Educational expansion and economic decline: returns to education in Kenya, 1978-1995

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WPS/99-6

February 1999

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Abstract: Educational expansion followed by economic decline in Kenya has been associated with a decline in the social return to secondary education, conventionally calculated, from 20% in 1978 to 6% in 1995. Wage benefits from primary school have fallen but returns remain unchanged because of correspondingly falls in costs. Returns to tertiary education have not fallen. The concept of expected returns to education is introduced to allow for effects of education on earnings from self-employment and on the probability of employment. These mirror conventionally calculated returns for men, but are higher for women due to large participation effects of education.

Contents

1.   Introduction

It is now conventional wisdom to stress the importance of education, a measure of human capital accumulation, in determining growth. This emphasis has been given fresh impetus by endogenous growth theories (eg Lucas, 1988) but is also evident in applications of the augmented Solow model (eg Mankiw, Romer and Weil, 1992). At the microeconomic level, conventional estimates of returns to education have been used to support calls for governments, particularly in developing countries, to prioritise educational spending. In the most recent in a series of four influential surveys of the literature on these estimates, the average social rate of return to primary education has been put at 18% (Psacharopoulos, 1994). Although the consensus surrounding the role of education in growth is widespread, it masks important empirical controversies. No robust estimate of the effect of education has yet been agreed upon in the macroeconomic literature on growth (compare the large positive effects of Gemmell, 1996, with the zero effect found by Pritchett, 1996, on virtually identical data). Conventional estimates at the microeconomic level do exhibit more robust regularities, although debates arise over how these regularities should be interpreted (Glewwe, 1996).

Sub-Saharan Africa provides an important test-bed for disputes about the role of education in economic growth. After independence, it undertook a major educational expansion but experienced economic slowdown in the 1960s followed by stagnation in the 1970s and decline post-1980. The experience on the subcontinent makes less surprising Pritchett's (1996) finding that there is no cross-country correlation between economic growth post-1960 and educational expansion, even after controlling for accumulation of physical capital. Despite this macroeconomic experience, it is commonly argued - based on the conclusions of Psacharopoulos - that microeconomic estimates of returns to education in Africa are very high and higher than for other regions of the world. This conclusion is rendered unsafe after a persuasive critique by Bennell (1995), who shows Psacharopoulos's findings for Africa to be heavily influenced by a few dated studies using very poor data. Estimates of conventional Mincerian rates of return to schooling in Africa made since 1980 have shown more modest effects (Appleton, 1999). What remains unclear is whether this reflects a fall in returns to education or whether returns were never as high as asserted by Psacharopoulos.

In this paper, we look at microeconomic evidence on changes in returns to education over time in one country in sub-Saharan Africa, namely Kenya. Although it is hard to identify any one country as representative of the subcontinent, Kenya is not atypical. Like the subcontinent as a whole it has experienced educational expansion and poor economic performance. At present, Kenya's educational achievements are above the average for the subcontinent (an illiteracy rate of 22% in 1995 compared to 44% in the subcontinent as a whole) while its income is below average (in 1997 its GNP per capita in PPP terms (1987 dollars) was $1110 compared to $1470 in the subcontinent; World Bank, 1998). The empirical contribution of this paper is to show how returns to schooling in Kenya have changed during the last two decades of educational expansion and economic decline. This is done using survey data from 1978, 1986 and 1995. To anticipate the findings of the paper, we reveal a dramatic fall in the returns to secondary schooling, although not to primary or tertiary education. We show that returns to secondary schooling may indeed have been very high in the 1970s, as indicated by some of the studies reported by Psacharopoulos. However, we do not corroborate his claim that the conventional returns to education were then or are now highest at the primary level. A byproduct of the analysis is documentation of a

dramatic fall in urban real wages during the period. This contradicts the predictions of some of the models of the early 1970s inspired by Kenyan labour markets, which posted urban real wage to be rigid downwards (Harris and Todaro, 1990).

A methodological contribution of the paper is to generalise conventional rate of return estimates to include urban self-employment as well as wage employment. One common critique of conventional rate of return to education estimates is that they are based on urban wage employees. This may be appropriate for males in industrialised countries, but is questionable in developing countries where most of the population depend on self-employment. We address this concern by introducing the concept of the "expected return to education" - the derivative of expected income with respect to education, where expected income is defined as the conditional expectation of earnings from an activity (wage employment or self-employment) weighted by the probability of engaging in such an activity. For the years for which we have data, we find rates of return to education within self-employment are comparable to those for wage employment. Education does have strong effects on the probability of employment and self-employment, an effect missed by conventional analysis of returns within employment (or self-employment) alone. However, earnings differentials between the two kinds of activity are not sufficiently large to make this a major consideration for men. For women, low rates of labour market participation imply that education may have a much stronger effect on earned income than implied by conventional estimates.

The paper proceeds as follows. Section 2 provides background information on the Kenyan economy during the period, reviews the changes in the education system in Kenya and the nature of its urban labour markets. Section 3 discusses the data and econometric specification. The core results on the determinants of earnings are discussed in section 4. Section 5 takes the estimated wage benefits of education and adds data on direct costs to estimate full rates of return. The analysis for the first two surveys is extended in section 6 to incorporate self-employment and, finally, the conclusions are in section 7.

2. Background

Since Independence in 1963, there has been a rapid expansion of education in Kenya (Table 1 refers). Student enrollments in primary and secondary schools increased from 0.9 and 0.03 million in 1963 to 5.5 and 0.6 million in 1995, respectively. At the primary level the expansion was partly due to free primary education introduced in 1974. At the secondary level, much of the expansion was through the establishment of community self-help (Harambee) schools which educated around half the secondary school students enrolled in the 1970s. Rapid expansion in university education took place in the late 1980s and early 1990s with the establishment of four more universities and a double intake of undergraduates as a result of reforming the educational system[1].

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[1]   In 1966, the Kenyan education system was changed from eight years ("Standards") of primary education to seven years. Secondary education comprised six years ("Forms"): four years of lower and two years of upper secondary education. University undergraduate degrees were supposed to take three years. This system was altered again in 1985 to an 8-4-4 system (meaning eight years of primary, four years of secondary and four years of university education).

