reduced by one year, so that pupils are now completing their elementary

* In 1967 repeating by a limited number of candidates was permitted for the first time.

† A few schools offered an integrated eight-year elementary course. Primary school leavers sat an examination which controlled entry to junior secondary school, but this examination was less competitive than the secondary school selection examination. In some areas pupils with bare pass marks were accepted for junior secondary education, and a few junior secondary schools had unfilled places.

education in seven years instead of eight. The examination is now known as the Primary Leaving Examination.

In this monograph, the term "secondary education" will be used for senior secondary education only. Primary and junior secondary education will be referred to as "elementary education".

The selection examination usually consists of three papers, two in English and one in Mathematics. Pupils also sit papers in other school subjects, but the marks are usually not included in the total mark on which selection decisions are based.

Over recent years the chances of a candidate gaining entry to a senior secondary school have improved. In 1960, about 9,400 candidates (Africans and Asians) competed for 2,000 places. By 1964 there were more than twice as many candidates (20,500), but the number of places available had more than trebled (6,060). Thus the proportion of places to candidates rose from 21% to nearly 30%, mainly as a result of rapid senior secondary expansion in 1963 and 1964, just after Uganda's independence. By 1968, however, there will probably be well over 60,000 candidates, so that although senior secondary provision will continue to expand, the proportion of places to candidates will probably fall back towards the levels of the early 1960's.

The method used in this study has been to compare the performance of pupils in the 1960 senior secondary selection examination with their achievement in the 1964 Cambridge School Certificate. We have thus used School Certificate achievement as a measure of secondary school progress, and as a criterion against which to measure the efficiency of the selection examination. In many ways School Certificate achievement is an unsatisfactory criterion. The papers are for the most part set and marked in Britain, and parts of the curriculum in a number of subjects are of doubtful relevance in East Africa.* The questions asked in some subjects, particularly in the non-sciences, tend to stress the ability to remember concrete and particular facts, and to give the candidate little opportunity to develop an argument, or to show grasp of general concepts (see Chapter 4, section B). Further, we do not know to what extent the marks are affected by changes in the content of the questions from year to year, or by variations in the criteria used for assessment by different markers. And finally,

* From 1968 the examination will gradually be taken over by the East African Examinations Council.

there are many aspects of intellectual and personal development which cannot be measured by an examination, but which nevertheless are highly relevant in determining how effectively a pupil will use his knowledge and skills when he leaves school. The only justification for using school certificate achievement as a measure of educational progress is that it is the criterion accepted by the community and the schools.

The study has been carried out retrospectively: that is, we took as our sample a group of pupils who had already sat Cambridge School Certificate and traced them back to the selection examination. This was done to avoid the four-year wait which would have been necessary if we had started with pupils just sitting the selection examination, but it has meant that the data used have been confined mainly to information available from Ministry of Education files. These files were compiled for selection purposes rather than for research. Thus data on important variables such as age, socio-economic status, and intellectual potential are not available. Further studies, such as the one being carried out by Silvey (1964) are needed to establish the relevance of factors such as these for secondary school selection.

The method used has, however, one compensating advantage. Because the information was, for the most part, obtained quickly and simply from a single source, it was possible to work with a much larger sample than would have been feasible if the information had been obtained from the pupils directly, by visiting schools. The sample contains nearly every African pupil who was accepted for secondary education in 1961 and who completed his school certificate course in the normal four-year period.

The study has one important weakness. We have investigated the predictive validity of only one selection examination, which was taken as long ago as 1960. Since then there have been a number of changes. Multiple-choice questions, for instance, are now much commoner. Perhaps, as a result of these changes, the examination now identifies pupils with the potential to succeed at secondary school more efficiently than it used to. Clearly, the present investigation is an exploratory study only. A much more detailed investigation, planned in advance and continued over a number of years, will be needed before the factors determining the efficiency of secondary school selection examinations in Uganda can be fully understood.

2

METHODS

It was decided to define the sample as consisting of all African candidates for the 1964 Cambridge School Certificate from government-aided secondary schools who sat the senior secondary selection examination (Junior Secondary Leaving Examination) in 1960. Not all pupils complete their secondary school courses in the usual four-year period, so some 1964 CSC candidates had sat the JSLE before 1960. Because of changes in the content and difficulty of the JSLE papers from year to year, it was necessary to omit these pupils from the sample. Asian and European candidates were also omitted. Our task in tracing back each CSC candidate was therefore twofold: firstly, to find in what year he had sat the JSLE, and secondly, if he had sat in 1960, to find out what his marks were in the various JSLE papers.

For each aided senior secondary school in Uganda lists were prepared of all 1964 African CSC candidates. These lists were then compared with the 1961 senior secondary acceptance lists and 1960 JSLE mark lists, issued by the Ministry of Education. JSLE marks were found without difficulty for about 60% of the candidates. To get information about the remaining 40%, we visited three schools near Kampala which offer post-school certificate courses, and consulted the pupils. The schools accept successful School Certificate candidates from all over Uganda. Thus, in 1965, it was possible to find at the three institutions visited, several 1964 School Certificate candidates from every senior secondary school in the country. At least one pupil from each of the contributing schools was interviewed, and information obtained about previous classmates whom we had not been able to trace. For nearly every school it was possible to interview more than one pupil, so that the information obtained could be checked.

Finally, when the interviews were finished, we wrote to the headmasters of those contributing senior secondary schools for which data were still incomplete, asking for information about untraced pupils.

About half the pupils who could not be traced using Ministry files proved to have sat the JSLE in 1960, but to have changed

their names during their secondary course. Both names were nearly always known to pupils who had been in the same class, so the marks obtained in the two examinations were usually matched without difficulty. Other pupils had transferred from one senior secondary school to another. Their JSLE marks were usually found in the acceptance list for their original school.

No attempt was made to trace JSLE marks for CSC candidates from two schools, Mvara S.S. and Lubiri S.S., because Ministry files were incomplete.* At the remaining 26 senior secondary schools there were 1,103 African CSC candidates in 1964. The years in which these pupils sat the JSLE are set out in Table I.

