

This work is licensed under a  
Creative Commons Attribution-NonCommercial-  
NoDerivs 3.0 Licence.

To view a copy of the licence please see:  
<http://creativecommons.org/licenses/by-nc-nd/3.0/>

DRAFT COPY NOT  
FOR PUBLICATION  
OR QUOTATION  
WITHOUT CONSENT  
OF THE AUTHOR.

(832)  
IDS LIBRARY  
RESERVE COLLECTION

INSTITUTE FOR DEVELOPMENT STUDIES  
UNIVERSITY COLLEGE, NAIROBI.

Discussion Paper No. 59

THE RETURNS TO INVESTMENT IN HIGHER LEVELS OF  
EDUCATION IN KENYA

Daniel C. Rogers.

January 1968



Any views expressed in this paper are those of the author. They should not be interpreted as reflecting the views of the Institute for Development Studies or of the University College, Nairobi.

## The Returns to Investment in Higher Levels of Education in Kenya

At independence, Kanu stated that it intended to achieve universal free primary education.<sup>1</sup> In 1967 only those types of education above form 4 were free.<sup>2</sup> The reason for the absence of free education at the lower levels is simple: the Government can not afford it.<sup>3</sup> The reason for the free education at the higher levels is, I would maintain, also simple: it has traditionally been so for those sorts of education (except for forms 5 and 6) which have a Cambridge Certificate (graduation from form 4) as a prerequisite. This policy is usually justified on the basis of manpower needs combined with students being unable to afford expensive higher education.<sup>4</sup> It is true that few students (or their families) would have the ability to pay out the full cost of these higher levels of education as the costs are incurred (the recurrent cost of a year at the University College Nairobi for one student is £1050, which is some 28 times the average per capita income of £38). This does not imply however that they would be unable, over a number of years, to pay for such education. The objectives of this paper are to determine the return that is currently being earned on educational investment and to determine the return which would be earned if the individual had to pay back the cost of the education via a loan programme, so that it can be ascertained whether such a programme is economically feasible.

### Lifetime Earnings

Ideally, in a study of the economic returns to education, one would like to have the earnings history of retired people having identical backgrounds and abilities but differing amounts of education. In addition, it would be desirable to have a purely competitive economy so that earnings reflected marginal products. Unfortunately such data are not available for any country in the world.<sup>5</sup> Since this study only investigates the private returns to education, and is hence concerned with actual earnings rather than marginal products, the assumption of competitiveness is not required. Because of the short time that high level education has been at all widespread, data for any study of returns to higher levels of education in Kenya will be far from the ideal. Using a number of explicit assumptions, this study will compute the private rate of return to various amounts of education. The sensitivity of the data to many of these assumptions will be demonstrated by introducing marginal changes in the examples and comparing results.

To find a rate of return, one needs to know the earnings histories of persons with and without a specific increment in education and the costs of that increment. Here, only levels of education above Form 4 are considered.<sup>6</sup> Earnings are calculated, in all cases, from government scales for civil servants and teachers.<sup>7</sup>

By assuming a standard income by education level, all of the problems associated with personal differences between individuals are cut away. Thus, if actual earnings for each person in a cohort were found, in addition to the differences in earnings due to education, one would also need to account for the effect of differences in ability, race, social class, and many other variables.

For many reasons, earnings of those in the private sector are not considered. First, it would certainly not be easy, and probably not be possible, to determine wage or salary levels by education in the private sector. Trying to estimate how these salaries would increase with the age of the employee would be even more difficult. Also, there may be more variation to private than public sector earnings for effectively the same job, due to the large number of employers in the private sector

as opposed to the smaller number in the public sector. As a justification for this procedure, it should be noted that the public sector employment did amount to one third of total reported employment in 1966 and about 40% of the high level manpower in the country and many feel that the earnings levels in the public sector tend to set the trend for private sector earnings.<sup>8</sup>

Eight categories of earnings and education are considered:

- 4 = 4th form education and 4th form requirement for a job;
- 4 + = 4th form education plus a government training program of nine months;
- 6 = 6th form education;
- P1 = 4th form plus two years of teacher training college--primary school teaching;
- SLA = 6th form plus one year teacher training college--secondary school teaching;
- SLB = 4th form plus three years teacher training college--secondary school teaching;
- A = Education through university graduation--earnings on A scale (either civil service or teaching);
- A+ = Education through university graduation--earnings on A scale followed by Super Scale;