Table 1: Education enrolments in Kenya

	Enrolments	1960	1970	1978	1986	1995
Primary	'000s	781	1428	2995	4702	5536
	Gross Ratio	47	58	91	94	85
Secondary	'000s	20.1	129.8	370.5	457.8	632.4
	Gross Ratio	2	9	18	20	24
Tertiary	'000s	-	-	9.9	21.8	41.8
	Gross Ratio	0	1	1	1	2

Source: World Bank (various), UNESCO (various)

Despite this educational expansion, Kenya's economic performance has been disappointing. The year of the first survey analysed in this paper, 1978, was the high water mark of Kenya's economy. In the decade before Independence in 1963, the manufacturing sector in Kenya had enjoyed substantial growth in output and large gains in labour productivity. In the period 1954-64, manufacturing output in Kenya grew by 7.6% and labour productivity by 8.7% (Harris and Todaro, 1969). In the next decade, growth was steady, with per capita real GDP growing at 3% per annum. The first oil shock brought recession but this was soon outweighed by the 1976-78 boom caused by the temporary rise in the price of the main export - coffee. Perhaps the best single measure of living standards is real private consumption per capita. This peaked in 1978 and by 1995 had fallen by a quarter (Table 2 refers)[2]. The decline appears to have been fairly steady: real private consumption per capita fell by 14% between the first and the second surveys used here (1978-1986) and by 13% between the second and third surveys (1986-1995). These falls in average living standards reflect a failure to keep up with the rise in population, which increased by 74% during the period.

In this paper we focus on the urban labour market in Kenya. Rural labour markets are less developed than urban ones, with most rural dwellers working their own small holdings. There has been a rapid increase in the supply of labour in urban labour markets. In part, this is driven by high population growth. In addition, female urban labour market participation has increased substantially. Finally, there is considerable rural-urban migration. Urbanisation rose from 8% in 1962 to 15% in 1978, 21% in 1986 and 29% in 1995 (World Bank, 1998). These factors imply an increase in the supply of urban labour which, given the poor growth performance, was not matched by demand. For competitive labour markets, this would imply a fall in real wages.

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[2]   National accounts data comes from IMF (various) and population data from the World Bank (1998). We measure prices in Kenya using the official consumer price indices for Nairobi (Central Bank of Kenya, various). We take a weighted average of the three CPIs for low, middle and high income groups (the weights are taken from the revised CPI: 0.768 for low income, 0.209 for middle and 0.023 for high; the old CPI was an unweighted average of the three separate indices). The CPI was revised in 1990, with values for both the old and revised series existing for that year. For 1978 and 1986, we take the values of the old CPI (relative to 1990); for 1995, we take the value of the revised CPI (relative to that for 1990). This gives figures of 28.9 for 1978, 70.3 for 1986 and 287.1 for 1995 (with 1990=100). That prices did rise roughly ten-fold during the period is supported by reports of market and producer prices for basic food items such as maize, beans and milk (Republic of Kenya, various).

However, some theories inspired by Kenya's labour markets posited an urban wage that was rigid downwards (Harris and Todaro, 1970). In practice, although there are imperfections in Kenya's labour markets, these have not been sufficient to prevent wages responding to supply outstripping demand. Official statistics imply that earnings fell by 35% between 1978 and 1995 (Table 2 refers). This fall is greater than the general fall in living standards noted above in the private consumption figures.

Table 2: Changes in wages over time in Kenya, official sources

Year	Wages per employee (1990 Ksh per month)		Minimum wage (1990 Ksh per month)	Real private consumption per capita (1990 Ksh pc pa)	CPI (1990=100)	Population (m)
	Total	Private Manufacturing				
1978	3051	3565	1209	5620	28.94	15.36
1986	2707	3371	919	4840	70.26	20.68
1995	1977	2232	663	4210	287.10	26.69

Sources: Wage data from Republic of Kenya (various years); private consumption from IMF (1996); population data from World Bank (1998); CPI constructed from old and revised CPIs as detailed in footnote 2.

3.   Data and methods

We compare data from three surveys: the 1978 Labour Force Survey; the 1986 Urban Labour Force Survey and the 1995 Regional Programme on Enterprise Development survey. The first two surveys are fairly similar, both being household-based and drawn from a national sample frame by the Central Bureau of Statistics. The RPED survey was enterprise-based, surveying 218 manufacturing firms from four sub-sectors (food, textile, wood and metal) in Nairobi, Mombasa, Nakuru and Eldoret. We focus on urban wage employees aged 15 to 64 years (the working age bracket in Kenya). The three surveys provide reasonably large samples after cleaning the data: 1331 workers in 1978, 2494 in 1986 and 1123 in 1995. However, the two labour force surveys provide much smaller numbers of manufacturing workers (Table 3 refers). The number who come from the same sub-sector and location as those in the RPED are even smaller. The potential problem in comparing the RPED with the two LFSs is an issue we return to below.

The impact of Kenya's educational expansion is evident in the rise in the level of education of the workforce over time (Table 3 refers). The proportion of manufacturing workers with no schooling fell from 14% in 1978 to 7% in 1986 and 3% in 1995. The proportion of manufacturing workers with complete lower secondary schooling (Form 3-4 or higher) rose from 29% in 1978 to 38% in 1986 and to 44% in 1995. New entrants to wage employment are much more likely to have secondary education than experienced cohorts. In 1978, only 21% of workers with less than nine years of experience had secondary schooling compared to 70% of more experienced workers. However, the proportion of workers in the recent cohorts with only primary schooling may be stabilising. In both 1986 and 1995, 26% of those with less than nine years of experience did not have secondary education. As with the official statistics, our data reveal a sharp fall in real wages between 1978 and 1995. Mean wages for manufacturing workers in comparable sub-sectors and

Table 3: Education and earnings; survey data

Variables	LFS 1978		LFS 1986		RPED 1995
	All employees	Manufacturing workers only	All employees	Manufacturing workers only	
Mean earnings (1990 KShillings per month)					
All	3366	3453	2801	3021	2027
Comparable locations and subsectors only	NA	2983	NA	NA	2027
Mean earnings by education (% workers with education in brackets)					
uneducated	1816 (15%)	1602 (14%)	1662 (9%)	1987 (7%)	1418 (3%)
standard 1-4	2242 (10%)	2041 (8%)	1916 (7%)	2300 (6%)	1576 (6%)
standard 5-8	2359 (36%)	2275 (38%)	1992 (31%)	2048 (35%)	1456 (40%)
form 1-2	3088 (12%)	3194 (11%)	2070 (11%)	2658 (14%)	2038 (10%)
form 3-4	5172 (23%)	5260 (25%)	2937 (28%)	3133 (29%)	2038 (30%)
form 5-6	6371 (3%)	7694 (1%)	4347 (9%)	7012 (7%)	2061 (8%)
vocational school	-	-	-	-	2311 (3%)
polytechnic	-	-	-	-	4868 (3%)
college	-	-	4256 (5%)	4575 (2%)	-
professional education	-	-	-	-	5268 (1%)
university	10299 (3%)	15722 (3%)	9284 (5%)	14965 (2%)	8279 (2%)
Memo items:					
experience (potential)	16.85	16.38	15.27	14.84	16.25
male	0.85	0.89	0.75	0.89	0.85
no. of obs.	1331	186	2494	312	1123