Table I

JSLE YEAR OF 1964 CSC CANDIDATES

Sat JSLE 1960			910
Did *not* sit JSLE 1960:			
(*a*)	JSLE 1959: Repeated a year at SS	57	
(*b*)	JSLE 1959: Missed a year at SS	15	
(*c*)	JSLE 1959 or 1958: Entered SS from J. III, Sec. Mod. or Tech. College	33	
(*d*)	Sat Home Economics Exam. 1960	27	
(*e*)	Never sat JSLE	19	
			151
JSLE year not determined			42
	Total		1103

One hundred and fifty-one pupils sat JSLE before 1960, or never sat at all, and are therefore outside our sample. Nine hundred and ten sat in 1960, while the JSLE year for the remaining 42 could not be ascertained. From our experience in tracing other pupils, it seems likely that at least half of the last group sat JSLE before 1960.

* Only 19 candidates from Mvara S.S. sat CSC in 1964, while at least half the 61 candidates from Lubiri S.S. sat the JSLE before 1960, and were hence outside the sample. Probably not more than 40 traceable candidates were lost by the omission of these schools.

JSLE marks were found for 881 of the pupils who sat the examination in 1960. Unfortunately it is not possible to calculate our exact success rate in tracing 1960 JSLE marks, because we do not know precisely how many pupils sat in 1960. If all the pupils for whom the JSLE year could not be ascertained sat in 1960, our success rate was 92.5%. If, on the other hand, none of them sat in 1960, the success rate was 96.8%. If, as appears most likely, about half sat in 1960, the success rate was between 94% and 95%.

The commonest reason for failure to find JSLE marks was that the pupil had transferred from one secondary school to another during his school certificate course. In these cases the second school had often never obtained details of JSLE performance, while records at the first school had not been kept.

Table I also shows the reasons why pupils outside the sample did not sit JSLE in 1960. It can be seen that 72 sat in 1959, and either repeated or missed a year at senior secondary school. Another 33 had transferred from secondary modern, technical, or J.III classes, having sat the selection examination before 1960. Twenty-seven girls sat in 1960, but offered papers in Home Economics and Arithmetic instead of the JSLE mathematics paper. Their total JSLE marks are thus not comparable with those of other candidates. Finally 19 had never sat the examination at all. Two had been ill at the time of the examination, but had been accepted into senior secondary school on their headmasters' recommendation, while the remaining 17 had entered senior secondary from schools outside Uganda, mainly from Rwanda and the Sudan.

The success rate in tracing JSLE marks varied to some extent from school to school. Assuming that all the candidates for whom the JSLE year could not be found sat in 1960, the lowest success rates were 70% and 80%, at two small schools with 20 and 25 CSC candidates respectively. At five schools the success rate was 100%: that is, the JSLE year was determined for every candidate, and marks were found for all those who sat in 1960.

Fully traced pupils performed better in the Cambridge School Certificate examination than those for whom JSLE marks were not found. The means are set out in Table II.*

* The Cambridge School Certificate marking system works in the opposite direction to most marking systems; a low aggregate indicates good performance, and a high grade aggregate poor performance.

Table II

MEAN CSC GRADE AGGREGATE BY SUCCESS IN TRACING JSLE RESULTS

	No.	*Mean CSC Grade Aggregate*
Sat JSLE 1960: marks found	881	30.12
Sat JSLE 1960: marks not found	29	36.17
JSLE year and marks not found	42	36.38
Total	952	30.58

The reasons for these differences are not clear. One possible explanation was suggested by the fact that nearly half the untraced pupils had transferred from one school to another during their senior secondary courses. Perhaps changing schools had affected their school certificate performance adversely. It was found, however, that among the untraced pupils those who had transferred performed better than those who had stayed in the same school; the respective means were 34.15 and 38.27. The most likely explanation for the differences is that the untraced pupils tend to be those who were accepted after the start of the first senior secondary year, to fill places which had been offered to other pupils but not taken up. These late-starting pupils would tend to be of low academic attainment, and their JSLE marks would be difficult to trace because their names and index numbers would not be recorded on the Senior Secondary Acceptance lists.

In this monograph we shall discuss results from fully traced pupils only. If we had succeeded in finding JSLE marks for all 1960 candidates these results would, of course, have been somewhat different, but the changes would almost certainly have been insignificant. It can be seen from Table II that, despite the poor CSC performance of the untraced pupils, the difference in mean CSC grade aggregate between the total sample and the traced sample is less than half a point, or about one-twentieth of a standard deviation. The proportionate difference in the mean JSLE mark might have been somewhat greater.

The effects of the untraced pupils on relationships between JSLE and CSC performance are more difficult to estimate. It seemed likely that the CSC aggregates might scatter more in the total sample than in the traced sample, because of the low mean among the untraced candidates. This would have suggested that the correlations between JSLE and CSC performance found in the traced sample would be rather lower than the true correlations in the full sample. The CSC standard deviation for the full sample, however, was in fact slightly lower than that for the traced sample (9.226 as against 9.312). In general, then, we can conclude with fair confidence that the results to be discussed have not been significantly distorted by our failure to trace JSLE marks for a small number of 1964 CSC candidates who sat the JSLE in 1960.

3

THE PREDICTIVE VALIDITY OF THE SELECTION EXAMINATION

In this chapter we shall start our discussion of the results by looking at the relationship between overall performance in the selection examination and overall performance in school certificate. The analysis will cover the general picture only; detailed discussion of performance in individual subjects will be kept for Chapter 4. Our main purpose will be to find out how efficient the 1960 Junior Secondary Leaving Examination was in identifying pupils with the potential to succeed in Cambridge School Certificate. To do this, we shall discuss the correlation between achievement in the two examinations and the shape of the regression of CSC grade aggregate on JSLE total mark. We shall also attempt to estimate how many pupils who would have obtained good school certificate marks were excluded from secondary school because of imperfect selection.

The results to be discussed in this chapter, and in Chapters 4 and 5 also, will be from the boys in our sample only. The boys outnumber the girls by 765 to 116, so the results for the girls have been analysed in much less detail. A brief summary of the girls' results is given in Chapter 6.

