

Human Capital and Economic Development*

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1. Introduction

Health and education are both components of human capital and contributors to human welfare. One index of human welfare, which incorporates income, education and health, shows that Africa's level of 'human development' is the lowest of any region in the world. In this paper we will frequently compare Africa with South Asia. While Africa's level of human development is lower than that of South Asia, its per capita income is higher. Africa's poor economic performance has been most marked in its growth rate which has been half that of South Asia. As Africa has found since 1980, slow economic growth severely limits the ability of governments and households to fund further investments in health and education. Low investments in human capital may impinge on already low growth rates of income. Such interrelations might be thought to imply a vicious circle of development, but this should not be overstated. Poor countries have considerable discretion over how much to invest in health and education. Since Independence, Africa has achieved a rapid growth of some aspects of human capital - particularly in the expansion of education - despite starting from a low level of income. The expansion of the human capital stock has not been matched by a commensurate rise in physical capital. The result has been low growth of incomes and low returns to the educational investment.

This paper provides an overview of Africa's achievements in the formation of human capital, and its impact on economic growth and welfare. Human capital, economic growth and welfare are closely interrelated. Section 2 provides an assessment of Africa's human development in the context of other developing regions. Section 3 turns to the central issue of how to promote economic growth in Africa and the role of human capital in that process. Section 4 presents evidence on the linkages between education and health outcomes, while section 5 provides some concluding remarks.

2. Africa's human development

The concept of development

The concept of human development centres around the notion that human welfare depends on various dimensions, many of which are not well captured by conventional measures of economic income (see

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Griffin and Knight, 1990; UNDP, 1990). Particular attention has been given to using measures of health and education as welfare indicators in addition to GDP per capita. Education, good health and longevity are intrinsically valuable outputs. In conventional measures of economic output, health and education's contribution is measured essentially by the costs of producing the outcomes, ie expenditures on schools and medical facilities. Such a procedure identifies inputs rather than outputs. The valuation of both health and education is difficult as both are goods with attributes different from most types of goods produced in an economy. Whilst high incomes may be conducive to health, health cannot be directly purchased like material goods and services. Health and education are often subsidised by the state and in some countries education is compulsory for certain minimum length of times. Many, if not most, health and education services are produced by the public sector. Governments play a direct part in providing services very directly linked to human welfare.

In this paper, health outcomes are measured mainly through mortality statistics. Of these, life expectancy at birth is perhaps the most comprehensive, depending as it does on the current age-specific mortality rates for all age groups. Educational indicators are either stock or flow measures. Stock measures of educational indicators include the literacy of the population, the average number of years of education of the population and the extent of educational attainment by level. These measures are appropriate for assessing the accumulated achievement of a country or for estimating the contribution of education to economic performance. Flow measures are school enrolment ratios and measure investment in the future capacities of the population.¹

The UNDP has developed a composite indicator, the human development index (HDI), which gives equal weight to three indicators: real GDP per capita (measured at purchasing power parity in constant prices); life expectancy at birth; and educational attainment, measured by adult literacy (two-thirds weight) and combined primary, secondary and tertiary enrolment ratios (one-third weight) (see UNDP, 1997, p122 for details). The index is valuable in extending the economic concept of welfare, but for many purposes it is more useful to focus on the individual components of the index than the index itself. Africa has performed very differently in each of the three dimensions of the welfare and the dimensions are not independent.

The most recent UNDP *Human Development Report* shows that Africa has the lowest level of human development of any region but its income per capita is higher than that of South Asia.² In what follows, we often compare Africa with South Asia. This comparison provides a useful benchmark, since South Asia is the region most similar to Africa in terms of income and overall development. For example, it is instructive to consider why Africa has a lower HDI than South Asia despite having higher income. The proximate cause is the relatively low life expectancy at birth of Africans.

Comparison with other developing countries

Table 1 sets out the HDI and its components by region for 1994. Life expectancy in Africa is 53 years, compared to 61 in South Asia. Much of the lower life expectancy in Africa reflects higher child mortality. Under-five mortality rates are 31% higher in Africa than in South Asia, and infant mortality rates 19% higher. However, adult mortality is also much higher in Africa than elsewhere (see World Bank, 1993). The explanation for the higher child mortality is probably not under-nutrition: the proportions of low-birth weight infants and of underweight children under five are much lower in Africa than in South Asia (see Table 47, UNDP, 1997). Instead, inferior health care is likely to be a factor. Immunisation rates are much lower in Africa: only 60.5% of one year olds are fully immunised against measles compared to 75% in South Asia; disparities in immunisation against tuberculosis are similar.

Table 1: Development indicators for Africa compared with other regions in 1994

	HDI	GDP per capita	Life Expectancy	Adult Literacy (PPP\$)	Combined educational enrolment
Africa	0.429	1907	53.3	54.7	46
S.Asia	0.459	1686	61.4	49.7	53
E.Asia	0.652	3001	69	81.8	59
S.E.Asia & Pacific	0.672	3628	64.3	86.3	78
S.America & Caribbean	0.829	5873	69	86.2	69
E.Europe & CIS	0.760	4203	68.1	98.1	75
Industrial countries	0.911	15986	74.1	98.5	83

Source: UNDP (1997).

Access to health services is lower in Africa: only 61% can reach a health facility by foot or local means within one hour, compared to 82% in South Asia. This partly reflects the lower population density in Africa. However, there are also less medical personnel. For the sample of countries for which information is available, there are estimated to be 16,957 people per doctor in Africa compared to 3,704 in South Asia. Another factor may be lack of access to “safe water”: only 56% of Africans have access to safe water, compared to 76% of people in South Asia.

Africa has higher adult literacy rates than South Asia. This largely reflects the higher rates of literacy among women in Africa compared to South Asia (43% compared to 34%; for men, literacy rates are 64% and 62% respectively)³. Nonetheless, African men are still nearly 50% more likely to be literate than African women. Africa’s superiority in literacy rates is likely to be eroded over time: school enrolment rates are now lower in Africa than in any other region. Combined primary, secondary and tertiary enrolment ratios average 46% in Africa, compared to 53% in South Asia. In most developing countries outside of Africa, male gross primary enrolment ratios are close to 100% whilst in Africa they are 85% (for girls, gross primary enrolment ratios are 73%). Box 1 discusses the issues raised by gender and human resource development.

These comparisons of Africa with other regions need to be seen in the context of trends in income and human development since 1960.

Trends since 1960

The welfare of Africans rose in both the 1960s and 1970s, whether assessed solely by GDP per capita or by the wider HDI. Taking a population weighted average for the 33 African countries for whom data is available, GDP per capita in 1987 US dollars rose by around two fifths between 1960 and 1980. For the five South Asian countries for whom data is available, the rise in incomes was smaller, amounting to less than one third of GDP per capita in 1960. After 1980, the situation radically changed. Per capita incomes fell in Africa whilst in South Asia they had risen by a half by 1994. Since 1960, Africa has experienced more improvement in the composite human development index than in GDP per capita. This is particularly marked since 1980, when the human development index continued to rise despite economic decline. However, the rise in the HDI during this period was much slower than in previous decades.