The A scale<sup>9</sup> (starting salary £804) is used for university graduates and the minimum increment in salary each year until the top salary is reached has been assumed. Here the way is split into two streams: either the man or woman stays at that salary for the rest of his career (this I call the A Scale) or he graduates, it is assumed, to the Super Scale (beginning at £2175) and moves up one salary level per year to the top (this I call the A plus Super Scale or just A+). In fact, to date, people tend to move up more quickly than this suggests. Balancing against this latter fact are two considerations. First, this rapid promotion can not remain the average behavior as more and more graduates leave the universities and as Africanization is completed. Secondly, only a small proportion of the university graduates will make the Super Scale levels in the long run. Both scales are presented so that the reader can see the sensitivity to the de facto assumptions associated with each and get an idea of the effect on the rate of return of his own evaluation as to the correct average speed of promotion.

G9 is the level at which both 6th and 4th form graduates come into government, but the latter come in at a lower part of it (£268 as opposed to £348). A fourth form graduate may be taken into a training programme, however, of nine months duration (I call this 4+). After his training such a person would enter at a G7 level (£520). Finally, I consider P1 (starting at £348) and S1 (starting at £582),<sup>10</sup> whose lifetime earnings are completely and unambiguously specified by the Government.

These then, are the salary scales. It is still necessary to make assumptions about the number of years in the work force. Starting with the end of form 4 as year zero, (approximately 18 years of age) persons with each amount of education enter the work force a number of years later, the specific number depending on the education necessary for the scale.<sup>11</sup> Each

person is assumed to stay in the work force until age 55 (year 37), the age suggested by Government for retirement. To test the sensitivity of this assumption, I also calculate the effect of staying an extra three years in the work force.

Since I am concerned with private returns, earnings after tax are used. Increments in earnings which are taxed away are of no merit to the individual. In addition, housing subsidies are included as part of earnings, as these are part of the job "package" for which education qualifies people. Thus, the thing that is called "Earnings" throughout this paper is actually salary +housing subsidy - taxes.<sup>12</sup> The pension is another aspect of the earnings package which has an effect on real income, but it was felt that it is too complex for inclusion in this analysis. Because pensions change as salary changes and they are not realized until retirement, the assumptions necessary to attribute a portion of the value to a specific year would have to be quite arbitrary and would determine completely the effect of their inclusion.

Finally it is assumed that there will be no unemployment at the levels of education which are being considered here. Assuming that any unemployment would appear first among the

TABLE 1: Income + Subsidy - Tax: Lifetime

	(Kenyan £'s)						
	4	4+	6	P1	SlA, B	A	A+
To age 55 <sup>a</sup>	25,126	46,423	25,119	28,504	39,955	52,377	61,718
To age 58 <sup>b</sup>	27,454	53,420	27,447	31,216	44,116	58,267	71,428

<sup>a</sup>Government's suggested retirement age.

<sup>b</sup>Forty years after form 4.

Sources: See text.

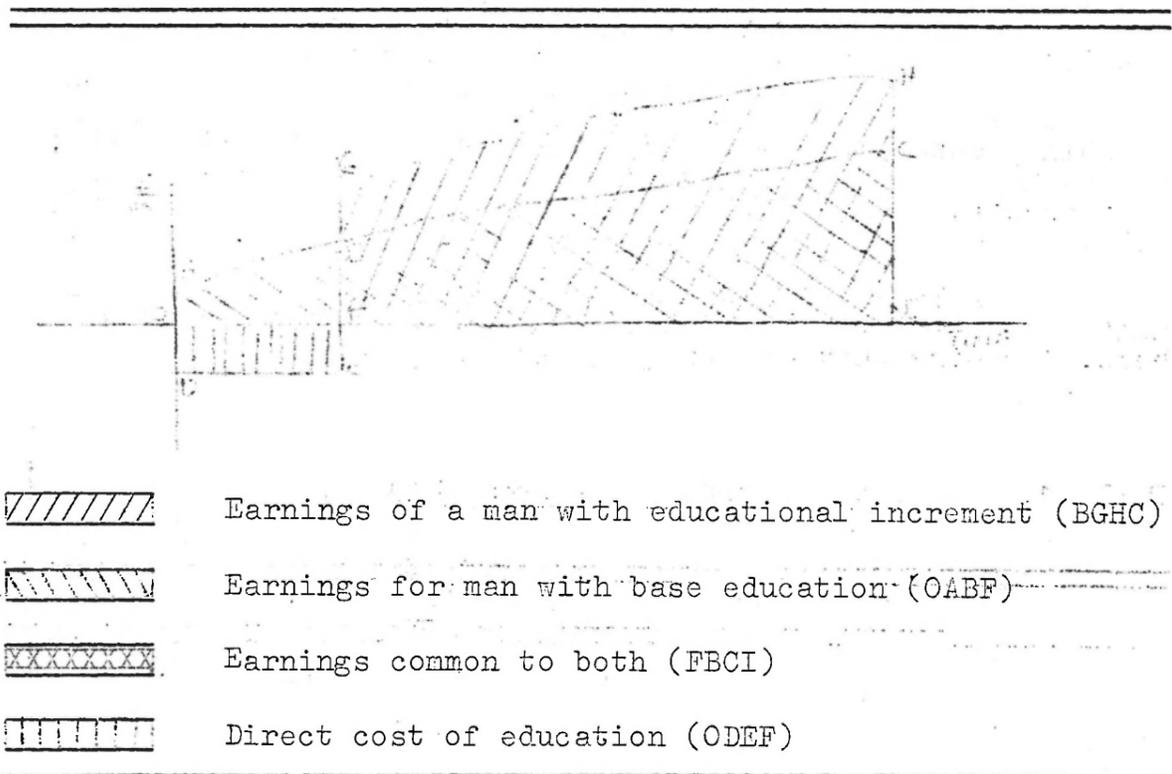
least educated, unemployment would increase the average increment in earnings of the most highly educated. Therefore, these are probably low estimates of the earnings differential associated with increments in education. (see Table 1 for estimate of lifetime earnings.)