A Relationship between JSLE total mark and CSC grade aggregate

Table III shows the distribution of 1964 Cambridge School Certificate grade aggregates according to marks obtained in the 1960 JSLE, for the 765 boys in our fully traced sample. CSC performance is plotted along the vertical axis, with high marks (i.e. low grade aggregates) at the top, and low marks (high grade aggregates) at the bottom. JSLE performance is plotted along the horizontal axis, with high marks at the right hand end and low marks at the left hand end. Thus boys with high marks in both examinations appear in the top right hand corner of the chart, and boys with low marks in both examinations in the bottom left hand corner. Those who did well in the selection examination but poorly

Table III

1964 CAMBRIDGE SCHOOL CERTIFICATE GRADE AGGREGATE BY 1960 JUNIOR SECONDARY LEAVING EXAMINATION TOTAL MARK. Boys only: N = 765

	CSC Grade Aggregate	JSLE Total Mark																											
		123—127	128—132	133—137	138—142	143—147	148—152	153—157	158—162	163—167	168—172	173—177	178—182	183—187	188—192	193—197	198—202	203—207	208—212	213—217	218—222	223—227	228—232	233—237	238—242	243—247	248—252	253—257	TOTAL
GRADE I	6—7																						1						1
	8—9												1																1
	10—11							1					1		2	2		1											7
	12—13									1		4	1					1		1									8
	14—15								1		1	1	5	3	3	2			1	3	2	1		1		1			25
	16—17				1			1	1	2	3	1	4	3	3	4	4	2	2		2	1			1				35
	18—19					1			1	1	4	3	4	4	3	2	5	3	3	1	1		1	1		1		1	40
	20—21				1		1	5	1	2	4	4	3	2	5	3	1		1	1	1	1							36
	22—23				1				2	3	6	3	6	4	6	3	2	3	1	2	1	1							44
GRADE II	24—25				1	1	1	3	5	11	5	6	5	5	2		2	1	1	1									50
	26—27				1	1	2	3	2	6	15	7	8	5	6		2	1	2	1	2								64
	28—29		2			1	3	8	5	5	10	8	8	3	10	2		1	1										67
	30—31				2	2	1	3	11	4	7	5	6	2	5	1	3	5	1	2									60
	32—33				1	1	2	3	3	2	8	3	5	9	1	2	3	1	1					1					46
GRADE III	34—35		1	1	1	2	4	3	4	10	9	5	4	6	3	6	2												61
	36—37				1		4	3	4	10	4	5	3	2	2	2	2	1											43
	38—39	1			1	2		6	7	3	3	8	2	2	5	1	1	1											43
	40—41				1		4	3	3	8	8		1	5	1	2	1	1	1										39
	42—43					1	1	3	8	4	4	3	1	1		1	1												28
FAIL	44—45			2			2	1	2	5	2	7	3	1	1	1	1												28
	46—47						1	3	5	1	2	2	1	1		1													17
	48—49					2			1	1	3	4																	11
	50—51						1	3	1		1	1																	7
	52—53								1	2		1																	4
	Total	1	3	3	12	14	27	52	68	81	99	81	72	58	58	35	30	22	15	12	9	4	2	3	1	2	0	1	765

in CSC are in the bottom right hand corner, while those with poor marks in the selection examination but good marks in CSC are in the top left corner. ("Good" and "poor" performance in the JSLE selection examination is, of course, judged relative to this sample of successful senior entrants only. As senior secondary places were available for only about 16% of the 1960 African male junior secondary leavers, even the poorest candidates in this sample scored above average relative to the total group of JSLE candidates.)

If there were a strong positive relationship between performance in the two examinations, we would expect most of the pupils to cluster, in a narrow oval, around a diagonal running from the bottom left to the top right corner of the chart. A boy's performance in the CSC examination could be predicted with some accuracy from a knowledge of his JSLE mark. If, on the other hand, performance in CSC were quite unrelated to the JSLE result, there would be no tendency for the sample to cluster around a diagonal. Instead the distribution would be either roughly circular, or oval-shaped, with the axes of the oval parallel to the axes of the graph. There would be approximately equal numbers of pupils in each of the four quadrants. Knowledge of a candidate's JSLE mark would be of no help in predicting his CSC performance.

The data presented in Table III fall between these extremes. The distribution is roughly oval in shape, and the major axis runs diagonally from bottom-left to top-right. A large number of pupils, however, do not cluster around this axis. Thus JSLE and CSC performance are positively correlated, but the relationship is not a strong one. School certificate performance tends to improve as the JSLE mark goes up, but any prediction of the CSC achievement of an individual from knowledge of his JSLE total mark would be subject to a wide margin of error. Many pupils whose JSLE performance had been just good enough to get them into secondary school were amongst the top school certificate candidates, and conversely a number of pupils with high selection examination marks performed poorly in school certificate.

The correlation between JSLE total mark and CSC grade aggregate is .374, so that the two examinations have only 14% of their variance in common. In other words the selection examination and the school certificate examination measured largely different things; 86% of the combined effect of all the factors which

go to determine each pupil's mark in school certificate (for example general intelligence, special abilities, quality of teaching, motivation, etc.) was specific to that examination and had not been measured by the selection examination.*

A further point to notice from Table III is that the scatter of pupils between the CSC and JSLE axes is not symmetrical. At the bottom end of the JSLE scale there is a wide scatter of CSC scores, whereas at the top end of the JSLE scale, CSC scores cluster more closely around the diagonal. Thus among the 112 pupils who just managed to get into senior secondary school, with JSLE marks of 157 or lower, there is virtually as wide a range of CSC aggregates as there is in the sample as a whole. Twelve have aggregates of 23 or better (most of these are Grade I passes); 42 aggregates between 24 and 33 (mostly Grade II passes); 43 aggregates between 34 and 43 (mostly Grade III); and 15 aggregates of 44 or poorer (mostly failures). Clearly, the JSLE underestimated the future educational achievement of a high proportion of these borderline secondary school entrants. Thirty-nine, or more than a third, had CSC grade aggregates better than the average for the sample as a whole, and good enough to gain them places in higher school certificate classes. One boy who was borderline in JSLE obtained a CSC result which was surpassed by only two boys in the entire sample, while two others had aggregates which placed them within the top 10% of the CSC distribution.