Box 1: Gender and human resources

There are gender differences in the allocation of human resources in Africa, although these may be largely confined to education. Unlike parts of South Asia, there is no strong evidence of excess female mortality or under-nutrition. However, African women are severely disadvantaged in terms of their education. Only 43% of African women are literate compared to 64% of African men. Girls in Africa are generally also less likely to be sent to school than boys. Gross primary school enrolments are 85% for boys, but only 73% for girls. A comparison of the gender differences in literacy and enrolment shows that gender inequalities in education are falling over time. This is also apparent in data on educational enrolments in the 1980s. What may be of increasing concern is the inferior academic performance of girls in many African countries. This is seldom reported in official statistics, but has been observed in countries such as Cote d'Ivoire, Ethiopia, Kenya and Tanzania. There is no presumption that girls are naturally less able: indeed, in countries such as the UK they outperform boys.

The low educational enrolment and achievement of African girls is of particular concern because there is no strong evidence that the returns to education are lower for women. Most analyses of wages find no systematic gender difference in the effects of education (see Table 6). It is possible that education has higher returns in wage employment, so that the return to female education is lower because of African women's lower formal labour market participation. However, this is difficult to establish because it requires a comparison with the non-wage returns to education, some of which are hard to quantify. Indeed, it may be that the non-wage returns are more likely sources of external benefits and thus reasons for government support. A study of agricultural productivity in Uganda found male and female education equally beneficial (Appleton and Balihuta, 1996). Non-monetary returns to education are often found to be higher for women. For example, maternal education is sometimes found to be more important than paternal education for child health and child schooling. Female education is increasingly emphasised as a way of reducing high fertility (for example, it was a major theme of the 1994 UN Conference on Population). This would help avoid the attendant risks of maternal and infant mortality. It would allow parents to invest more in their smaller numbers of children. Not least, it would help reduce the demands and constraints on women's time. Dasgupta (1993) has estimated that in high fertility regimes in Africa women spend around one third of their adult lives pregnant or breast-feeding. By reducing fertility, female education is likely to lessen this severe constraint.

Although health in Africa is poor compared to elsewhere, it has improved greatly since 1960 when life expectancy on the continent was only 41 years. Until 1980, life expectancy in Africa was only slightly less than in South Asia. Thereafter, however, trends in the two regions diverged sharply. Life expectancy in Africa rose only 3.5 years from 1980-1994. By contrast, the rate of increase in longevity accelerated in South Asia, rising from 51.5 to 61.3. This period also marked the greatest divergence in economic performance between the two regions.

Africa's high literacy rates compared to its income reflects the substantial expansion of schooling in Africa since 1960. For the 27 African countries for whom we could obtain data, gross primary school enrolment ratios rose from 38% in 1960 to 83% in 1980. As a consequence, the adult literacy rate doubled between 1970 and 1994. These improvements in literacy are greater than those in South Asia: during the same period, adult literacy in that region increased by only slightly more than one half. Whilst adult literacy rates were lower in Africa than in South Asia in 1970, the reverse is now true. However, in the area of enrolments Africa's performance has been inferior to that of South Asia. Combined educational enrolments in 1994 are only 3 points above their 1980 levels; in South Asia, they had risen by 16 points. For the countries for whom we have data, gross primary school

enrolments have on average fallen since 1980. Secondary school enrolment rates - and the proportion of girls in primary school - have continued to rise but at a slower rate than before. Educational expenditures per student have fallen in real terms (Sahn, 1992).

The result of these flow expenditures on the stock of human capital can be assessed using a consistent set of data from 1965 to 1990. This we do in Table 2 and figure 1 which show the percentage of the population over 15 with no education, and with some primary and with completed primary education. The levels of completion at secondary and higher levels are also shown. The figures for primary completers include those who completed education beyond primary. In 1965 both Africa and South Asia had 70 per cent of their population over 15 with no education. By 1990 this percentage had fallen further in Africa than in South Asia, to 46 per cent as compared with 55 per cent. While Africa has out-performed South Asia in giving its population some education, in terms of both primary and secondary completion rates its performance is inferior. In 1990 25 per cent of Africa's population had completed primary school, while in South Asia it was 32 per cent. Africa has been relatively good in getting children into primary school, but bad at inducing them to complete. This problem of drop-outs is a major problem for many African countries: they spend large amounts of money teaching children who do not stay in school long enough to learn much or to acquire any qualifications. Drop-outs may be partly due to the low quality of schooling offered. Experimental evidence from Brazil suggests that investments in higher quality education (such as extra provision of textbooks) may be self-funding if they lower drop-out and repetition rates (Harbison and Hanushek, 1992). Africa also has low rates of secondary school completion at 4 per cent, they are less than half that of South Asia, one-third that of South-East Asia and less than 10 per cent of that of East Asia. The decline in enrolments rates and the decline in the growth rate of educational coverage that can be observed in Africa may well reflect the low growth rates of income the 1980s. In both 1965 and 1990 East Asia's education level was markedly higher than that for the other developing regions.

Variation within the continent

Although it can be useful to consider Africa as a whole, there is considerable variation in human and economic development within the continent. Table 3 provides alternative rankings of African countries based on their HDIs and GDP per capita. What is striking about the table is that the same countries are in the top third of both lists. In many ways, these countries should be analysed separately from the others on the continent. They include the North African countries bordering the Mediterranean, South Africa and some smaller states. They are typically classified as having medium (and in some cases, high) human development by UNDP and as being middle income countries by the World Bank. The remaining two thirds of the countries are classified as having low human development and (in the main) low incomes. However, the rankings of the poorest performing two-thirds of countries differ substantially according to whether the HDI or GDP per capita is used. Some countries with very low GDP per capita (Democratic Republic of Congo, Madagascar, Tanzania, Zambia) are in the middle of the list ranked by the HDI. Others (Djibouti, Guinea, Senegal, Uganda) are in the middle third ranked by income, but not by human development. This suggests that even given their incomes, countries have some discretion over their degree of human development: some, such as Tanzania prior to 1980, may promote health and education; others may neglect it. However, the variation also reflects the fact that the flow of income can vary more in the short term than the stock of literate adults and the health status of the population. Consequently, some countries (eg Democratic Republic of Congo) may have high HDI figures relative to income because of marked economic decline rather than good social sector