#### Costs of Education

So much for earnings. Now, costs will be considered. Educational costs are of two types. First there are the direct costs: teachers' salaries, books, stationery, electricity, etc. Second, and sometimes neglected, are the costs of the earnings which are foregone by the students who are in school rather than in the labor force earning a wage. Taking this latter factor first, when earnings increments are considered, as described above, foregone earnings have already been taken into account. That is, the earnings of the individual with the lesser amount of education during the years the other man continues his education are, one can assume, the earnings which the person who continues his education is foregoing.<sup>13</sup> Thus, part of the

difference between the earnings streams of the two individuals is foregone earnings (OADF in Figure 1). Figure 1 demonstrates this relationship between the expenditure-earnings streams diagrammatically.

FIGURE 1: Expenditure-Earnings Streams



Let us now consider the direct costs, which may differ for society and the individual. Since the ultimate objective of this paper is to investigate the effect on the return to education of a loan programme which would finance the cost of education, both the individual's and society's costs are examined. In all cases high, average, and low cost schools are considered separately but the emphasis of the analysis will be on the average cost of schooling. In addition, total and academic costs are considered separately, the difference between the two being the cost of such items as would have to be purchased whether or not school is being attended--room, clothes, etc. -- which are included in the costs of many schools. The emphasis here will be on total costs. (See Table 2 for the costs of education in Kenya.) In all cases only recurrent costs are being considered.

Rate of Return

Once the costs and benefits of an investment are determined, a method is needed by which to compare the two so that alternative investments can be evaluated.<sup>14</sup> The two most common methods are comparisons through present values and computation of internal rates of return.<sup>15</sup> Descriptions of these two methods follow.

In order to evaluate any investment it is necessary to discount its costs and benefits because of the preferences between present and future income which exist. Present value<sup>16</sup> can distinguish between two streams of earnings and thereby objectively determine which is the more valuable. However,

present value is extremely sensitive to the rate used in discounting the stream of earnings. When comparing the present value of two earnings streams, their relative size can easily be reversed by using a different rate.<sup>17</sup> This can happen if

TABLE 2: Costs per Year of Education in Kenya

(Kenyan £'s)

	<u>FORMS 5 &amp; 6</u>		<u>TEACHERS COLLEGES</u>				<u>UNIVERSITY</u>	
	<u>Academic<sup>a</sup></u>	<u>Total<sup>a</sup></u>	<u>Academic<sup>a</sup></u>		<u>Total<sup>a</sup></u>		<u>Academic<sup>a</sup></u>	<u>Total<sup>a</sup></u>
			<u>P<sup>b</sup></u>	<u>S<sup>c</sup></u>	<u>P<sup>b</sup></u>	<u>S<sup>c</sup></u>		
High	250	299	150	236	189	300	872	1050
Average	90	132	119	196	156	260	872	1050
Low	69	99	81	186	118	250	872	1050

<sup>a</sup> This is defined in the text above.

<sup>b</sup> Teachers College for primary school teachers.

<sup>c</sup> Teachers College for secondary school teachers.