locations were 32% lower in 1995 than in 1978. We do not have survey data on general wages in 1995, but it seems likely that they have fallen along with wages in manufacturing. Both our data and official statistics show manufacturing wages falling slightly less than general wages between 1978 and 1986; official statistics imply that manufacturing wages fell slightly more than general wages between 1986 and 1995. The fall in wages was not uniform for employees of different levels of education. Those with secondary schooling suffered the largest falls in real wages. Mean wages for those with 3-4 years of secondary schooling in the RPED are 61% lower than those for comparable manufacturing workers in 1978. The wages for those without education have fallen by only 11%, but this probably partly reflects a change in their age composition. For primary completers, wages were reduced by 36% between 1978 and 1986.

We follow Mincer (1974) in estimating a semi-logarithmic equation for the determinants of earnings:

$$\ln(W_i) = \alpha + \sum \beta_k S_{ik} + \gamma_1 A_i + \gamma_2 A_i^2 + \gamma_3 A_i^3 + \delta Z_i + U_i \tag{1}$$

where W is earnings per worker i; S_k is a 0-1 dummy variable for being educated at least up to level k, A is potential experience[3]; Z a vector of control variables(sex and location) and U an error term.

Our interest in estimating equation (1) is to calculate the rate of return to education, RORE. Estimates of the RORE conventionally measure the benefits of education in the form of higher wages relative to the combined opportunity and direct costs of acquiring education. Private ROREs include only private benefits and costs; social ROREs as reported by Psacharopoulos (1994) and others differ only in including the direct costs of education to the government as well as benefits in terms of higher taxes. Where the direct costs are low, a useful approximation to the RORE is the Mincerian return to education, which is the increment in earnings expressed as a proportion of wages forgone[4]. Given equation (1), if the level of education k comprises E_k years of education, the Mincerian RORE to each of those years of schooling is:

$$RORE \equiv [(W_{ik} - W_{ik-1})/W_{ik-1}]/E_k$$
$$= (\exp(\beta_k)-1)/E_k \tag{2}$$

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[3]   Potential experience is an estimate of the number of years since the age of fifteen that an individual has not been in full-time education Based partly on the ages of students in the LFS 1986, we assume the following ages of entry to the labour force:

primary school leavers	15 years or earlier
forms 1-2	17 years
forms 3-4 or vocational	19 years
forms 5-6	21 years
college, polytechnic & professional	22 years
university	25 years

[4]   This approximation would be exact if the direct costs of schooling are zero, individuals live for ever and schooling generates a constant proportionate wage premium (as in equation 1).

Such conventional estimates of ROREs have been widely criticised in the literature. Perhaps the two most widespread and important criticisms are that conventional earnings functions such as (1) do not provide consistent estimates of the wage benefits of education and that, anyway, such benefits are too narrowly construed to be of much interest, for example to policymakers. On the first issue, there are concerns that correlations between education and unobservables - such as pre-existing worker ability, health, family background and school quality - may render the estimates of β misleading. This paper cannot address this issue, since - in common with most conventional studies - our data does not include measures of such variables. However, several "unconventional" studies suggest that standard rate of return estimates may not be wholly misleading[5]. Furthermore, the changes in the partial associations between schooling and wages which we identify are sufficiently large to be of interest, although readers should bear in mind the serious caveats surrounding their interpretation. On the second issue, there is a concern that wage benefits are purely private monetary gains and do not capture possible external benefits and/or non-monetary benefits, in terms of improved child health or the intrinsic value of education. These issues are clearly important for policy but raise as yet unresolved questions and go far beyond the scope of this paper. For example, there is virtually no empirical literature on how to measure income externalities from education and to the extent that non-monetary benefits can be quantified, it is far from clear how if at all they should be valued in monetary terms. Rate of return estimates based on private income benefits from education remain of interest for several reasons. Households often seem to evaluate schooling decisions in terms of their benefits to future income. If these benefits turn out to be very low, then policies advocating the use of education services as part of a poverty alleviation package may be ill-conceived. Moreover, if these rates of return are very high, that is prima facie evidence that individuals are not able to obtain the optimal amount of education - perhaps due to credit constraints and other market imperfections.

This paper is able to address two other criticisms of conventional rate of return estimates. The first is that conventional rate of return estimates assume existing wage differentials will persist indefinitely, rather than respond to changes in labour market conditions. By comparing estimates at different points in time, we are able to examine how serious this problem may be. The second is that wage benefits are of dubious relevance in poor countries such as Kenya where most people depend on income from self-employment, not wages. Since we have data on income from self-employment for the first two of our data-sets, we are able to address this issue at least for urban areas for those two years[6]. To do this, we focus on expected income, defined as:

$$E(Y_i) = E(W_i \mid W_i>0).Pr(W_i>0) + E(R_i \mid R_i>0).Pr(R_i>0) \qquad (3)$$

The expected return to a marginal change in education is:

$$\delta E(Y_i)/\delta E = Pr(W_i>0).\delta E(W_i \mid W_i>0)/\delta E_i + E(W_i \mid W_i>0).\delta Pr(W_i>0)/\delta E_i$$

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[5] One way to control for many unobservables is to study the earnings differences of twins (Ashenfelter and Krueger, 1994; Behrman, Rosenzweig and Taubman,1994; and Ashenfelter and Rouse, 1998). Ashenfelter and Rouse (1998) conclude: "All of these studies find that once estimates are adjusted for measurement error, the fixed effects are insignificantly different from the OLS estimates."