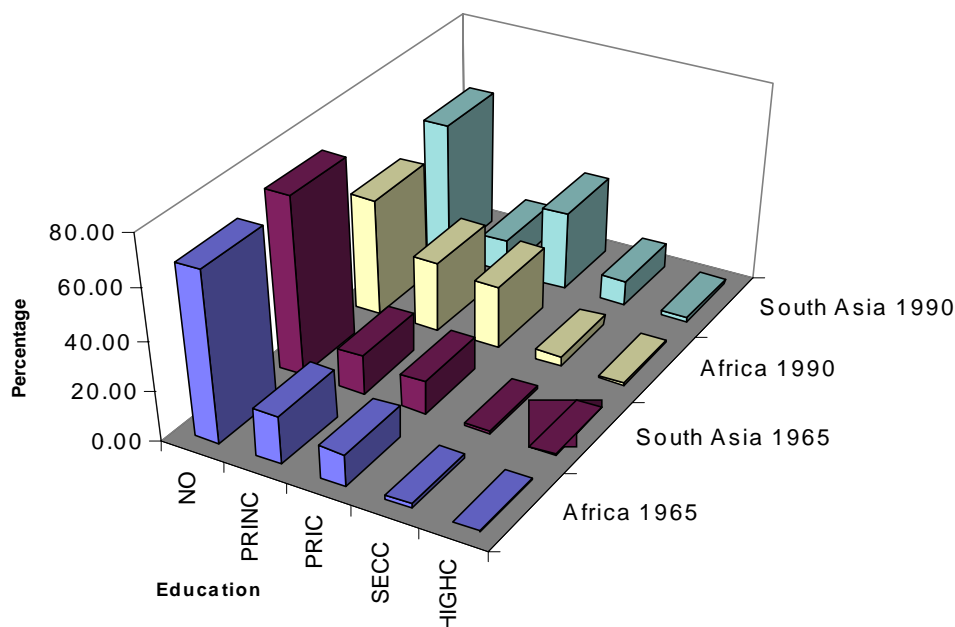
Table 2: Changes in the Stock of Human Capital: 1965-1990

	1965	1980	1990
Percentage of population over 15 with no education			
Africa	70	56	46
S.Asia	71	67	55
East Asia	32	14	10
South East Asia and the Pacific	49	25	17
South America and the Caribbean	37	24	17
Industrial Countries	4	3	3
Percentage of population over 15 with some primary			
Africa	17	25	28
S. Asia	16	8	13
East Asia	11	11	5
South East Asia and the Pacific	25	37	31
South America and the Caribbean	35	39	40
Industrial Countries	20	17	16
Percentage of population over 15 with primary completed			
Africa	13	19	25
S. Asia	13	25	32
East Asia	58	74	85
South East Asia and the Pacific	26	39	52
South America and the Caribbean	28	37	43
Industrial Countries	76	80	81
Percentage of population over 15 with secondary completed			
Africa	2	3	4
S. Asia	1	8	10
East Asia	14	35	50
South East Asia and the Pacific	4	10	12
South America and the Caribbean	6	11	16
Industrial Countries	20	41	39
Percentage of population over 15 with higher education completed			
Africa	0.2	0.3	0.7
S.Asia	0.04	0.7	2.0
East Asia	2.0	4.4	5.9
South East Asia and the Pacific	0.8	1.7	3.1
South America and the Caribbean	0.9	2.0	3.7
Industrial Countries	4	7	11

Source: Barro and Lee (1994) data. The figures are weighted by the country populations. The sample is confined to those countries which have data for all three years.

policies. Others (eg Uganda since 1987) may benefit from economic recovery for some time before its legacy of poor human development can be overcome. However, for further analysis it is useful to disaggregate the components of the HDI. Although the components are strongly correlated across African countries, there are some striking divergences in performance. Malawi has much better educational indicators than one would expect from its low income, but lower life expectancy.

Figure 1
Educational Level Africa and South Asia: 1965 and 1990



NO: Percentage of the population over 15 with no education
 PRINC: Percentage of the population over 15 who failed to complete primary education
 PRIC: Percentage of the population over 15 who have completed primary education
 SECC: percentage of the population over 15 who have completed secondary education
 HIGHC: Percentage of the population over 15 who have completed higher education.

Life expectancy varies markedly across the continent. Although it is typically around 50 years, in eight countries it exceeds the world average of 63 years. Life expectancy in Africa is more strongly correlated with GDP per capita than either adult literacy rates or gross educational enrolments. However, some countries have very different life expectancy from what one would predict given their incomes. The two least developed African countries (for whom there is data) - Rwanda and Sierra Leone - are reported to have exceptionally low life expectancies at birth (23 and 34 respectively). Uganda also has a much lower life expectancy than one would predict given its income. Although this partly reflects the legacy of civil war and the onset of AIDS, much can be explained by its relatively low public spending on health. Botswana also has a much lower life expectancy - at 52, it is 13 years lower than one would predict given its income⁴. It could perhaps learn from nearby Lesotho, where life expectancy is nine years higher than would be expected from its income alone.

Literacy rates vary enormously across the continent from less than 20% in Niger and Burkina Faso to over 80% in Mauritius, the Seychelles, South Africa and Zimbabwe. School enrolment statistics exhibit almost as much variation. Some countries have achieved almost universal primary education; in others - notably the Sahelian countries - only a minority of children ever attend school. Variations in income per capita can explain 59% of the variation in combined educational enrolments. However, Southern African countries (with the exceptions of Angola, Botswana and Mozambique) have noticeably higher enrolment rates than would be expected given their income, whilst many countries bordering the Sahara desert tend to have lower than expected enrolment rates. Gender inequalities also vary considerably across African countries. Inequalities are less marked in countries with high overall rates of literacy and enrolments, but variation persists even controlling for that.

Table 3: Ranking African Countries by the Human Development Index and by Incomes UNDP (1997)

Ranking by HDI			Ranking by GDP per capita		
Rank	Value	Country	Country	Rank	Value (PPP\$)
1	0.845	Seychelles	Mauritius	1	13172
2	0.831	Mauritius	Seychelles	2	7891
3	0.801	Libya	Libya	3	6125
4	0.748	Tunisia	Algeria	4	5442
5	0.737	Algeria	Botswana	5	5367
6	0.716	S.Africa	Tunisia	6	5319
7	0.673	Botswana	S.Africa	7	4291
8	0.614	Egypt	Namibia	8	4027
9	0.582	Swaziland	Egypt	9	3846
10	0.570	Namibia	Morocco	10	3681
11	0.566	Morocco	Gabon	11	3641
12	0.562	Gabon	Swaziland	12	2821
13	0.547	Cape Verde	Congo	13	2410
14	0.534	Sao Tome	Zimbabwe	14	2196
15	0.513	Zimbabwe	Cameroon	15	2120
16	0.500	Congo	Ghana	16	1960
17	0.468	Ghana	Cape Verde	17	1862
18	0.468	Cameroon	Sao Tome	18	1704
19	0.463	Kenya	Benin	19	1696
20	0.462	E.Guinea	E.Guinea	20	1673
21	0.457	Lesotho	Côte d'Ivoire	21	1668
22	0.412	Comoros	Angola	22	1600
23	0.393	Nigeria	Senegal	23	1596
24	0.381	Congo (DRC)	Mauritania	24	1593
25	0.369	Zambia	Kenya	25	1404
26	0.368	Côte d'Ivoire	Uganda	26	1370
27	0.368	Benin	Comoros	27	1366
28	0.365	Togo	Nigeria	28	1351
29	0.357	Tanzania	Djibouti	29	1270
30	0.355	Mauritania	CAR	30	1130
31	0.355	CAR	Lesotho	31	1109
32	0.350	Madagascar	Togo	32	1109
33	0.335	Angola	Guinea	33	1103
34	0.333	Sudan	Sudan	34	1084
35	0.328	Uganda	Mozambique	35	986
36	0.326	Senegal	Zambia	36	962
37	0.320	Malawi	Eritrea	37	960
38	0.319	Djibouti	Gambia	38	939
39	0.291	Guinea Bissau	Burkina Faso	39	796
40	0.288	Chad	Guinea Bissau	40	793
41	0.281	Gambia	Niger	41	787
42	0.281	Mozambique	Chad	42	700
43	0.271	Guinea	Burundi	43	698
44	0.269	Eritrea	Madagascar	44	694
45	0.247	Burundi	Malawi	45	694
46	0.244	Ethiopia	Tanzania	46	656
47	0.229	Mali	Sierra Leone	47	643
48	0.221	Burkina Faso	Mali	48	543
49	0.206	Niger	Congo (DRC)	49	429
50	0.187	Rwanda	Ethiopia	50	427
51	0.176	Sierra Leone	Rwanda	51	352