In each JSLE mark group right up to the sample mean (176.08), CSC performance continues to be scattered over nearly the whole possible range. Among the 81 boys with JSLE marks between 173 and 177, for instance, 16 had CSC grade aggregates better than 24, 50 were between 24 and 43, and 15 had aggregates of 44 or poorer. It is only among boys who entered senior secondary school with JSLE marks well into the top half that there is any marked tendency for the poorest CSC results to disappear. As we move up towards the highest JSLE marks, however, the range of CSC aggregates begins to narrow rapidly. There are still three boys among those with JSLE marks of 193-202 who have CSC aggregates of 44 or poorer, but among the 71 who entered with marks above 202, none failed, and only four had aggregates poorer than 33.

* The JSLE-CSC correlation is uncorrected for restriction of range. The reasons why the correction has not been applied will be discussed later in this chapter. (Section D).

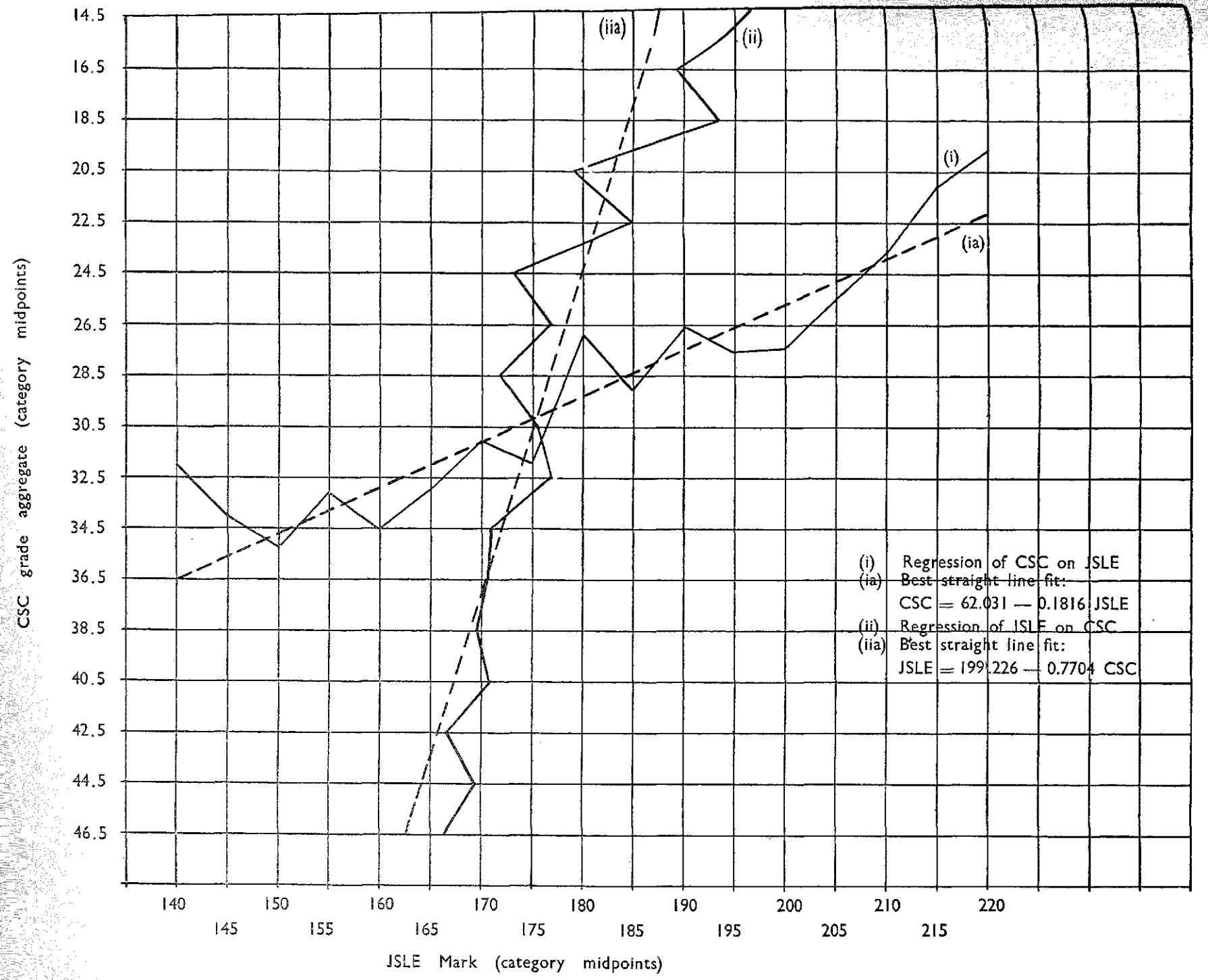
The same tendencies can be seen when we look at the range of JSLE marks inside the various CSC result categories. Among the boys with the most outstanding CSC performance there are some who were lucky to get in to senior secondary school at all on their selection examination results, and others whose JSLE marks were the highest in the sample. The poorest CSC results, however, are confined mainly to boys whose JSLE marks were in the bottom half of the distribution.

The conclusions suggested by these findings are clear. The JSLE is a fairly good predictor of school certificate performance for the boys who entered secondary school with outstanding selection examination marks, but is a poor predictor for average and borderline boys. It could, for example, be predicted with a better than 90% chance of being right, that a pupil whose JSLE mark was 203 or higher would gain at least a Grade II school certificate. But a prediction for any pupil with a JSLE mark below 178 would have virtually no validity.