[6] For rural areas, it is likely that returns to education within agriculture are lower but this may be offset by greater benefits of education in terms of access to off-farm income (see Appleton, 1999).

$$+ \Pr(R_i > 0).E(R_i | R_i > 0)/\delta E_i + E(R_i | R_i > 0).\delta \Pr(R_i > 0)/\delta E_i \qquad (4)$$

Conventional rate of return estimates focus on $\delta E(W_i | W_i > 0)/\delta E_i$. The expected rate of return weights this by the probability of being in employment, augments it by a corresponding term for the return within self-employment weighted by the probability of being in self-employment and then adds terms for the effects of education on the probabilities of being in employment and self-employment, weighted by the returns in those activities[7]. We model the probability of being in employment, self-employment or other activity by a multinomial logit:

$$\Pr(W_i > 0) = \exp(\pi_w Q_i)/\exp(\pi_w Q_i + \pi_r Q_i)$$

$$\Pr(R_i > 0) = \exp(\pi_r Q_i)/\exp(\pi_w Q_i + \pi_r Q_i)$$

$$\Pr(W_i = 0, R_i = 0) = 1/\exp(\pi_w Q_i + \pi_r Q_i) \qquad (5)$$

where Q is a vector of explanatory variables, π_w and π_r two vectors of coefficients. The explanatory variables are assumed to be the same as those which determine wages (education, experience, sex, location)[8]. The multinomial model could be given a theoretical justification as the outcome of stochastic utility maximisation. However, we do not assume this in our interpretation in order to allow for the possibility of involuntary unemployment and other constraints on choice.

4. Mincerian returns to education

Education, potential experience, sex and location explain around half of the variance in the log of real monthly earnings in the LFSs and just more than a third in the RPED (Table 4 refers). The implied Mincerian returns to schooling are reported in Table 5. Mincerian rates of return to secondary education for the general sample (all cohorts combined) were very high in 1978, standing at 42% for the first four years ("lower secondary" school) and 28% for the final two ("upper secondary" school). The Mincerian RORE at the primary and tertiary levels were more modest, at 8% and 15% respectively. However, the latter figure is an underestimate due to a data problem; the true figure may be considerably higher[9]. Mincerian returns to schooling have fallen

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[7]   In the empirical analysis, we do not apply equation (5) since the changes in education we consider are not marginal. Instead, we directly compute expected earnings for workers with different levels of education and calculate rates of return from these.

[8]   Ideally, it would be desirable to have variables which might affect allocation into activities and not wages, in order to identify selectivity effects. However, the surveys did not provide such variables. A handful of individuals reports earnings from both wages and self-employment, but these are too few to model and are dropped from the empirical work.

[9]   An upper limit of 9999 was set on reported earnings in 1978 (only), presumably because only four digits were allowed in the data entry procedure for the earnings variable. Twenty-one workers were entered with incomes at the upper limit of 9999: eleven were university graduates (21% of all university graduates in the sample), nine had attained Forms 3-4 (3% of all Form 3-4 graduates) and one had only Standards 5-8 (0.2% of Standard 5-8 graduates). We excluded such observations from 1978. To explore the likely biased caused by having to exclude these highest earning observations, we imposed similar truncation on the 1986 LFS. That is to say we excluded the highest earning 21% of university graduates; for those with Form 3-4 and

over time. In 1986, this was only visible at the lower secondary school level amongst the full sample of all employees. The secondary RORE fell from 42% to 26%, a statistically significant fall. However, for the subset of employees in manufacturing there appears to have been a more general fall in the returns to schooling. Returns to primary and lower secondary schooling for manufacturing workers were half what they were in 1978. In 1995 the Mincerian RORE for manufacturing workers stood at 2% for primary school and 12% for secondary school. It appears that the return to primary education in manufacturing had halved again between 1986 and 1995, whilst that to lower secondary schooling had fallen by a quarter. In contrast to schooling, university appeared to give high returns in 1995 with a Mincerian RORE of 69%.

The simple specification of the earnings function in (1) is restrictive in implying that the percentage return to experience is invariant to education. A less restrictive approach is to estimate earnings functions separately for sub-samples with different levels of education. We did this for the uneducated, for "primary completers" (those with Standards 5-8 only) and for "secondary completers" (forms 3-4). Figures 1-3 plot the earnings profiles predicted by these models, evaluated at the means of the other explanatory variables (sex and location). In all three surveys, the return to experience is higher for secondary completers than others. Secondary completers with five years potential experience are predicted to earn 157% (120%) more than primary completers in 1978 (1986); for those with twenty-five years experience, the figure is 167% (137%). For the uneducated, earnings do not noticeably increase with experience once it reaches 15 years. For primary completers, there continues to be a positive relation until around 30 years of experience. For secondary completers, experience appears to continue bringing substantial returns throughout the working life. Nonetheless, comparing the three figures, the narrowing gap between the earnings of secondary and primary completers is apparent. In the RPED, secondary completers with five years experience have only 44% higher earnings than primary completers; for those with 25 years experience, the figure is 71%. Only when considering those with even higher experience, do we see secondary completers earning double the income of primary completers.

Estimating earnings functions for particular age cohorts, it is seems that those who received secondary education in the 1960s or earlier have been protected to a degree against falling returns. The pre-Independence cohort enjoyed a 45% wage premium per year of lower secondary school in 1978; by 1986 this had been eroded to 35% and by 1995, those in manufacturing received 34%. For those who entered the labour market in 1963-70, the wage premium to lower secondary schooling fell from 42% in 1978 to 29% in manufacturing in 1995. Although these are substantial falls, the wage premium remained substantial even in the 1990s. By contrast, among those entering the labour market after 1970, there is little evidence of "vintage" effects of secondary education. In 1986, the Mincerian returns to secondary education varied little between the 1971-78 cohort and the 1979-1986 cohort. Furthermore, the Mincerian return to secondary education