The variation in human development within Africa is also marked in respect to trends since 1960. Although on average life expectancy increased by 12 years in the continent, for some - eg the Maghreb countries - the increase was around twenty years whilst in Uganda and Rwanda, life expectancy actually fell. Burundi, Malawi, Zambia and Zimbabwe experienced only very modest improvements. All African countries have made substantial gains in adult literacy since 1970. However, since 1980, trends in educational enrolments have diverged considerably. In eleven of the forty-two countries for which there is data, combined educational enrolments fell between 1980 and 1994, whilst in many others there were strong gains.

3. The Effects of Human Capital on Economic Development

Human and Physical Capital

Human capital is a broad concept which identifies human characteristics which can be acquired and which increase income. It is commonly taken to include peoples' knowledge and skills, acquired partly through education, but can also include their strength and vitality, which are dependent on their health and nutrition. Human capital theory focuses on health and education as inputs to economic production. This is in contrast to the concept of human development which views health and education as intrinsically valuable outcomes to be placed alongside economic production as measures of human welfare. In understanding the role of human capital as an input into development it is necessary to consider the possible links between human capital, other forms of capital, income and growth. While it is true for every country, for which there is data, that more educated people earn more than less educated ones it does not follow that there is a simple relationship between investing in people and countries becoming richer. Human and certain forms of physical capital may be complementary. The problem in investing is to match skills with machines. It is not a question of either investing in people or investing in machines, both are necessary. Even more important is the issue of how much to invest in alternative forms of capital equipment and skilled labour. The answer to that question is unlikely to be the same for all countries or to remain unchanged over time.

Rates of Return

By what criterion should an investment policy be judged? One important criterion is the rate of return on investment. What is meant by the rate of return on the investment and why is such a figure important? The rate of return on investment is comparable to the interest rate which must be paid on a loan. Formally it is the rate of interest which ensures that the present value of the net benefits of an investment are zero. Usually the more profitable is the investment, the more a given dollar raises future income, the higher is the rate of return.⁵ If there is 1 dollar to invest it makes sense to invest it in the activity which generates most income. Rates of return calculations simply tell us where the money goes furthest. Put that way it may sound rather obvious that we should look at rates of return. In one sense it is, but the problems arise because measuring rates of return is difficult.

Difficulties arise, firstly, because rates of return calculations inevitably involve assessments about the future which is uncertain. Secondly, private and social rates of return may differ. From the point of view of society as a whole it is the social rate of return which matters and that is particularly hard to measure. Arguments which see the key to growth in investment in human capital are essentially arguing that social rates of return on such investment are high. In particular they are arguing that such social

returns are higher than private ones and that private markets are likely to invest too little in education.

The role of human and physical capital in growth

We begin by a consideration of the links by which investment may affect the growth of output. Both physical and human capital directly impact on the productive capacity of an economy. However such direct effects may not be the most important. More human capital may itself affect the rate of growth of physical capital. If human and physical capital are complements then increasing human capital raises the rate of return on physical capital. The underlying rate of technical progress in an economy, by which is meant the increase in output due to factors other than measured inputs, may depend on how much educated labour there is in the economy. Rates of return on investment must consider both the direct and indirect effects of such investment. In assessing the effects of human capital on output we have both macro and micro evidence. We present both in the following sections.

To place the problem in context it is useful to set out how the stock of both human and physical capital in Africa compares with non-African countries. The comparative data set for human capital available from Barro and Lee (1994) was used in Table 2 above. In Table 4 the figures for physical capital are also presented. The data is drawn from the PENN world tables (Summers and Heston, 1991). The physical capital stock is a measure of the non-residential capital stock per worker.

Table 5 presents the growth rates, over the period 1965 to 1990, for income per worker and for human and physical capital investment that can be computed from Tables 2 and 4. The growth rate for the average of primary and secondary school completion in Africa is half that for South Asia, as is the growth rate of income. In Figure 2 the data from Table 5 is presented as a chart. The growth rate for human capital is a weighted average of the growth rates for primary and secondary school completion rates with the weights taken from 1980. While the averaged growth of education in Africa is lower than both East Asia and South-East Asia the gap is small relative to the differences in the growth rate of physical capital. It is at the secondary level where Africa's growth rate is far below that of any other developing region. At this level the gap between Africa and other developing regions has widened substantially. There is evidence that it is education at the secondary level which is important for increasing productivity in manufacturing. This poor performance may have serious implications for Africa's ability to compete in a global market place. Box 2 discusses some of the issues raised by globalisation and the rise of new technologies.

The gap between Africa and the rest of the developing world also widened in the case of the physical capital stock. Table 5 shows that the growth rate of the physical capital stock in Africa, at 1 per cent per annum, was far below that of any other region. The comparable figures for other regions are: 3.6 in South Asia, 7.9 in East Asia, 3.4 in South-East Asia, and 2.5 in South America. In 1965 Africa's physical capital stock was 34 per cent of that of East Asia; in 1990 it was 6 per cent. While this is an extreme figure it dramatises the point that there is a widening gap between Africa and other developing regions for physical capital and some dimensions of human capital.

There is research suggesting that the level of education as well as its growth rate may be important:

“Given the initial level of per capita GDP, the growth rate is substantially positively related to the starting amount of human capital. Thus poor countries tend to catch up with rich countries if the poor countries have high human capital per person (in relation to their level of per capita GDP), but not otherwise. As a related matter, countries with high human capital have low fertility rates and high ratios of physical investment to GDP.” (Barro, 1991, p.437).

Table 4: Physical Capital

	Income Per Worker (a)	Physical Capital Stock per Worker (b)	Investment Total (c)
Africa			
1965	2,074	924	11
1990	2,702	1,141	8
South Asia			
1965	1,822	852	13
1990	3,284	2,083	16
East Asia			
1965	3,736	2,734	14
1990	17,290	19,844	31
South East Asia and the Pacific			
1965	2,831	1,810	14
1990	5,726	4,278	22
South America and the Caribbean			
1965	10,354	6,193	17
1990	12,565	11,467	14
Industrial Countries			
1965	18,610	12,924	26
1990	30,361	34,914	25

Source: PENN 5.6 World Tables, Summers and Heston (1991). The regional figures are population weighted averages.