Sources: Ministry of Education and University College Nairobi.

the earnings streams cross at least once.<sup>18</sup> When dealing with long-lived investments such as railroads, trees, or education, the discount rate used to compare one investment with another is therefore often crucial.

The appropriate discount rate is to some degree subjectively determined. That is, one individual's time preference and risk assessment may be vastly different from that of another. Since, in addition, there is no identifiable "market" rate of interest to seize upon, various discount rates have been used more or less arbitrarily in studies of education.<sup>19</sup>

Present values can be compared or alternatively, as in this study, the internal rate of return can be computed. The internal rate is the discount rate which equates the present value of the stream of costs, in this case foregone earnings and direct costs of education (OABF + ODEF as seen in Figure 1), to the present value of the stream of benefits, here the added earnings after education (BGHC).<sup>20</sup> Put another way, it makes the present value of the difference between the two expenditure-earnings streams  $\sqrt{(ODEF + FGHI) - OACI}$  equal zero.

#### Private Internal Rates of Return

Table 3 presents a summary of the internal rates of return currently being earned by the hypothetical people with the indicated educational increments who earn the assumed lifetime earnings. The Table is read by looking at the column heading, which is the base amount of education, then down the column to the figure in the row of the increment in education the effect of which it is desired to find. For example, to find the internal rate of return to an education which qualifies for a P1 teaching post as opposed to a 4th form education, (called P1-4 for short) look down the column headed by "4" to the row labeled P1 and the figure 10.6 percent is found.

The internal rates of return in Table 3 are called private returns because these are the returns currently being realized by people who fit the assumptions made as to earnings for these levels of schooling. It should be repeated here that these are returns based on earnings, plus housing subsidies minus income and Graduated Personal taxes, for people who retire at 55. Direct costs do not come into the calculation since all of the levels of schooling considered here are free. Nevertheless, these are returns because there is a cost of the education to the individual: the earnings he foregoes while in school. As can be seen, these rates are generally quite high--higher rates of return than most people who invest in capital expect to gain.

TABLE 3: Private Rates of Return

FROM:	4	4+	6	Pl	SlA	SlB
To: 4+	58					
6	neg	neg				
Pl	10.6	neg	a			
SlA	19.0	neg	42.0	39.0		
SlB	19.0	neg	42.0	39.0	-	
A	18.8	10.7	26.0	24.4	19.0	18.8
A+	19.2	12.5	26.5	24.5	20.2	19.0

neg = negative rate of return.

a = Infinite rate of return as Pl income is greater than 6 income in every year.

One of the most interesting sequences to note is that through the teaching credentials (Pl, Sl, and A i.e., graduate). This is not a time sequence as the training requirements are mutually exclusive rather than cumulative. Pl training from the point of view of a 4th form graduate has a private internal rate of return of 10.6%. That is, the private costs of achieving a Pl certificate, which are the foregone earnings that the 4th form graduate could earn, yield an increment in lifetime earnings such that the internal rate of return is 10.6%. Sl over Pl has a return of 39%. This high "marginal" rate brings the "average" rate for Sl education (Sl over 4) up to 19%. Nineteen percent, then, is the weighted average of the Pl over 4 and the Sl over Pl rates. The education necessary for becoming a graduate teacher (A over Sl) has an internal rate of 18.8%. This is also the "average" rate for a graduate teacher's investment (A over 4).

These figures suggest that from the point of view of a 4th form graduate, Sl and graduate credentials are equally attractive (19 and 18.8%, respectively) but a Pl credential is much less attractive (10.6%).

The sensitivity of these results to the year of retirement is not great. For example, using a retirement age of 58 rather than 55 increases the private internal rate of return for Pl level education over 4th form from 10.6 to 10.8 percent. Similarly, the rate for university (A) over 4th form increases from 18.8 to 18.9 percent. These are typical examples and show

that the assumption of retirement at age 55 does have an effect on the internal rate of return, but that it is limited to a few tenths of one percentage point.

Internal Rates of Return under Various Programs Whereby Students Assume the Cost of Education

These then are the current internal rates of return. We now turn to the costs of these increments in education. Table 4 shows the return which would have been realized if the entire recurrent costs of the education had been met, at the time, by the individual receiving the education. This table is for average cost education. The rates of return are cut drastically from those seen in Table 3. However, they are still well above those earned, for example, on Kenya Government bonds. This table alone, I think, indicates that a loan programme is indeed feasible. As is seen, S1 teachers compared to P1 teachers or Higher School Certificate holders who enter the government service with no other qualification or training, have the highest rate of return to their investment. This is a consequence of the small amount of additional expenditure necessary to move from the one to the other.