Standards 5-8, the exclusions were 3% and 0.2%. The effect of this truncation was to lower the Mincerian RORE at the university level in 1986 from 30% to 21%. For other levels of education, the impact of such truncation was negligible. This suggests that the true Mincerian rate of return to university education in 1978 may have been 50 percent larger than our estimates in Table 5.
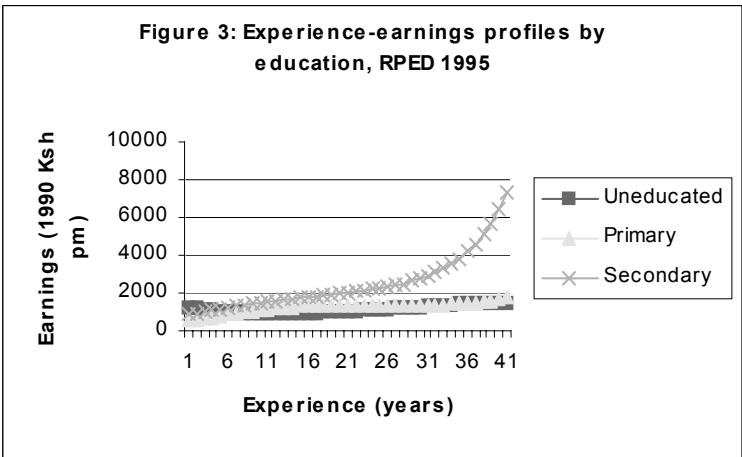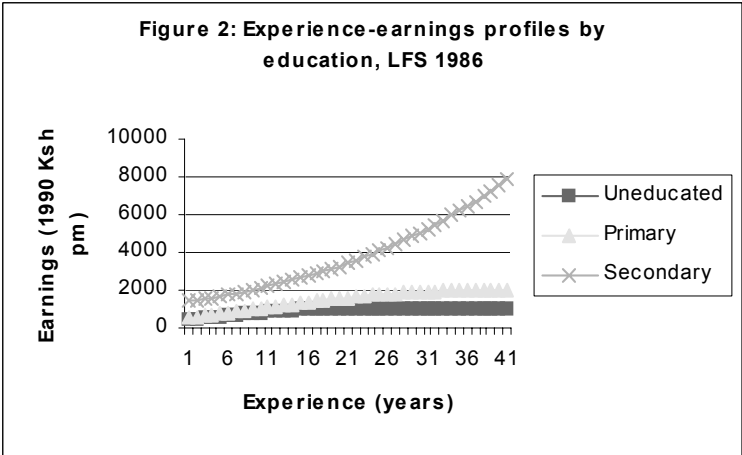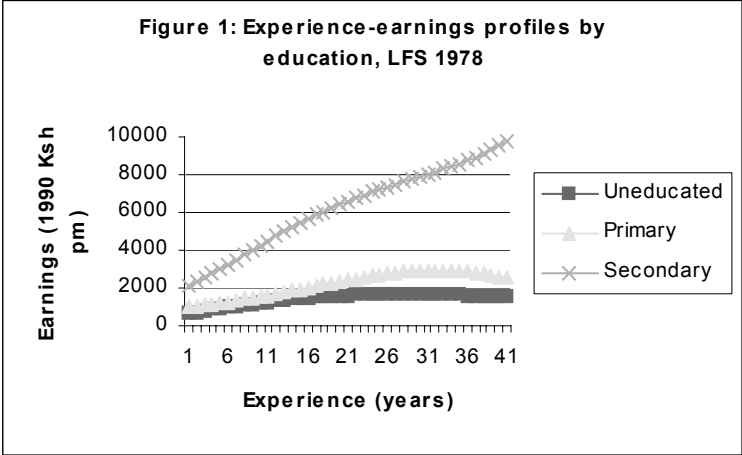
Figure 1: Experience-earnings profiles by education, LFS 1978

Figure 2: Experience-earnings profiles by education, LFS 1986

Figure 3: Experience-earnings profiles by education, RPED 1995

Table 4: Earnings functions for wage employees (log monthly earnings 1990 prices)

Variables	LFS 1978		LFS 1986		RPED 1995
	All employees	Manufacturing workers only	All employees	Manufacturing workers only	
constant	5.941 (52.57)	5.346 (15.95)	5.880 (75.75)	6.473 (24.88)	5.85 (42,68)
standard 1-4	0.199 (3.05)	0.270 (1.31)	0.235 (4.31)	0.208 (1.30)	0.076 (0.67)
standard 5-8	0.242 (4.25)	0.246 (1.42)	0.249 (5.55)	0.073 (0.56)	0.069 (0.98)
form 1-2	0.441 (8.24)	0.431 (2.71)	0.224 (5.77)	0.314 (3.24)	0.208 (3.61)
form 3-4	0.550 (9.76)	0.423 (2.58)	0.516 (13.13)	0.229 (2.30)	0.182 (3.04)
form 5-6	0.445 (4.48)	0.214 (0.59)	0.469 (8.49)	1.041 (7.06)	0.170 (2.02)
vocational school	-	-	-	-	0.507 (5.18)
polytechnic	-	-	-	-	0.507 (4.01)
college	-	-	0.087 (1.23)	-0.319 (1.32)	-
professional	-	-	-	-	0.754 (4.17)
university	0.465 (3.60)	1.233 (2.76)	0.783 (10.94)	0.587 (2.46)	1.327 (10.03)
experience	0.0951 (7.09)	0.146 (3.84)	0.0649 (7.62)	0.0424 (1.38)	0.0813 (5.63)
experience squared	-0.00236 (-3.38)	-0.00526 (-2.52)	-0.00113 (-2.39)	-0.000183 (-0.10)	-0.00266 (-3.36)
experience cubed	0.0000189 (1.69)	0.0000675 (2.03)	0.000005265 (0.703)	-0.0000122 (-0.42)	0.0000317 (2.51)
nairobi	0.319 (4.50)	0.394 (2.11)	0.080 (1.57)	0.094 (0.73)	0.427 (7.81)
mombassa	0.370 (4.84)	0.278 (1.22)	0.152 (2.66)	0.042 (0.28)	0.196 (2.97)
eldoret	0.006 (0.06)	-0.213 (-0.93)	-0.013 (-0.18)	-0.169 (-1.13)	0.133 (1.78)
other town (not Nakuru)	0.141 (1.90)	0.101 (0.50)	-0.170 (-3.29)	-0.226 (-1.62)	-
male	0.057 (1.25)	0.366 (2.51)	0.122 (4.67)	-0.036 (-0.38)	0.102 (2.19)
no. of obs.	1331	186	2494	312	1123
adjusted R^2	0.474	0.491	0.533	0.479	0.350
mean lnw	7.870	7.816	7.508	7.519	7.331

Table 5: Mincerian returns to education over time

Survey	Cohort	Primary S8	Secondary F4	University
LFS 1978 all employees	1962 and earlier	7	45	13
	1963-1970	10	42	13
	1971-1978	3	38	22
	All cohorts	8	42	15
LFS 1978 manufacturing employees only	All cohorts	10	34	61
LFS 1986 all employees	1962 and earlier	13	35	49
	1963-1970	8	32	18
	1971-1978	4	25	16
	1979-1986	7	31	52
	All cohorts	9	26	30
LFS 1986 manufacturing employees only	All cohorts	5	16	20
RPED 1995	1962 and earlier	1	34	NA
	1963-1970	-13	29	NA
	1971-1978	4	8	100
	1979-1986	6	10	103
	1987-1995	2	11	63
	All cohorts	2	12	69

Assuming 7 years to complete primary; 4 for lower secondary; 2 for higher secondary and 4 for university
Cohorts defined by the year when an individual is predicted to enter the labour force.
NA = not available (no university graduates in cohort in survey)

was similar for the three youngest cohorts in 1995. The fact that the wage premium to secondary education was similar across cohorts in 1978 would seem to rule out some otherwise plausible explanations for why the premium in the 1980s and 1990s was lower for younger cohorts. In particular, it makes it hard to argue that the higher premium for older cohorts reflects their having received higher quality schooling or schooling with a higher signalling value. Instead, it may be that Africanisation and economic growth in the 1960s allowed educated workers to secure positions that were to some extent protected from competition from the increased supply of educated labour in subsequent decades.