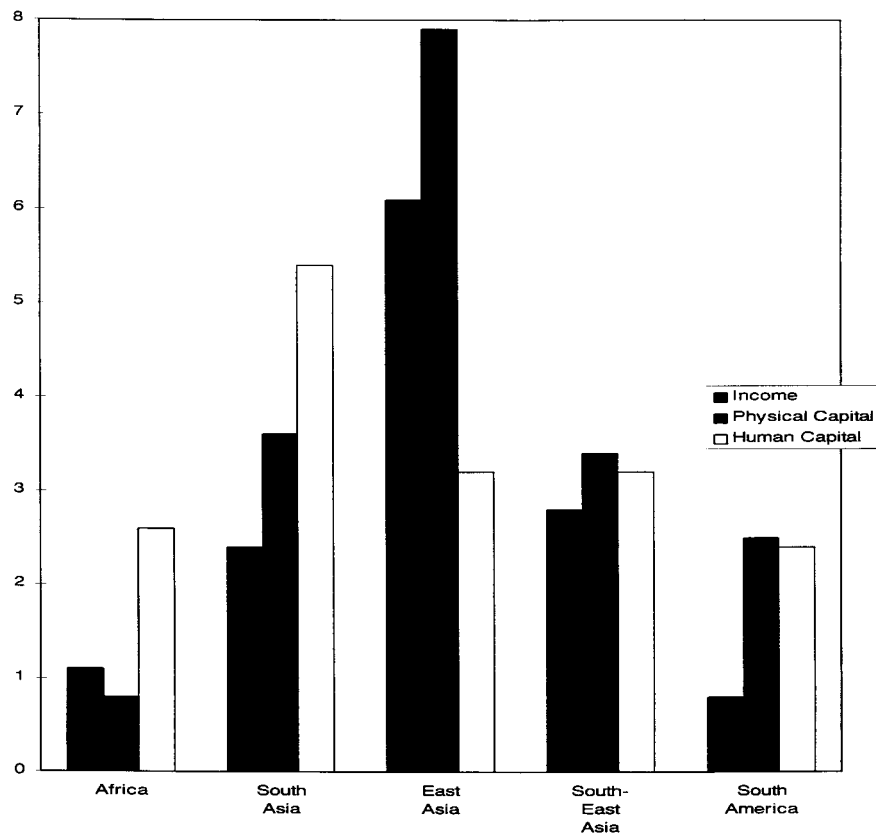
(a) Income per worker definition: real GDP per worker at 1985 international prices.

(b) Physical capital per worker definition: Non-residential capital stock per worker at 1985 international prices.

(c) Total investment definition: Percentage share of Investment in GDP at 1985 international prices.

Table 5: Growth Rates, Income and Investment in Human and Physical Capital

Growth Rates (per cent per annum) 1965-1990					
	Income per Worker	Physical Capital per Worker	Primary School Completion	Secondary School Completion	Combined Primary and Secondary
Africa	1.1	0.8	2.6	2.8	2.6
South Asia	2.4	3.6	3.6	9.2	5.4
East Asia	6.1	7.9	1.5	5.1	3.2
South East Asia and Pacific	2.8	3.4	2.8	4.4	3.2
South America and the Caribbean	0.8	2.5	1.7	3.9	2.4
Industrial Countries	2.0	3.9	0.3	2.7	1.5

Figure 2: Growth rates of income per worker physical and human capital

If this view is correct then it is the high levels of secondary and primary school completion in 1965, rather than the changes since then, which are important for explaining the differences across the countries. Why might the level of education be important? One effect of low levels of the human capital may be to lower the ability of the economy to absorb information. Indeed

One of the great virtues of education, which has been shown in many micro studies, is that it makes workers more flexible. It may be the case that levels matter as well as changes in those levels. Even by 1990 the stock of human capital in Africa was far below its level in East Asia in 1965. However, in 1965 Africa was marginally ahead of South Asia. While this region has not experienced the dramatic growth of East Asia, it has outperformed Africa. It is clear from the above that while human capital may have an important role to play this role will be vitiated unless policies ensure rapid investment in other forms of capital. The problems associated with this were covered in the African Development Report for last year.

Macroeconomic data allow the performance of African economies in the area of human and physical capital to be seen in context. The data presented does not allow us to directly answer the question as to the rate of return on investment in education of different levels. We now turn to micro data which allows that question to be addressed.

Box 2: Globalization, new technology and the return to human capital

Labour market conditions in African and elsewhere are likely to be influenced by two phenomena: increasing globalization and the rise of new technology. One form of globalization is the increase in the share of international trade from developing countries, particularly those in East Asia. The rise of new technology is most visible in the case of information technology. Such technology is likely to induce a shift in demand from unskilled to skilled labour. This will raise the return to acquiring higher levels of human capital and may help to explain why the return to post-primary education is still sizable, despite large increases in supply. However, other technologies may also be important for Africa: for example, agriculture on the continent has yet to benefit from anything comparable to the Asian “Green Revolution”. Studies of agricultural productivity in developing countries tend to find substantial returns to education in “modernising” environments - where there are new technologies to adopt - but virtually no returns in “traditional” environments (Lockheed, Jamison and Lau, 1980). This is consistent with Schultz’s hypothesis that education allows agents to adjust to disequilibria (Schultz, 1975).

The impact of globalization is more ambiguous. Some, such as the World Bank, argue that a liberalised Africa can follow the example of the East Asian countries and enjoy growth based on manufactured exports. Manufacturing is likely to require more education than agriculture. Studies of agricultural productivity typically find primary rather than secondary education to be important whilst for non-agricultural wage employment in Africa post-primary is more important. Consequently, if globalization promotes the development of African manufacturing, this should lead to a rise in the return to education. However, Africa has benefited much less than other developing regions from the increase in manufactured exports in the last two decades. Others, such as Adrian Wood at the University of Sussex, argue that Africa’s much lower endowment of skilled labour relative to land gives it a similar comparative advantage in agriculture rather than manufacturing (Wood and Berge, 1997). In a simple Heckscher-Ohlin model where skills and land are the only factors, international trade would reduce the return to education in a land-intensive region such as Africa. Wood argues that increases in the skills of Africa’s workers by improved education is a pre-requisite to strong growth of manufactured

Rates of Return on Educational Investment from Micro Studies

The conventional wisdom is that there is a high rate of return on primary schooling. This view is based largely on surveys of rate of return studies by Psacharopoulos. In the most recent of these surveys, (Psacharopoulos, 1994), the social rate of return on primary education in sub-Saharan Africa was estimated to be 24 per cent, for secondary education it was 18 and for higher education 11 per cent. Private returns were higher at 41%, 27% and 28% respectively. However, this view has been persuasively challenged by Bennell (1996). Bennell makes two points. First, the original sources do not support Psacharopoulos’s estimates. Second, that in so far as it ever was true, “*the conventional rate of return on education patterns almost certainly do not prevail in sub-Saharan Africa under current labour market conditions*” (p.195). That this second objection is possibly correct is suggested by the survey of the Mincerian returns to education in sub-Saharan Africa in Appleton, Hodinott and Mackinnon (1996) reproduced as Table 6. The average (private) returns to education suggested by their survey are substantially below those presented in Psacharopoulos (1994). This is true for both primary and post-primary schooling, although the latter still appears to have substantial returns.