The results we have discussed in the last few paragraphs might be summarised more technically by saying that the regression of Cambridge School Certificate grade aggregate on Junior Secondary Leaving Examination total mark is curvilinear, with the angle of slope increasing as JSLE increases. This can be seen clearly in Fig. I, which essentially presents the data of Table III summarised in graphical form. The two curves show (1) the average CSC mark obtained by boys in each JSLE group (the regression of CSC, the dependent variable, on JSLE, the independent variable) and (2) the average JSLE mark obtained by boys in each school certificate group (the regression of JSLE, the dependent variable, on CSC, the independent variable). As we are interested in predicting CSC performance from JSLE mark, rather than vice versa, we shall be mainly concerned with the first curve.

Although the regression lines are somewhat irregular, because the subsamples are rather small, the tendency for both to follow a curve rather than a straight line is clear. For the regression of CSC on JSLE, the curve starts off nearly parallel to the JSLE axis, but becomes steeper as JSLE rises. Between JSLE marks of 145 and 165, successive increases in JSLE produce practically no improvement in average CSC performance. Between 165 and 200, each 5-mark increase in JSLE is accompanied, on the average, by a one-point improvement in CSC grade aggregate, while with

Figure I


14.5
16.5
18.5
20.5
22.5
24.5
26.5
28.5
30.5
32.5
34.5
36.5
38.5
40.5
42.5
44.5
46.5
CSC grade aggregate (category midpoints)
(iia)
(ii)
(i)
(ia)
(i) Regression of CSC on JSLE
(ia) Best straight line fit:
CSC = 62.031 — 0.1816 JSLE
(ii) Regression of JSLE on CSC
(iia) Best straight line fit:
JSLE = 199.226 — 0.7704 CSC
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210
215
220
JSLE Mark (category midpoints)

JSLE marks of over 200 mean CSC performance is nearly two points better with each step in JSLE. To some extent the middle section of the regression line divides into two parts, with a fairly steep curve between 165 and 180 and a plateau between 180 and 200, but the overall tendency for the angle of slope to increase as JSLE increases is clear. Statistically, this curvilinearity is significant.*

It is apparent from these results that the product moment correlation coefficient, by itself, gives us an inadequate description of the relationship between performance in the entrance examination and performance in school certificate. A correlation coefficient is a measure of a linear relationship; it assumes that the variables are related to each other in exactly the same way throughout their distributions. Where regressions are curvilinear, as in the present case, the correlation coefficient will be a measure of the degree of relationship indicated by the best fitting straight lines. These lines are included in Fig. I. It can be seen that for the regression of CSC on JSLE, the best straight-line fit is too steep for JSLE marks of 165 and under, and not steep enough for marks of over 200. The correlation between two variables is directly proportional to the slope of the regression line: when the standard deviations of the two variables are represented by equal distances on both axes an angle of 45° indicates perfect correlation and an angle of 0° zero correlation. Thus the correlation coefficient obtained for the sample as a whole ($r = 0.374$) is an *overestimate* of the degree of relationship between JSLE and CSC among boys with borderline JSLE marks, and an *underestimate* of the relationship among boys with very high marks. If the approximate slope running through the CSC means for boys with JSLE marks between 145 and 165

---

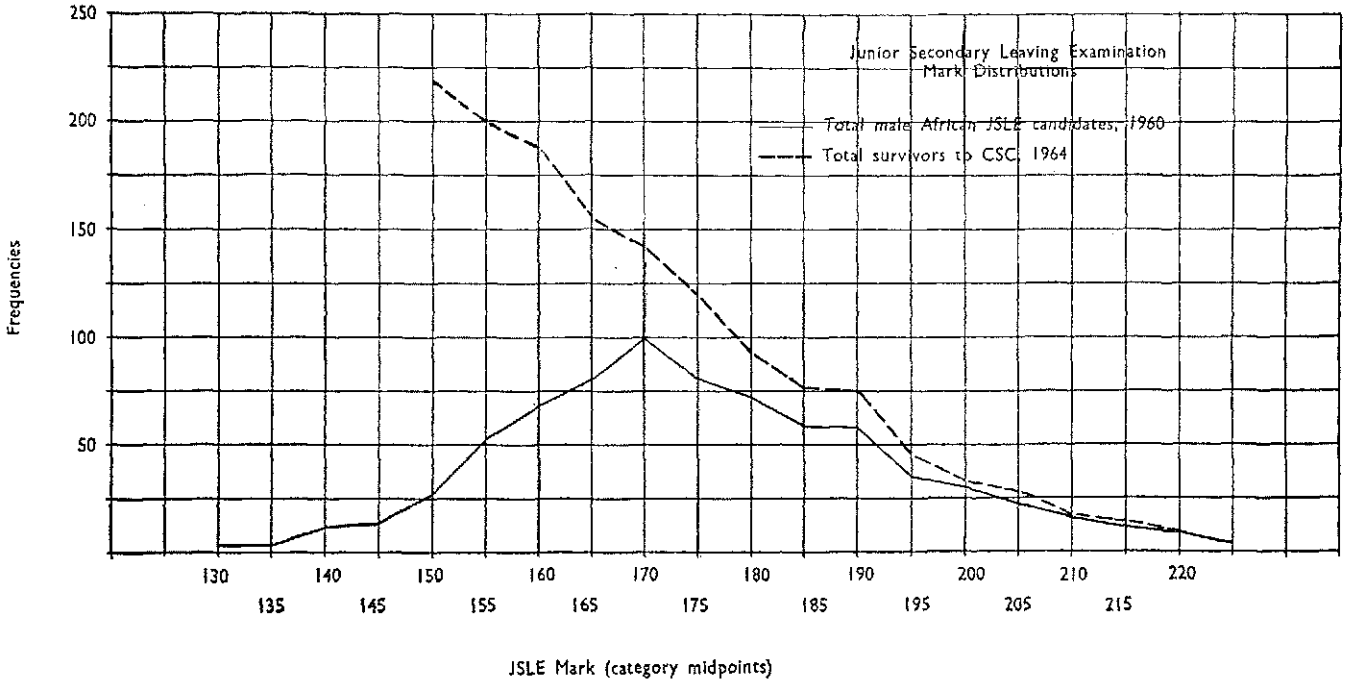
* The significance of the curvilinearity of the two regression lines was tested using the ICT 1500 Least Squares Polynomial Fit computer programme. Neither the second degree nor the third degree polynomial produced a fully satisfactory fit for the regression of CSC on JSLE; in particular, both curves underestimated the true angle of slope at the top end of the JSLE scale. Nevertheless the third degree polynomial did produce a significant reduction in the error sums of squares over the best fitting straight line ($F=3.09$; df 2 and 761; $p<.05>.025$). The equation was:

$$CSC = -130.10+2.82228\ JSLE-.0153918\ JSLE^2+.000025817\ JSLE^3$$

The curve for the regression of JSLE on CSC is much simpler, consequently the second degree polynomial provided an excellent fit, with a highly significant reduction in error sums of squares ($F=10.84$; df 1 and 762; $p=.001$).
The equation was:

$$JSLE = 2.6-2.0290\ CSC+.020608\ CSC^2.$$

Figure II


Junior Secondary Leaving Examination
Mark Distributions
Total male African JSLE candidates, 1960
Total survivors to CSC, 1964
Frequencies
250
200
150
100
50
130
135
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210
215
220
JSLE Mark (category midpoints)

had continued right through the JSLE distribution, the correlation coefficient would have been only about 0.2. In contrast, the angle of slope at the top end of the JSLE dimension would, if continued through the distribution, result in a correlation of about 0.7.

The results we have just discussed suggest strongly that while the JSLE is quite successful at predicting CSC performance for boys who enter senior secondary school with very high marks, it is almost valueless as an indicator of the future attainment of those who enter with average or borderline marks. Before we can accept this conclusion, however, we must eliminate the possibility that the curvilinearity of the regression of CSC on JSLE is due, not to deficiencies in the JSLE but rather to the effects of factors not connected with examination performance which enter into secondary school selection.

B Non-academic factors in secondary school selection: two hypotheses

There are three main factors which determine whether a pupil is offered a place in a senior secondary school:

1. By far the most important factor is *performance in the JSLE*. Boys with marks above a certain point are virtually certain to be offered a place, unless they are over age or have a bad conduct record, while boys with marks below another point have no chance of being accepted. Between these two points, however, there is a region of the mark distribution from which some boys will be accepted and others rejected, on grounds other than their JSLE performance. In 1960 the upper boundary of this region fell quite sharply between marks 167 and 168, and the lower boundary at about 140, although a few boys with even lower marks were accepted. This can be seen from Fig. II, which plots the distribution of 1960 JSLE marks (a) for the sample traced to 1964 CSC (continuous line) and (b) for the total group of 1960 African male JSLE candidates (pecked line). As full records are not available for boys with JSLE marks below 145, curve (b) is incomplete.

It can be seen that, moving from the top end of the distribution, the two curves remain closely in step with each other as far as the 168-172 category. The gap between the two curves to this point is accounted for mainly by senior secondary dropouts, although it also contains some boys who sat in 1965, having repeated or missed a year, and also a few who enrolled at the two small

schools not included in the sample or at Catholic seminaries. The survival rate is about 80% among those with JSLE marks of 193 and over, dropping slowly to about 70% in the 168-172 category.

Below 168, however, the curves start to diverge rapidly. Only about 52% of the boys with 1960 JSLE marks between 163 and 167 are in our 1964 sample. In the 153 to 157 category the proportion is down to 26%, and below 148 it falls to under 10%. It is thus among the boys with JSLE marks of 167 or lower that we must look for the effects of selection factors other than JSLE performance.

2. The second factor that may affect a candidate's chances of being offered a place is *choice of senior secondary school*. In his application form for the selection examination, each candidate is asked to name, in order of preference, six senior secondary schools for which he would like to be accepted. Some schools are much more popular than others, and consequently obtain an intake of higher than average calibre. In our sample, for instance, average JSLE mark ranges from 193.50 and 187.46 for the two highest schools to 158.00 and 159.11 for the lowest schools. A pupil who had made his six choices from among the most popular schools may thus, if his mark is borderline, fail to get in to any of them, while another pupil with similar marks who has chosen some of the less popular schools may be accepted. Some pupils may be offered places by schools which they have not chosen, but many headmasters, particularly in the urban day schools, tend to prefer a boy who wants to go to their school, rather than a boy with higher marks who wants to go somewhere else.

3. The third factor which enters into selection is the senior secondary school *headmaster's assessment*. As well as the JSLE total mark, a good deal of subsidiary information is available to the headmaster about each pupil, and this information may be used in deciding among borderline candidates. Data which may be relevant include: age, conduct record, position in class, ability at games, and performance in specific JSLE papers. Another important factor is where the pupil comes from. Given a choice between two equally well qualified candidates, headmasters tend to choose the pupil who lives nearer the school. In the selection for the 1961 senior secondary entry, this factor worked in favour of boys living in Buganda, because of the disproportionate number of places available in Buganda schools. More than half

of the boys who entered senior secondary school from junior secondary schools in Buganda had JSLE marks of less than 168, as compared with less than a quarter of the boys from junior secondary schools in other districts.*

Headmasters vary a great deal in the extent to which they take account of factors other than JSLE performance in making selection decisions. Some seem to rely almost entirely on the examination marks. The JSLE mark distributions of the entrants to these schools have a strong positive skew. The minimum mark necessary to get into such a school is sharply defined, and many entrants have marks just above it. Other schools place much more emphasis on non-academic factors. Their mark distributions are typically symmetrical or even negatively skewed, and there is no clearly defined minimum mark. The marks also tend to scatter widely: in two schools of this type the standard deviations of the JSLE distributions are as high as 23.72 and 20.20, whereas in two schools of the former type they are as low as 10.65 and 11.32. It should be noted that there is no tendency for the schools which take account of non-academic factors in selection to have poorer school certificate results; in fact the two schools whose 1961 entrants had the most widely scattered JSLE marks are both among the eight most successful schools in the CSC examination.