It is clear from our results that conventional rate of return estimates are subject to severe limitations when based on wage patterns at a given point in time. Consider what the wage patterns in 1978 implied for the 1979-86 cohort. Someone entering the labour market with four years of secondary schooling in 1979 might expect - based on wage patterns in 1978 for the 1971-1978

cohort - to have a 151% wage premium over a primary school completer with the same experience. In 1986, the actual premium would have been 126%, in 1995, it was only 41%.

5.   Full returns to education; incorporating pecuniary costs

Mincerian rates of return assume the only cost of education is foregone wages, the opportunity cost. Data on direct costs paid by the government are available from official sources (Table 6 refers)[10]. At the primary level, the costs fell by more than two-fifths between 1978 and 1995; at the university level they have fallen by more than three fifths. At the secondary level, the fall is more modest, at less than one eighth. These falls are not due to rising student-teacher ratios[11]. Instead, they reflect the fall in real wages described above, since labour costs account for the bulk of educational expenditures[12]. There is less information available on the private pecuniary costs of schooling in Kenya. Perhaps the most reliable source of information is that from the 1992/93 Welfare Monitoring Survey, reported by Demery and Verghis (1994). This can be used to estimate mean household educational expenditures per student for each level of schooling. Private spending per student is ten times as high at the secondary level as at the primary level. This reflects the fact that fees are not supposed to be charged by state primary schools, but account for 84% of household educational expenditure on secondary school students. Households actually spend less per student on university students than on secondary school students, although the figures understate ultimate costs if student loans are actually repaid. We take the Demery and Verghis estimates of the real private pecuniary costs of education in 1992/93 and assume that costs were constant at that level throughout the period 1978-95. There is little data which to test this assumption, with none for the primary and university level[13]. At the secondary level, there are two other sources of information: an estimate for 1979 by Armitage and Sabot (1984) and those from a survey of rural households in Central Province in 1982 (Bevan, Collier and Gunning, 1989). These two sources differ, but average out at a similar figure in real terms to that of Demery and Verghis.

One way to gauge the relative importance of the direct costs of education is to compare them with average earnings, an indicator opportunity costs. At the primary level, the annual direct private costs appear very small: 2% of the mean earnings of uneducated workers in 1978. At the secondary level, direct private costs are more substantial: 14% of the mean earnings of primary

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[10]   A complicating issue is the treatment of the Student Loan Scheme, which was introduced in the 1990s and provides loans to university students at 2% interest to cover fees, board and lodging and bookstore accounts. Following Demery and Verghis (1994), we treat these loans as a disguised grant, since there was little evidence of more than token repayments at the time Demery and Verghis wrote. If the loans are regarded as genuine transfers, the cost per university student to the government would fall by around 32%.

[11]   According to UNESCO, student-teacher ratios fell between 1978 and 1990 from 33 to 31 at the primary level amd remained constant (at 41) at the secondary level. At the tertiary level, student-teacher ratio rose only slightly from 7.1 in 1980 to 8.1 in 1990 (UNESCO, various years; Wolff, 1984).

[12]   In 1992/3, labour costs accounted for 90-95% of educational expenditures at the primary level and 85-90% at the secondary level.

[13]   One might expect private direct costs to have risen with the increased emphasis on cost-sharing. This implies our estimates of the fall in the return to schooling over time might be underestimated.

educated manufacturing workers in 1978, rising to 25% in 1995. University direct private costs are only 4% of the mean earnings of employees with Form 4, rising to 10% in 1995. Total direct costs are substantial for university, remaining roughly constant during the period at slightly under twice the mean earnings of those with Form 4.

Table 6: Estimates of the pecuniary costs of schooling (1990 shillings per student per year)

	Primary	Secondary	University	Notes
Public				
1968 (Carnoy and Thias, 1971)	1600	17476 lower 36310 higher	255340	
1978 UNESCO	1698	3714	122014	Sub-sectoral shares estimated as an average of 1976 and 1980 values
1986 UNESCO	1374	3740	66510	Estimated as an average of 1985 and 1987 costs
1995/96 (MOE, personal communication)	979	3269	45490	
Private				
1968 (Carnoy and Thias, 1971)	4272	11922 for lower 0 for higher	0	fees only
1979 (Armitage and Sabot, 1984)	-	4761	-	government schools only
1982 (Bevan, Collier and Gunning, 1989)	736	3470	-	from rural Central province
1992/93 (Demery and Verghis, 1994)	424	4344	2400	Not including liability from university Student Loan Scheme

Note: In 1995/96, total expenditure was 21% higher than recurrent expenditure at the university level; at the primary level it was 2.4% higher; at the secondary level it was 0.6% higher. These figures were used to adjust upwards the UNESCO statistics, which included recurrent expenditure only.

We can combine this data on costs with estimates of the wage benefits of education to yield full estimates of the rate of return to education. The rate of return to education is that which equates the net present value of the earnings stream of the educated, less direct costs, to the earnings stream of the uneducated. As is conventional, we estimate earnings streams using data on wage employees. We assume that individuals not in education are wage employment from age 15 to 55 (only) and that they do not earn income from other activities at any time. Implicitly this assumes that there is no opportunity cost to schooling for children under 15 (the primary school going ages). This is certainly untrue for rural Kenya, where children do provide labour for household activities. However, it may be a reasonable approximation for urban Kenya where school may even provide a valuable benefit to some households simply by providing child care. To allow for experience-earnings interactions, we estimate equation (2) for each education

category. Private rates of return make allowance for private direct costs. Social rates of return include public direct costs.