More recent evidence is available. Data has been collected over three years for a panel of firms within the manufacturing sectors of the Cameroon, Ghana, Kenya, Zambia and Zimbabwe over the

Table 6

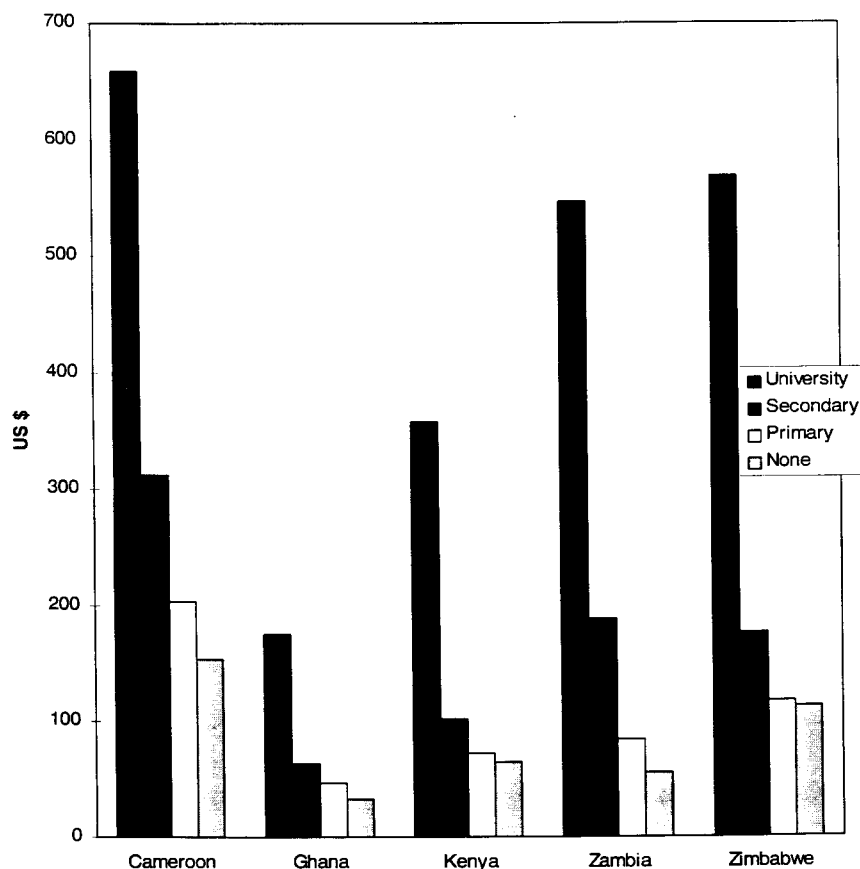
period 1992-1995, Bigsten et al (1997). The sectors within the manufacturing sector were chosen so as to be as similar as possible across the countries. At the same time as the firms were surveyed a parallel interview was carried out for a representative sample of the workers in the enterprises.

In Table 7 the data is presented for the earnings for each educational category by country in US dollars. At the university level there is a fairly narrow range for three of the countries, Cameroon, Zambia and Zimbabwe, which widens steadily as the education level falls. For all educational levels wages in Ghana are substantially below the other countries. A university completer in Ghana earns less than a primary school completer in Cameroon. In broad terms we observe a wide spectrum of earnings with workers in Ghana at the bottom. In Ghana an employee who has completed primary school earns US\$47, which is well below wage levels for rural workers in Chinese enterprises, Knight, Song and Huaibin (1997). The differential across countries is not identical for all the educational categories. The table also presents Mincerian rates of return to education (Mincer, 1974). The assumption which underlies the Mincerian interpretation is that, for each educational level, the only costs are opportunity costs: the wages forgone whilst acquiring education. The measure omits pecuniary costs (including those born by the government) and so will tend to over-estimate the returns, particularly at the university level. However, at the primary level, the assumption that wages are forgone by attending school may be incorrect and cause the returns to be under-estimated. As with the estimates in Table 6, the rates of return to education rise with the level of education. The rates of return on university education are very much larger than those at lower levels. As Figure 3 shows the increments in earnings from completing either primary or secondary are dwarfed by the rises that accrue to those with university education. These high earnings may partly reflect the ability of those with higher qualifications to work abroad, a problem which has been identified as a brain drain, see Box 3.

There are several reasons why the returns to education presented in Table 7 may be based on coefficients that are biased. The years of schooling are measured assuming no repetition (see Behrman and Deolalikar, 1991). Biases may also arise as we have not allowed for selectivity. Those who work in the manufacturing sector are highly atypical. Secondly, such educational measures cannot distinguish between signalling and credentialism as alternatives to the human capital interpretation. The signalling explanation for the findings suggests that education is associated with higher incomes because those with higher education have more ability. Education signals ability. The credentialist view is that institutional wage structures reward those with qualifications: it is qualifications that are rewarded rather than the skills the qualifications are meant to reflect. Thirdly, it is known that parental background can play an important role in educational choice. The sample is limited to those in manufacturing, and it was not possible to use variables measuring ability or information on parental background. To see if these factors indicate that the rates of return presented in Table 7 are too high it is necessary to assess the importance of these problems.

A recent study examining some of these issues for Ghana is Glewwe (1996). The question that needs to be posed is as follows: if no controls are included for cognitive skills or parental background, is there evidence of significant bias in the education variable? Glewwe provides evidence that there may be some upward bias. If selectivity is allowed for in the private sector earnings function then the coefficient on years of schooling becomes insignificant. Glewwe then calculates the rate of return on education based on the measures of cognitive skills available for his data set. He finds a figures of 4 per cent, for an individual aged 25, which compares with a rate of return of 7 per cent from the earning function. If a years of education measure is used in the earnings function for the data in Table 7 the return to education for Ghana is 6 per cent. Thus the evidence from Glewwe (1996) suggests there may be some bias in an upward direction.

Figure 3: Monthly earnings in five African countries by education in US\$, 1992-1995



Four studies which have information on parental background are Behrman and Wolfe (1983), Lam and Schoeni (1993), Heckman and Hotz (1986) and Kingdon (1997). The conclusion, which is uniform across the studies is that the inclusion of parental background reduces the returns to schooling by about 20 per cent. Again this is evidence that the estimates presented in Table 7 may be upwardly biased. A recent study which uses a panel data set of twins to estimate the returns to school quality, Behrman, Rosenzweig and Taubman (1996) finds that controlling for family background does affect the assessment of the returns from school quality but has only very marginal effects on the returns to schooling coefficient. A study which has very detailed information on cognitive skills and parental background is that of Knight and Sabot (1990). Their study uses comparative data drawn from workers in the manufacturing sectors of Kenya and Tanzania. They argue that the returns of education variable is picking up human capital formation. While signalling may play some role, it is not the primary reason years of education determines earnings.