Is the curvilinearity of the regression of CSC on JSLE due to the nature of the selection examination itself, or rather to the effects of the non-academic selection factors we have just discussed? This question is crucial; for the answer we give to it will determine the interpretation we must make of the results presented in this chapter. It will be remembered that the curve in the regression line means essentially that pupils who enter senior secondary school with borderline JSLE marks tend to do better in the CSC examination than we would expect when we compare their results with those of pupils who entered senior secondary school with higher marks. Let us set out the two possibilities as alternative hypotheses, and then examine the implications of each to see if we can find evidence to enable us to decide between them.

* With the very large expansion in senior secondary places that has taken place since 1962, this bias may have disappeared by now. The results, however, emphasise that although Uganda secondary schools are open to pupils from all over the country, a disproportionate number of places in one district will give an advantage to pupils from that district. The relationship between junior secondary output and senior secondary places available in each district thus needs to be kept under review.

1. The *first hypothesis* is that the curve in the regression line is due to the selection examination itself. The JSLE predicts quite well the future CSC performance of boys with high marks, but has almost no predictive validity among boys with average and borderline marks. If a boy has demonstrated his ability to profit from teaching and to cope with examinations successfully by gaining an outstanding mark in the JSLE we can be reasonably confident that he is of high academic potential, and will continue to use his potential effectively during his secondary school years. Hence the regression line is steep near the top end of the JSLE distribution. If, on the other hand, his mark is average or borderline, we do not know what his potential is. We do not know whether he is making effective use of relatively poor potential, or relatively ineffective use of good potential. The present selection examination underestimates the academic potential of a large number of these pupils. Some candidates with high potential but borderline marks are lucky enough to get into senior secondary school, together with proportionate numbers of pupils with similar marks but lower potential, and their subsequent good performance in CSC is responsible for the flatness of the regression curve near the bottom of the JSLE scale. Many others, however, who would have been just as successful, are rejected.

2. The *second hypothesis* is that the true regression of CSC on JSLE mark is approximately linear, and that the curvilinearity arises from the effects of factors other than JSLE mark which enter into selection. It is possible that the use by the headmasters of supplementary information in making selection decisions among the borderline candidates may enable them to cream off the most promising pupils in this group. Hence their performance in the CSC is better than would otherwise be expected, and the regression curve flattens off towards the bottom end of the JSLE scale. The rejected candidates from the borderline group would have proved to be of inferior calibre if they had been allowed to continue their education to school certificate.* A more remote possibility is that

* The possible effects of selection factors other than JSLE mark can perhaps be better appreciated if we consider what might have happened to the shape of the regression curve if there had been fewer senior secondary places available and if the headmasters had rejected some candidates from the 168-172 category (the lowest category from which all candidates were in fact accepted). If 25% had been rejected, and if the additional information available to headmasters had enabled them to make perfect selection decisions (that is, if they rejected those who would have got the poorest CSC results) the mean CSC aggregate of the survivors would have

borderline candidates of high academic potential are more skilled at making their secondary school choices than pupils of low potential, and so have a better chance of being accepted.

It is interesting to note that the implications of the two hypotheses for the validity of present selection methods are exactly opposite. Under the first hypothesis, curvilinear regression indicates *poorer* discrimination among borderline candidates than would a straight line regression. Under the second hypothesis, on the other hand, a curved regression indicates *better* discrimination at the borderline than a straight line. Thus, if the first hypothesis is sustained, we must conclude that present methods fail to select efficiently among borderline candidates; whereas if the second hypothesis is sustained we must conclude that discrimination among borderline candidates is relatively good.

What evidence is available to enable us to decide between the two alternative hypotheses? We have already mentioned that the JSLE mark distribution can be divided into two parts: an upper part, in which acceptance for senior secondary education is almost automatic, and a lower part, in which selection depends on both JSLE mark and other, non-academic, factors. The boundary between the two parts is quite sharply defined, and falls, for the 1961 entrants, between marks 167 and 168. Nearly all the candidates with a total mark of 168 were accepted, while some of those with only 167 were rejected. It can be estimated from Fig. II that between a fifth and a quarter of the pupils with marks between 163 and 167 did not get into senior secondary school, about 45% of those between 158 and 162, and as many as 60% of those with marks between 153 and 157.

According to hypothesis (2), the curvilinearity of the regression of CSC on JSLE is due to the effect of selection factors other than examination performance. Thus, if this hypothesis is correct, we would expect the regression to be essentially linear from the top of the JSLE dimension down to the 168-172 category. The first

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been 27.2, instead of 31.1, and the regression line would have taken a sharp upward turn. If the selection decisions had had only partial validity, so that for every two rejected candidates who would have got a CSC grade aggregate below the category median, one was rejected who would have scored above the median, the survivors' mean would have been about 30, and the downward slope of the regression would have been reduced. If the decisions had had no validity, the mean for the survivors would have been approximately the same as that for the total category, and the regression line would have been unchanged.

sign of curvilinearity should appear in the 163-167 category, where non-academic factors begin to be relevant in selection, and should become progressively more marked through the 158-162 and 153-157 categories, as non-academic factors become more important. Under hypothesis (1), on the other hand, we would expect curvilinearity to appear first among pupils with marks near the average for the selected group, because it is at this point we would first expect to find significant numbers of pupils whose academic potential had been underestimated by the selection examination.

It can be seen from Fig. I that the first clear signs of curvilinearity appear in the 193-197 JSLE category, and become more marked in the three categories from 192 down to 178. The evidence is thus *compatible with hypothesis (1)*, (although perhaps we would have expected the curvilinearity to start a little lower down the regression line), and *incompatible with hypothesis (2)*. Curvilinearity starts about 30 marks above the point at which selection factors other than JSLE performance begin to be significant. It might still be argued that the curvilinearity is due both to the JSLE itself and to the non-academic factors, but this possibility is ruled out when we notice that in the categories 163-167 and 158-162, where the effects of the non-academic factors should first be apparent, the regression line tends to be *steeper* rather than *shallower* than it has been, on average, over the middle section of the JSLE distribution. Between the categories 198-202 and 168-172, mean CSC performance drops by a little over half a point per category, whereas in the category 163-167, mean performance falls nearly 2 points and in the category 158-162, a further 1½ points. In other words, in the two categories over which selection factors other than JSLE mark begin to be important, average performance in the CSC tends to be rather poorer than we would have expected if we had extrapolated the regression line from that part of the distribution in which selection is based on examination mark only. There is thus no evidence that the headmasters by taking account of information supplementary to the JSLE mark, succeeded in creaming off the most promising of the borderline candidates. Indeed there is some indication that rather more pupils of high academic potential might have been admitted to senior secondary school if selection had been based on JSLE performance alone. Changes in the angle of slope over only two categories must, of course, be interpreted cautiously, because of the possible effects of chance variations, but at least it is certain that non-

academic selection factors are not responsible for any part of the curvilinearity of the regression of CSC on JSLE.