Full returns allowing for direct costs are generally very different from Mincerian returns (Table 7) refers. For post-primary education, the returns - particularly social returns - are markedly lower - often only half as large. However at the primary level, full returns far exceed Mincerian returns. This is because we replace the Mincerian assumption that young children forgo adult wages to attend school with the assumption that there is no opportunity cost to their time. Since direct costs to primary school are very low, this produces high (25%) private returns to primary school and reasonable social returns (13%) despite the wage benefits to primary education having fallen to very low levels by 1995 (a Mincerian return of only 2%). Social returns are always lower than private returns by construction. The difference is most marked at the university level and least pronounced at the secondary level. By 1995, private and social returns to secondary schooling are very close, due to the relatively modest public contribution to costs. Both the private and social returns to secondary schooling have fallen by more than two-thirds between 1978 and 1995[14]. By 1995, the private and social returns to secondary schooling were 6-7%. This is below the 10% figure often referred to - for example, by Psacharopoulos (1994) - as the discount rate for government projects. By contrast, the private returns to university education in 1995 are very large - 35% - whilst social returns are reasonable, at 17%. These figures for manufacturing workers are similar to those for all employees in 1986. It is hard to compare these figures with LFS 1978 because of the biases in the estimates of the wage premium for university graduates. However, it seems likely that the returns to university education have risen. This is partly due to the rise in the wage premium for university graduates and, in the case of social returns, due to the sharp fall in direct costs per student. Nonetheless, caution is required in drawing conclusions about the RORE at the university level because of the small number of graduates sampled.

Table 7 also presents estimates of the returns to incremental increases in education. Primary education appears to pay off mainly after Standard 4, often thought to be the minimum required for functional literacy. This suggests that reducing dropouts from primary schooling may have a good return. This is still a policy issue in Kenya where dropping out of primary school remains common, despite high primary school enrolment rates. However, the above evidence may not be particularly relevant here, since very few recent entrants to wage employment have less than four standards of primary schooling[15]. With secondary schooling in 1978 and 1986, moving from Forms 1-2 to Forms 3-4 appears twice as remunerative as moving from primary completion to Forms 1-2. This is not true in the 1995 RPED, although this may represent a difference between returns in manufacturing and outside of manufacturing rather than a change over time[16].

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[14]   This conclusion is based on a comparison of all employees in LFS 1978 with manufacturing workers only in the RPED 1995. However, it is likely to be valid: Mincerian returns fell even more when comparing the RPED with just manufacturing workers in LFS 1978 than when comparing it with all employees in 1978.

[15]   In the 1995 RPED, only 1.1% of the workers with less than eight years experience had incomplete primary schooling.

[16]   In table 4, the coefficients on Forms 3-4 are lower for manufacturing in the LFSs than for all wage employees.

Table 7: Full rates of return to education; incorporating direct costs

	LFS 1978		LFS 1986		RPED 1995	
	Private	Social	Private	Social	Private	Social
Primary	24	13	22	13	25	13
Secondary (lower)	23	20	17	14	7	6
Higher secondary	28	25	20	18	NA	NA
University	13	2	31	10	35	17
Incremental returns:						
Primary 1-4	10	7	18	10	8	6
Primary 5-8	70	27	28	17	83	37
Form 1-2	15	14	10	8	10	8
Form 3-4	38	32	23	19	4	3

NA = not applicable (Forms 5 and 6 abolished).

We can compare the full rates of return in Table 7 with the averages for sub-Saharan Africa reported by Psacharopoulos (1994). He reported private returns of 41% for primary, 27% for secondary and 28% for higher education; social returns were 24%, 185 and 11% respectively. In our data, returns to primary school throughout the period are scarcely over half the values given by Psacharopoulos. Returns to secondary school in 1978 were of a similar magnitude to those reported by Psacharopoulos but have since fallen to less than a third of that figure. Returns to university education may have risen over time and are now slightly higher than Psacharopoulos's estimates. Our results do not support the suggestion that the "conventional pattern" of returns - with primary being the most profitable and university education the least - might have held in earlier decades in Kenya. Indeed in 1978, the opposite pattern is observed. In 1986, social rates of return were roughly comparable across different levels of education. By 1995, tertiary education clearly has the highest return and secondary the lowest. There is a natural tendency to make direct policy inferences from such results but it should be recalled that here we are comparing standard rates of return, making no allowances for external or non-wage effects of education.

6.   Expected returns to education; incorporating self-employment

The above calculations are limited by being based on samples of wage earners only. Calculating the effect of education on the expected income of urban residents in general provides a broader picture of the benefits of education. In this section, we calculate expected incomes for individuals with differing levels of education but otherwise identical characteristics. In addition to earnings functions for wage employees, this requires us to estimate earnings functions for the self-employed and multinomial logit models for whether an individual is employed or self-employed.

We are only able to do this for 1978 and 1986, since our data for 1995 is for wage employees only.

The Mincerian returns to schooling for the self-employed in 1978 are strikingly similar to those for wage employees (Table 8 refers). Returns to primary schooling in self-employment are 9% compared to 8% for wage employees; returns to lower secondary schooling are 40% compared to 42%. Returns to secondary schooling for the self-employed fall sharply to only 15% in 1986. This is much lower than return for wage employees in general, but very similar to the 16% figure estimated for manufacturing wage employees. One might speculate that the returns for the self-employed and manufacturing wage employees are quicker to respond to changes in market conditions, perhaps because they are more exclusively outside the public sector. The Mincerian returns to primary schooling in self-employment were fairly stable between 1978 and 1986, if anything rising slightly. There are too few university graduates in self-employment in the surveys to be very confident about the return to tertiary education. However, those observed in 1986 earned substantially more than less educated workers, ceteris paribus (a Mincerian rate of return of 65%).

The probabilities of individuals being in employment or self-employment are predicted using multinomial logit models. Along with education, the other explanatory variables were a cubic term in experience together with dummy variables for residence in Nairobi and Mombasa. The logits were estimated separately for men and for women. Full results of the multinomial logits are not presented here but are available from the authors on request. Instead, we report how the probabilities of being in wage employment and self-employment predicted by the models vary with education (Table 9 refers). We focus on predictions for an individual with sixteen years of experience, not resident in either Nairobi or Mombasa. Education generally raises the probability of employment for both sexes in both 1978 and 1986. It has some tendency to reduce the probability of self-employment, but the rises in employment probabilities are mainly mirrored in the fall in the probability of being neither employed nor self-employed. The patterns are strongest for women: in 1986, those with Form 3-4 have an 84% probability of being in wage or self-employment; those with no education have only a 36% probability.