TABLE 4: Returns When Average Total Costs Are Paid as Incurred

	FROM:	4	4+	6	P1	S1A	S1B
To:	4+	58					
	6	neg	a				
	P1	8.4	a	49.0			
	S1A	14.7	a	29.0	27.8		
	S1B	12.9	a	20.6	17.8	--	
	A	10.6	a	12.2	11.3	7.6	8.5
	A+	10.7	a	12.4	12.4	8.8	9.6

neg = negative rate of return.  
a = no cost figures available.

If costs other than the average total cost were used in this exercise, different results would be found. The internal rates of return have also been calculated for high and low cost schools and for academic costs. The effects of changing these assumptions about cost are shown in Table 5 for two typical increments in education. When the entire cost is met currently, the effect of high versus low cost schools on the internal rate of return can be as much as 9.0 percentage points. (looking

TABLE 5: Two Examples of the Effect of Various Cost Assumptions on the Internal Rates of Return

	P-4				A-4			
	Total		Academic		Total		Academic	
	to 55	to 58	to 55	to 58	to 55	to 58	to 55	to 58
Cost; Low	9.0	9.2	9.6	9.7	10.6	11.0	11.7	11.8
Average	8.4	8.6	8.9	9.1	10.5	10.7	11.5	11.8
High	8.3	8.5	8.6	8.8	9.9	10.0	10.8	11.1

(at all of the data, not just the two examples of Table 5). The difference between charging the total cost and only the academic cost can be as much as 4.0 or as little as 0 percentage points. When all of these possibilities are considered together using these varied assumptions, there can be as much as 9.6 percentage points variance in the calculated rate of return. No rate is affected so much as to change the "tone" of the result. These variations demonstrate, however, that the results of this analysis should be used with caution and that orders of magnitude are more reliable than exact figures.

The conditions of a loan programme of any sort would not be nearly as stringent as those used in calculating the returns presented in Table 4. When the costs are paid over a period of years as opposed to immediately, the population which can take advantage of higher education is changed from an extremely limited one to all those with the necessary ability. There, the full cost of the education was paid as it was being realized. Any loan programme would require re-payment only after the education began to bear monetary fruit. Two sorts of repayment plans are considered here.<sup>21</sup> In neither is an interest charged on the loan. The effect of an interest charge will be calculated in the near future. In the first a payment of a specific amount each month would be made until the balance of the loan had been repaid. In the second program, a percentage of income would be paid annually for life.

For the program of repayment in which a specified sum was paid each month beginning one year after completion of the course of study, the figures of £10 per month for a university graduate and £2/10 per month for all lower levels were somewhat arbitrarily chosen. These rates do have the virtue of paying off the loan in a maximum of 28 years.<sup>22</sup> Table 6, which presents the rates of return under this repayment program shows a high return for almost all levels, usually between 15 and 30 percent. In all cases the rates here are well above those shown in Table 4. This is a result of no interest being included in these calculations for the loan program. Since the payment is over a long period of time instead of immediately as in the calculations for Table 4, the internal rate is much higher. From a purely economic point of view, these figures also suggest that a repayment program is feasible. Most levels of education would still have a return much higher than could be derived from investment in physical capital or securities.

The second repayment program is of the type which has recently been much publicized and discussed in the United States.<sup>23</sup> It has been suggested that the charge on lifetime earnings be 1 percent per each \$3000 (£1072) borrowed. I suggest a repayment of 1 percent of lifetime income per £700 borrowed for Kenya because the returns to education are higher here and the smaller amount (1% per £1072) would not even pay back the cost whereas 1% per £700 will. In an extensive study I found returns to university over secondary school education in the United States were 9 percent,<sup>24</sup> as opposed to the private returns in Kenya of about 25 percent, as seen above. This program has the virtue of not affecting adversely the person who is unemployed or desires to go into a low paying, but quite worthwhile occupation since such a person pays back one percent of his income per £700 borrowed just as does the corporation president or permanent secretary who earns a much higher salary. It is just a smaller amount. The effect is for the latter to subsidize the former. But since the repayment is a fixed, and low, percentage of income, it does not impose many hardships on the individual. This plan has the further advantage of being a sort of surcharge on the income tax which automatically comes due and could even be included in PAYE (pay as you earn).