The conclusion we would draw is that the evidence suggests that the education variable may overstate the returns to human capital, but not by very much, and that the major influence of years of education on earnings is through its effects of cognitive skills and not, as the signalling explanation would

Box 3: Human capital flight from Africa

“There has been an amazing brain drain from Africa. The rest of the world has benefited from this, but it has not been to the benefit of Africa” (Jaycox, 1993, p.73)

Data on the extent of the flight of the most educated Africans from the continent is provided by census data from industrialised countries. In the UK, there are 134,500 Africans: 14,500 have first degrees and 4,600 have advanced degrees. Of all the ethnic minorities in the UK, Africans the largest percentage with recognized educational qualifications (Owen, 1993). More generally, it has been estimated that *“about 100,000 foreign experts work in Africa, whilst some 100,000 skilled Africans work in Europe and North America”* (Williams, 1994) These skilled Africans are typically doctors, research scientists and university teachers. Such an exchange of labour has positive aspects, but in general the emigration of many of highly educated from Africa is of concern given the scarcity of such people in the continent. Although governments pay for most of the cost of higher education, the emigration of graduates means that their countries do not benefit from these investments. Often these graduates are replaced by hiring in expatriates at great cost (typically, higher wages are necessary to induce people to work in foreign countries).

Most of the “brain drain” occurs when Africans leave to study abroad. Consequently, improving higher education in Africa would go some way to reducing the problem (it would also make leading scholars less likely to emigrate). Increasing the extent of cost recovery in higher education would help pay for such improvements and would also reduce one major reason for being concerned about the “brain drain” (namely, that Africans are paying for the education of people who will work in other countries). Introducing a system of “bonding” students, so that they would have to pay back the cost of their studies if they emigrate might be an alternative or additional solution (Bhagwati and Partington, 1976). Many of the most internationally mobile professionals work in occupations where the state is the main employer (eg medicine, research, higher education) Such jobs may often be underpaid. Given the willingness of many industrialised countries to accept highly skilled Africans as immigrants, such workers are effectively in an international labour market and can command international rates of pay. Even if they do not emigrate and remain in government employment, underpaid professionals may put their energies into consultancy work for international agencies or establish their own businesses, at the expense of their main employers. African governments may be unwilling to pay higher rates because they cannot afford commensurate increases for less skilled workers. However, such differentials may be necessary if top African professionals are to stay in the continent and work efficiently for the government.

imply, indirectly through signalling ability. Even if the biases are more significant than the empirical evidence currently suggests, it is not clear that they would explain, or mitigate, the non-linearity in the returns to education. The conclusion, that the returns to education are modest, is one common to other studies. Freeman (1986, p.377) notes that “every study also finds that, by itself, years of schooling explains a relatively small part of the variance of log earnings, say 3-5 percent at most”.

In Table 7 the pattern is similar across all the countries, the rate of return falls with the level of education. What might account for this pattern? The returns to primary and secondary school completers obtain mainly through gaining employment in the formal sector. In the context of Africa such jobs have declined in the last decade. This decline has occurred in the context of the rapid expansion of education and very low growth rates of physical capital. In such a context low rates of return on education might be expected.

Table 7: Manufacturing workers' earnings (monthly in US\$) by Education

	Cameroon	Ghana	Kenya	Zambia	Zimbabwe
Completed University					
Earnings	659	175	358	547	569
Education (years)	19	19	16	16	16
Rate of return	38	29	43	65	37
No. of observations	130	40	59	107	33
Completed Secondary					
Earnings	312	64	102	188	176
Education (years)	15.5	14.6	11.5	12.8	11.2
Rate of return	4.4	8.2	3.4	7.4	6.1
No. Of observations	723	524	1,215	899	651
Completed Primary					
Earnings	203	47	72	84	117
Education (years)	7.3	10.1	8	8.7	8
Rate of return	3	2.8	2.4	4.9	2
No. of observations	674	1,838	1,384	1,244	959
Incomplete primary					
Earnings	154	33	65	55	112
Education (years)	2.1	na	4.2	3.6	4.4
No. of observations	128	155	475	221	317
All					
Earnings	283	52	88	139	143
Formal Education	11.2	10.6	8.9	10.0	8.6
No. of observations	1655	2557	3133	2471	1960

Source: Bigsten et al (1997). In the case of Ghana the number of years attended school for those who did not complete primary education is not available. Rates of return are Mincerian, calculated as percentage per year of schooling.

Productivity effects of ill health and malnutrition

Less research has been done on the returns to health and nutrition than on the returns to education. This is partly because the non-monetary aspects of these returns - greater longevity, reduced suffering and absence of disability - are arguably more central than in the case of education. Attempts have been made to put financial values on these non-monetary outcomes, but the judgements involved are complex and subject to considerable controversy. More promising are attempts to assess the cost-effectiveness of various interventions in improving particular health indicators (see, for example, the analysis of cost-effectiveness in terms of "disability life years" in the World Development Report, 1993). Here we consider some of the direct economic costs of ill-health in terms of reduced labour productivity. Possible indirect effects, in terms of lower investment in the quality of future labour, will be considered next.

Labour supply is adversely affected by illness in various ways. Most directly, days of work are lost when workers fall ill. Table 8 reports estimates of the cost of this using data from the Living Standards Measurement Surveys. On average, adult workers in the three African countries were ill for between 7% (in Mauritania) and 11% (in Ghana) of the 30 days prior to the surveys. Estimated income

Table 8: Expected income loss due to illness in the last 30 days, adult workers aged 20-59

Country	Expected days ill	Expected work days absent	Expected income loss (% of normal earnings)
Africa:			
Côte d'Ivoire	2.7	1.3	4.6
Ghana	3.5	1.4	11.0
Mauritania	2.2	1.6	5.2

Source: Table drawn from King and Wang (p23, 1995).

losses arising from absence due to illness range from around 5% in Côte d'Ivoire and Mauritania, to over 10% in Ghana. These losses are substantially higher than in the American countries for whom comparable figures are available.

These figures are probably underestimates, since they exclude a number of other important effects of ill-health. Often people may continue to work when ill, but with lower productivity. Healthy workers are likely to have to stop work to care for sick household members (particularly children). Invalidity and premature death may also substantially reduce labour supply. Low life expectancy and the risk of serious illness may reduce incentives to undertake longer term investments which might raise productivity.

There has been a large literature on the effects of nutritional status on labour productivity and wages. Behrman (1993) provides a recent review of the literature on two types of evidence. The first type of evidence is provided by data from socio-economic surveys which enable the association between measures of nutrition and worker productivity (or wages) to be investigated. One African study, Strauss (1986), studied the link between calorie intake and agricultural labour productivity in Sierra Leone. Care was taken to control for the simultaneity of the relationship⁶. A one standard deviation increase in calories per equivalent adult was predicted to raise farm output by 20%, compared to the 33% impact of a one standard deviation in labour input. In a study of farm productivity in Ethiopia, Croppenstedt and Muller (1997), find a one standard deviation increase in the household head's weight-for-height would increase output by 27%. The second kind of evidence is experimental: different groups of workers are given different kinds of nutritional supplement. One experiment gave Kenyan construction workers supplements of 1,000 calories per day. Since less food was consumed at home, this translated into an increase of 500 calories per day (a low-calorie supplement of 200 calories per day was almost completely offset by reduced consumption at home). Workers on the high-calorie supplement increased their productivity by 12.5% per day, a large increase (implying an output elasticity of 0.5 compared with the 0.33 estimated for Sierra Leone)⁷.