By comparing differentials in expected earnings for representative workers with different levels of education, we can calculate expected returns to education[17]. For men, expected earnings are generally similar to the conventional Mincerian returns from wage employment. Consequently, standard estimates of the rates of return, based only on earnings profiles for wage employees, are close to expected rates of return. This result is consistent with the predictions of competitive labour markets. For women, expected rates of return to education differ substantially. This is particularly marked in the case of lower secondary schooling (Form 4), where the expected rate of return far exceeds the conventional one because of the positive effect of secondary schooling on women's employment probabilities.

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[17]   Our concept of an expected return is analogous to the Mincerian rate of return, not the full rate of return, since we do not allow for direct costs. Focussing on expected returns requires no change in the measurement of costs and we wish to concentrate here on how it changes the measurement of the benefits of education.

Table 8: Earnings functions for the self-employed

	LFS 1978	LFS 1986
constant	6.214 (20.95)	5.604 (30.97)
standard 1-4	0.464 (2.23)	0.114 (0.78)
standard 5-8	0.030 (0.14)	0.574 (4.17)
form 1-2	0.390 (1.28)	0.170 (1.16)
form 3-4	0.565 (1.52)	0.298 (1.80)
form 5-6	0.814 (1.52)	0.024 (0.06)
college	NA	0.633 (1.22)
university	-0.097 (-0.08)	1.215 (2.60)
experience	0.0463 (1.85)	0.0587 (4.48)
experience squared	-0.000867 (-1.69)	-0.000878 (-3.05)
nairobi	-0.614 (-3.25)	0.346 (3.71)
mombassa	-0.052 (-0.31)	0.328 (2.78)
male	0.638 (4.24)	0.386 (4.48)
adjusted R^2	0.262	0.279
no. of observations	254	629
mean lnw	7.401	7.297
primary ROR	9.1	12.4
secondary ROR	40.0	14.9

7.   Conclusions

We have estimated conventional rates of return to education in Kenya for surveys from the mid-70s, mid-80s and mid-90s. These are most interesting at the secondary level. Between 1978 and 1995, both social and private returns to secondary education appear to have fallen by more than two-thirds. This is driven almost exclusively by a narrowing of the wage premium to secondary educated workers; direct costs have remained fairly constant. The social returns to secondary education in 1995 appear modest at around 6-7% compared to a healthy 20% in 1978. At the primary level, conventional estimates are of largely historic interest because almost no workers

in recent cohorts are uneducated. However, the wage benefits of primary education do appear to have fallen sharply, although this has not led to a fall in social returns since direct costs have fallen correspondingly. At the university level, the small numbers of graduates in the samples and other data problems make one cautious about the reliability of the estimates. Although the estimates for university education must be regarded with caution, there is no evidence of a marked fall in returns at that level - if anything, the opposite is true. Returns, particularly private returns, in 1986 and in 1995 were high. This may help to explain the strong political pressure within the country in the late 1980s to expand university education.

For 1978 and 1986, we were able to generalise our analysis to include self-employment as well as wage employment. This allowed us to calculate an expected rate of return that took into account the effect of education on access to employment and returns within self-employment. For men, the expected rate of return to education did not differ too much from the conventional Mincerian rate of return, partly because wage employment is the most common activity for men and partly because there did appear to be returns to education in self-employment. However, the decline in the expected return to secondary schooling between 1978 and 1986 was larger than the decline in the standard Mincerian return because the returns to secondary schooling fell much more in self-employment than in wage employment. For women, expected rates of return are much higher than standard Mincerian returns, although this is driven by imputing zero value to activities outside of employment and self-employment.

Table 9: Expected earnings by education

a) Men

	Wage Employment		Self-employment		Expected earnings	Rate of return	
	Probability	Earnings	Probability	Earnings		Mincerian	Expected
LFS 1978							
Uneducated	67	1041	22	1630	1057	-	-
Primary completer	77	1650	16	2074	1602	8	7
Secondary Form 4	83	4220	13	6694	4373	39	43
Secondary Form 6	81	6993	18	12772	8558	33	48
University graduate	85	12352	14	12760	13910	19	16
LFS 1986							
Uneducated	63	830	25	814	726		-
Primary completer	73	1297	20	1487	1244	8	10
Secondary Form 4	82	2797	14	2232	2606	29	27
Secondary Form 6	90	4892	9	2690	4645	37	39
University graduate	74	9676	26	9705	9684	24	27

b) Women

	Wage Employment		Self-employment		Expected earnings	Rate of return	
	Probability	Earnings	Probability	Earnings		Standard	Expected
LFS 1978							
Uneducated	13	992	29	996	418	-	-
Primary completer	21	1573	22	1268	609	8	7
Secondary Form 4	72	4022	5	4093	3100	39	102
Secondary Form 6	63	6665	8	7809	4824	33	28
University graduate	-	11773	-	7801	-	21	-
LFS 1986							
Uneducated	10	747	26	520	210	-	-
Primary completer	23	1167	30	950	531	8	22
Secondary Form 4	70	2519	14	1426	1963	29	55
Secondary Form 6	84	4405	6	1719	3803	37	47
University graduate	88	8712	9	6201	8225	24	29

Evaluating for a person with 16 years potential experience, not in Nairobi or Mombassa.
Expected rate of return is the premia in expected earnings for a year of education

One must be wary of deriving policy implications from estimates of the conventional rates of return to education. Like most of the literature, we do not control for many unobservables that may be correlated with education; nor do we consider non-monetary or external benefits to education. Nonetheless, the above results do suggest that patterns of rates of returns prevailing in the 1970s cannot be assumed to hold in the 1990s. This conclusion may well be true of African countries other than Kenya which have also expanded educational access but experienced economic decline. It is possible that our results reflect a declining quality of secondary education. However, we are unconvinced by this explanation: expenditure per student fell less at the secondary level than at other levels whilst class sizes did not increase. Moreover, all cohorts suffered a fall in the return to education, not just the most recent. It is true that the oldest cohorts - those educated before the 1970s - still appear to receive substantial returns but this can be explained by their having secured higher paying occupations that are more scarce for recent cohorts. We are also sceptical that our results reflect a lower value of secondary education a signal of student ability. Knight and Sabot (1990) found pre-school ability to play relatively little role in determining the return to secondary education in 1980. Furthermore, for 1978, we found

substantial returns to secondary education in self-employment, a sector where signalling presumably plays no role. Instead, perhaps the most plausible interpretation of the fall in the returns to lower secondary is that it illustrates the most basic principle of economics: the value of scarcity.

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