From an educational point of view, there is little doubt that a loan program would have beneficial results. Students who are committing a proportion of their future earnings in order to attend school will certainly be more serious about their studies than students who are "getting a free ride" at the expense of Government. They will not only benefit in their academic studies but also in their attitudes towards the world and work.<sup>25</sup>

TABLE 6: Returns When Average Total Costs Are Repaid by Regular Monthly Payments of £10 for University or £2/10 for Others

FROM:	4	4+	6	P1	SlA	SlB
To: 4+	a					
6	neg	a				
P1	9.6	a	49.0			
SlA	17.8	a	41.8	26.4		
SlB	17.8	a	41.8	26.5	--	
A	17.6	a	24.6	23.2	15.8	16.0
A+	17.8	a	25.5	23.7	16.8	16.9

neg = negative rate of return.  
a = no cost figure available.

TABLE 7: Returns When Average Total Costs Are Repaid on the Basis of 1% of Earnings for Life per £700.

FROM:	4	4+	6	P1	SlA	SlB
To: 4+	a					
6	neg	a				
P1	10.4	a	49.0			
SlA	18.6	a	39.5	26.2		
SlB	18.4	a	39.0	25.6	--	
A	18.0	a	24.8	22.8	17.1	17.2
A+	18.9	a	25.2	23.5	17.9	18.0

neg = negative rate of return.  
a = no cost figure available.

What remains at question is the political and social feasibility of such a program. Many have suggested that loans for education are impossible to collect in a less developed country like Kenya. It is argued that the pressures of the extended family on the successful individual are so great that there is never any excess which could be used to retire educational loans. While it is quite clear that this type of pressure does exist and is indeed heavy for many individuals, it is also clear that methods could be devised which would assist the individual in successfully resisting such pressures. The successful loans for the hire-purchase of automobiles is one example of the old maxim "where there is a will, there is a way." The fact that few salaried people are continually in arrears on their income and graduated personal taxes is another indication of this same thing. What I am suggesting is that if the right program is instituted with sufficient incentives

and sanctions repayment will not be politically or socially impracticable. A loan program's economic feasibility has already been demonstrated.

The Government of Kenya already has a loan program which has made some 294 loans in its 15 years of existence. Ninety-six, or 33 percent, have been repaid while only five (2%) have been written off as losses. Nevertheless, this program has not been considered a success by most Government officials. The program has been small and repayments have been slow. I would suggest that there is a causal relationship here. There is a great feeling that the program is unfair because only a small minority of all those receiving higher education have to pay for it. It would appear that a program encompassing all students would have a much better chance of success in collecting the money due and receiving popular support.

Government's Internal Rates of Return

Some have suggested that the increased tax revenue associated with the increased income of those with higher education adequately compensates Government for the cost of that education. Table 8 presents the internal rate of return realized by Government on educational investment expenditure. The "return" to Government is the increment in tax revenue associated with the higher earnings of the more educated individuals. The calculation, then, is a comparison of total expenditure on education to taxes received. This implicitly assumes that the jobs for which the specified education "qualifies" individuals would not be filled if there were no Government supported education. To the extent that such jobs are filled by expatriates, undereducated people, or privately educated people, the internal rate of return to government is infinite, as these have no cost to government. As can be seen, the majority of the figures are very small. I would argue that even if the return to Government was quite high in every case, this would be no justification for the free education which is now current. The tax structure is aimed at having each person shoulder a portion, based on his income, of the expense of Government. This is quite separate from the issue of free education.

TABLE 8: Internal Rates of Return to Government

FROM:	4	6	P	S1A	S1B
To: 6	neg				
P	neg	15.0			
S1A	7.0	16.0	16.7		
S1B	3.8	8.4	8.2		
A	1.4	1.9	1.8	neg(-0.1)	neg(-0.5)
A+	3.5	4.0	4.0	3.2	3.2

neg = negative rate of return.

TABLE 9: Lifetime Taxes: Income and Graduated Personal

	(Kenyan £'s)						
	4	4+	6	P1	S1A,B	A	A+
To age 55 <sup>a</sup>	1,308	4,218	993	1,445	2,906	5,527	8,839
To age 58 <sup>b</sup>	1,398	5,372	1083	1,577	3,191	6,081	10,943

<sup>a</sup>Government's suggested retirement age.  
<sup>b</sup>Forty years after form 4.

Conclusion

In conclusion, this paper demonstrates that loan programs for higher levels of education would not be a heavy economic burden on students. The loan program which requires the repayment of a percentage of income for life is one which should be politically feasible as well. The welfare implication of the present situation versus the situation which would exist in a "loan program world" are obvious. In this connection it might be useful to point out that the resources supporting one university student for one year could support 130 primary school students for that period.<sup>27</sup>

Alternatively, the resources could be used for general Government development purposes. In either case, a redistribution from the most, to the least, affluent would result.