Hypothesis (2) must therefore be rejected, and hypothesis (1) accepted. The curvilinearity of the regression is due to the deficiencies of the selection examination itself, and not to the effects of other factors such as headmasters' assessment or pupils' choice of school. The present selection examination is shown to be an inefficient predictor of future attainment, particularly among average and borderline candidates. The examination underestimates the academic potential of a large proportion of these pupils. Further, the supplementary information which is used to choose among borderline candidates does nothing to improve the efficiency of selection; borderline candidates who were excluded from senior secondary education would probably have been just as successful in school certificate as those who were admitted.

C Effects of imperfect selection on school certificate output

In Table IV an attempt is made to estimate the loss of high-level school certificate passes as a result of the failure of the 1960 Junior Secondary Leaving Examination to identify pupils of high

Table IV

ESTIMATED EFFECTS OF IMPERFECT SELECTION ON SCHOOL CERTIFICATE OUTPUT

1 JSLE Mark Category	2 Total male JSLE candidates, selected and unselected	3 Estimated survival rate to CSC	4 Estimated total no. of *potential* CSC candidates (2 × 3)	5 Total no. of *actual* CSC candidates	6 Estimated ratio, potential: actual candidates (4 ÷ 5)	7 Total no. *actual* Grade I CSC passes	8 Total no. *potential* Grade I CSC passes (7 × 6)	9 *Actual* no. acceptable for HSC (grade aggregate <30)	10 *Potential* no. acceptable for HSC (9 × 6)
163-167	155	68%	105	81	1.30	9	12	31	40
158-162	188	66%	124	68	1.82	6	11	18	33
153-157	199	64%	127	52	2.44	7	17	21	51
148-152	203	62%	130	27	4.81	1	5	7	34
Total	745	—	486	228	—	23	42	77	158

academic potential. Only borderline candidates with marks between 148 and 167 are considered. We have seen when discussing Table III that pupils with even lower JSLE marks than this performed well in the CSC examination, but so few of these pupils were admitted to senior secondary school that any estimate of the potential performance of those who were excluded would be subject to a wide margin of error.

Column 2 gives the total number of 1960 male JSLE candidates, whether selected for secondary school or not, in each of the mark categories. In column 3 estimates are made of the proportions which would have survived to 1964 CSC if senior secondary places had been found for all these pupils. These estimates are based on results contained in Fig. II. It may be recalled that among pupils with JSLE marks of 193 and over, all of whom were offered senior secondary places, about 80% survived to sit CSC in 1964. This survival rate dropped slowly, by about 2% per JSLE category, to a level of about 70% among those with marks of 168-172. The estimates in Table IV are based on the assumption that this downward trend would continue through the next four categories. It should be remembered, however, that the survival ratios overestimate the true rate of dropout, perhaps by as much as 15%, for two reasons: (1) a substantial number of 1961 entrants who did not sit CSC in 1964 sat in 1965, having missed or repeated a year; (2) no allowance is made for 1961 entrants who sat 1964 CSC at Catholic seminaries, or at the two senior secondary schools for which JSLE marks were not traced. Figures in Table IV calculated from the estimated survival rates will therefore tend to be conservative.

Column 4 estimates the numbers who would have survived to school certificate in each category if all had been admitted to senior secondary school, assuming the survival rates in column 3. Column 5 gives the actual number of candidates, and in column 6 the total number of potential candidates is expressed as a ratio of the actual candidates. These ratios are then multiplied by the actual numbers of grade I CSC passes (col. 7) to give, in column 8, estimates of the total numbers who probably could have achieved grade I passes if they had been selected. In column 10 similar estimates are made of the numbers who probably could have reached a CSC standard high enough to gain them admission to higher school certificate classes (grade aggregate below 30).

It can be seen that, if all the pupils from these four borderline groups had been admitted to senior secondary schools (or if the selection examination had identified the pupils with high potential) about 42 would have passed CSC in grade I, as compared with 23 who actually reached that level. Instead of only 77 borderline entrants with school certificate marks of HSC entry level, there would have been about 158. As there are only 378 pupils with aggregates below 30 in the total sample, correct identification of potentially successful pupils from the group with JSLE marks between 148 and 167 would have increased the output of CSC graduates with passes good enough to justify continued education to higher school certificate level by more than 20%. If pupils with marks below 148 were included, this proportion would probably be at least as high as 30%.

D Effects of secondary school quality and restriction of range

Before we leave the relationship of JSLE total mark to CSC grade aggregate, we must consider briefly the effects of secondary school quality, and of restriction of range, on the results we have been discussing.

1 Effects of secondary school quality

It has already been mentioned that some senior secondary schools are more popular than others and therefore tend to attract a disproportionate share of the JSLE candidates with the highest marks. The range in average JSLE mark between the intakes of the most popular and the least popular school, it may be recalled, was more than 30 points. For the most part these popular schools tend to be the oldest and best known. Because of their established reputations, these schools are often in the position to attract better qualified and more experienced teachers. Hence it is possible that the correlation between JSLE total mark and CSC grade aggregate is spuriously inflated by the effects of senior secondary school quality. The boys with better JSLE marks tend to get into schools which give them better teaching, while boys with poorer marks tend to get into schools which give poorer teaching. Thus any tendency for the former group to be more successful in the CSC examination may be due to the better teaching they have received, and may tell us nothing about the validity of the selection examination. It is quite possible that a JSLE-CSC correlation of the order of the