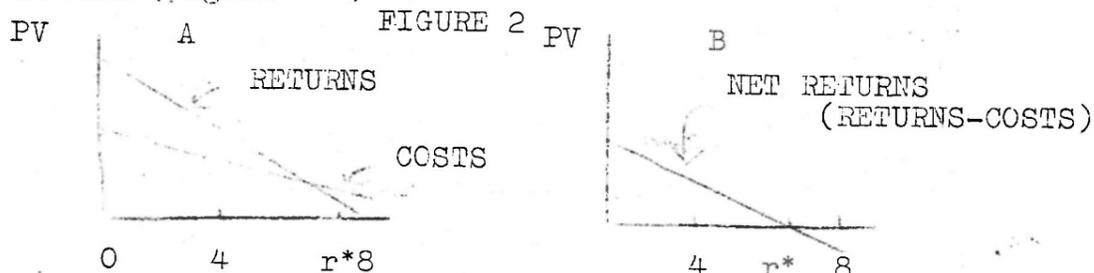
1. Kenya African National Union, What a KANU Government Offers You, (KANU, Nairobi 1963), "K.A.N.U. intends that every child in Kenya shall have a minimum of seven years' free education.", p.4.
2. This is true for all except some 40% of the Form 5 and 6 students. These are students at the former Asian and European schools, many of whom are not citizens. The Kenyan school system consists of the following:  
primary school - standards 1-7 - capped by the Kenya Primary Examination; secondary school - forms 1-4 - capped by the Cambridge School Certificate and forms 5 and 6 capped by the Higher School Certificate; teachers training colleges, technical and speciality schools; and a three year University course capped by the bachelors degree.
3. "A third major obstacle to be overcome before the goal of universal primary education can be reached is the substantial capital and recurrent cost which expansion of the physical facilities and teaching staff imply." p.306, Kenya Government. Development Plan 1966-1970, (Government Printer, Nairobi 1966). Approximately one third, some £3.2 million, of the cost of primary education is met by school fees, see Kyale Mwendwa, "Constraint and Strategy in Planning Education" in James R. Sheffield, ed., Education and Rural Development, (East African Publishing House, Nairobi, 1967), p. 273
4. "...the highest priority in education is the rapid expansion and diversification of secondary schools. To this end fees for Forms V and VI in low-cost schools have been eliminated... This will provide a growing base for increasing the supply of middle- and high-level manpower." (Emphasis added.) p.307, Development Plan 1966-1970. On the other hand, there is an as yet unfulfilled declaration that in the future Government will "continue to ...move increasingly towards loans as a method of financing the studies of students in post-secondary school education." p. 311, Ibid.
5. The United States will have data approaching this ideal in some 40 years time. A lifetime study of some 460,000 secondary school students is being undertaken under near perfect conditions. See John C. Flanagan, et al., Project Talent: The American High-School Student, (Pittsburgh: Project Talent Office, University of Pittsburgh, 1964).
6. Education of Form 4 or more is the criterion for high and middle level manpower which Davis used in his projections for Kenya's manpower plan. Calvin F. Davis, High-Level Manpower Requirements and Resources in Kenya 1964-1970. (Government Press: Nairobi, 1965), p.5.
7. See Republic of Kenya, Staff List as of 1st July, 1966 (Nairobi 1966) pp. vi-viii, for a full listing of the scales used in these calculations. These scales have since been marginally changed.
8. See e.g. Dharam Ghai, Analytical Aspect of an Incomes Policy for Kenya, (IDS Discussion Paper No. 50) p. 17. An additional factor is that Employment in the public sector was growing faster than the private, (3.1 versus 2.4%), see Kenya Government, Economic Survey 1967.
9. This is a civil service scale of salaries and time progression through them. See fn. 7.

10. A Pl teacher must have one year of teacher training plus a Cambridge School Certificate (Form 4 graduation) and teaches primary school. Sl is a secondary school teachers' credential. It may be obtained by two routes: Both must have Cambridge School Certificate. In addition what I called an "SlA" has three years of teacher training college while an "SlB" has a Higher School Certificate (through Form 6) plus one year of teacher training college.
11. 4th form enter in year 1; 4+ enter in year 2; 6th form enter in year 3; Pl teachers enter in year 3; Sl(A) and Sl(B) teachers enter in year 4; and A and A+ enter in year 6.
12. The subsidy is the maximum specified for each salary as presented in the Salaries Review Commission. Taxes are calculated on the basis of average age of marriage (24) (14 years) and childbearing, (First child at age 25; second at age 29; third at age 34; and fourth at age 39. Only four children are relevant for income tax purposes.) These were derived from Ministry of Finance and Economic Planning, Kenya Population Census: 1962 (Nairobi 1964).
13. If one year increments of education were being compared, this would fully account for the foregone earnings. However, if educational increments of more than one year are being considered (e.g., two years of college vs. secondary school graduation) it is a moot question as to whether the earnings differential between the two people being compared fully represents the earnings foregone. One of the two possibilities to be reconciled is that at the end of first year the additional year of education might mean that the more educated man would have a higher marginal product than the less educated individual, so that the latter's earnings in the second year are not as great as the former's earnings potential. On the other hand, the less educated man has one year of experience which adds to his value in the second year over that of a man who is first entering the work force. The difference in value between a year of schooling and a year of working experience is difficult to estimate empirically. The problem becomes rather more complex when people with larger differences in education are being compared.
14. The following discussion draws heavily on my Private Rates of Return to Education in the United States: a Case Study (unpublished Ph.D dissertation, Yale, 1967), chapter 1.
15. For extensive discussions of these two methods of comparing investments, see Ezra Solomon, ed., The Management of Corporate Capital (Free Press: New York, 1959); especially the chapters by Armen A. Alchian. "The Rate of Interest, Fisher's Rate of Return over Costs and Keynes' Internal Rate of Return," and J. Hirshleifer, "On the Theory of Optimal Investment Decision".
16. 
$$PV = \sum_{i=0}^n \frac{R_i}{(1+r)^i}$$

Where: PV= present value;  
R= return in a given period;  
r= the discount rate per period; and  
i= the period.
17. For example, at 20 percent, \$100 today and \$500 ten years from now (A) is better than \$0 today and \$1,000 in ten years (B) (A's present value = \$180 and B's = \$162), but at 10 percent the opposite is true (A's present value = \$293 and B's = \$386).

Investment	Payments		Present Value	
	Today	In 10 Years	At 20 percent	At 10 percent
A	\$100	\$500	\$180	\$293
B	0	\$1,000	\$162	\$386

18. See Hirshleifer, pp. 223-25 of Solomon.
19. Rates of 0, 3, 3 1/2, 4, 5, 6, 8, and 10 percent have all been used by other researchers.
20. The present values of the returns at each discount rate are plotted on a graph of present value versus discount rate. The same is done for the costs. A curve is then fitted to each of these sets of points. The point where the two lines cross yields the value of the internal rate of return (Figure 2 A). Alternatively, the present values of the net returns can be plotted and have a curve fitted to them. In this case, the point where the line crosses the discount rate axis is the value of the internal rate of return (Figure 2 B).



Where: PV = Present Value; r = Discount rate; r\* = Internal rate of return.

21. I do plan to consider others when time permits.
22. University--28 years; S1A--17 years; S1B--26 years; P1--10 years; 6th Form--9 years.
23. See for example, Time Magazine's over story on "The Precarious Future of the Private College, June 23, 1967, Vol. 89, No. 25. See also Educational Opportunity Bank: a Report of the Panel on Educational Innovation (U.S. Government Printer, Washington, D.C., 1967).
24. See my Private Rates of Returns to Education in the United States, op. cit., Chapter 6 for an extensive comparison of the rates of return in the United States found by several researchers.
25. See Educational Opportunity Bank, op. cit., p. 7, for a similar viewpoint.
26. According to the Ministry of Education. These loans averaged £532. The terms of the loans are as follows: they must be repaid within 8 years; the interest is paid on the loan at the rate of 4% percent per annum; a declaration of financial inability must be submitted; the student must already be admitted to an institution of higher education; security in the form of collateral or "personal bonds signed by substantial citizens" must be posted; and the person is expected to return and take up employment. GN 360 of 1962, Government of Kenya, The Kenya Gazette Vol. LXIV (Government Printer, Nairobi 1962) and colony of Kenya Ordinances Enacted During the year 1952 Vol XXXI (new series), (Government Printer: Nairobi, 1953) p. 373.
27. Mwendwa, op. cit., states that the cost of primary education is about £8 per student per year. The costs of higher levels of education to the Government over the next decade and the effect on Government revenue of a loan program will be investigated in a forthcoming paper.