4. The Indirect Effects of Investment in Human Capital

In sections 2 and 3 education and health were treated as separate components of human capital. Here the possible linkages between them are discussed. Expenditures on education may affect health and parental education may benefit children. Health expenditures may themselves affect the value of education. These links are important for understanding the potential range of benefits which accrue to expenditures on human capital.

Effects of health on child schooling and cognitive development

Ill-health and poor nutrition may have indirect effects on labour productivity by adversely affecting schooling. Illness often leads to absence from school and nutritional deficiencies can reduce the ability to learn. Some experimental studies imply substantial benefits from particular interventions. One African example found positive effects of deworming medication on school attendance and achievement in Kenya (Jamison and Leslie, 1990). Cross-sectional evidence is more difficult to interpret but still suggestive. In Ghana, one econometric study attributed delayed primary school enrolment to low height-for-age (Glewwe and Jacoby, 1995). A study of Kenya found no effect of height-for-age on children's school performance (Sigman, Newman, Jansen and Bwibo, 1989). However, calorie intake did affect school performance by affecting time off task for girls. Ill-health inhibits school attendance; this may be true of the ill-health of other household members as well as morbidity of the pupil herself. Adult mortality - such as that from AIDS - is likely to pose grave threats to the schooling of bereaved children (Ainsworth and Koda, 1993). In Box 3 the general issues raised by poverty and human resources are discussed.

Effects of education upon health and nutrition

One indirect effect of expenditure on education may be its effects on health. Within developing countries, the children of educated parents face lower risks of premature death. This is apparent from analysis of both the World Fertility Surveys and the subsequent Demographic and Health Surveys (Hobcraft, 1993). Parental education is also associated with better child anthropometric status (weight and height), although the association is less marked than that with mortality. However, in socio-economic surveys, educated parents are often more likely to report that their children have been ill. This suggests that educated parents are better at recognising medical problems in their children.

Part of the association between parental education and child mortality may work via household income. However, the independent impact of education in models which carefully control for income shows this cannot be the only transmission mechanism. Indeed, many studies have found education to have a stronger direct effect on child health than income.⁸ The direct effect of education may be informational. In Uganda, recent work found educated mothers to be better informed about various diseases and that such information was strongly associated with lower child mortality (Mackinnon, 1995). Similarly, in Morocco, mothers' education appears to improve child anthropometric status by providing cognitive skills which increase knowledge about health (Glewwe, 1997). In Côte d'Ivoire and Kenya, educated mothers are more likely to send sick children for treatment (Appleton, 1992).

Effects of education upon fertility

Whether and how government policy should affect fertility is a controversial ethical issue. However, the UN International Conference on Population and Development in Cairo in September 1994 highlighted the importance of enhancing female education as part of a successful population policy. More educated women commonly tend to have smaller families, although this is less marked in Africa than elsewhere. Perhaps the best evidence on the relationship between fertility and female education in Africa is that provided by the Demographic and Health Surveys (DHS) carried out in the late 1980s. Table 9 provides descriptive statistics on the differentials by education in total fertility rates of women aged 15-49 in fourteen African countries. Women with primary education tend to have fewer children in most countries, but the relationship is weak. By contrast, women with post-primary education have markedly fewer children. These associations persist even after controlling for other variables (Ainsworth, Beegle and

Table 9: Total fertility rates for women aged 15-49 by education

	Year	None	Education Primary ^a	Completed Primary	More than Primary
Tanzania	1991-92	6.5	6.4 ^b	6.0	4.2
Uganda	1988-89	7.7	7.2 ^b	7.3	6.7/5.1 ^c
Burundi	1987	6.8	7.2	-	5.5
Mali	1987	6.8	6.2	-	n.a.
Niger	1992	7.5	6.3 ^d	-	-
Nigeria	1990	6.5	7.2 ^b	5.6	5.1/4.2 ^c
Kenya	1993	6.0	6.2 ^b	5.0	4.0
Ghana	1993	6.7	6.1	-	4.7/2.9 ^c
Togo	1988	6.8	5.7	-	4.5
Zambia	1992	7.1	6.8	-	4.9
Zimbabwe	1988	7.0	6.0	-	3.8
Senegal	1992-93	6.5	5.7	-	3.8
Cameroon	1991	6.2	6.4	-	4.5
Botswana	1988	6.0	5.2 ^b	4.6	3.3

Source: DHS country reports, as presented in Ainsworth, Beegle and Nyamete (1996).

n.a. Not applicable

- Not reported.

a. Unless otherwise noted, primary refers to any primary schooling, including completed primary.

b. Incomplete primary.

c. First figure is for lower secondary school; second for upper secondary school.

d. Any schooling (primary or more).

Nyamete, 1995)⁹. In half of the countries, there was no significant association between primary education and fertility after controlling for income, age and a few other variables. For the other half of the countries, there was a significant negative relationship but it was less strong than with secondary schooling. By contrast, there was a universally negative relationship between fertility and female secondary schooling. The effects of higher secondary schooling (11 years of schooling or more) were 2-4 as large as those of lower secondary schooling. Husbands' education also had a negative effect on fertility where it was significant, although the effect was weaker than that of wives' education. Education appears to reduce fertility more in the DHS data than in the earlier World Fertility Surveys carried out in the late 1970s (see UN, 1987). Although this may partly be accounted for by methodological differences in the data analysis, this seems to reflect a genuine change over time. In particular, amongst women in the older cohort (aged 35 and over) of the DHS, schooling of less than eleven years was seldom associated with lower fertility.

The associations between female education and fertility are likely to be, at least partly, causal. Educated women may be able to obtain higher wages, increasing the opportunity cost of time spent rearing children. They may also have a preference for more educated children, making it more expensive to have large families. Education may also change knowledge of and attitudes towards the use of modern contraception. However, there is a simultaneity between female education and fertility. In most countries, child-bearing and school attendance are incompatible, so girls face a choice between staying on at school and marrying young. This may partly explain why higher secondary schooling has such a large impact on fertility, since the age of students often coincides with the typical age at marriage in many African countries.

Box 4: Poverty and Human Resources

Poverty can prevent households from making high return investments in the human capital of their children. The poor may not be able to spare their children - particularly their girls - from household work in order to go to school. A study of gender differences in performance in the primary-leaving examination in the Cote d'Ivoire found that the difference arose due to the under-performance of girls from poor households. This may reflect the demands on the time of girls in poor households. In their last two years of primary school, girls from the poorest 25% of households reported spending 16 hours a week in school and 15 hours on housework; in the most affluent 25% of households, the figures were 27 hours and 7 hours respectively (Appleton, 1995a). Poor households may also not be able to afford the monetary costs of health care and education. These costs may help explain why the benefits of post-primary schooling accrue mainly to the non-poor. A beneficiary assessment of social sector spending in Tanzania found the poorest and most affluent quintiles received 19% and 18% respectively of expenditure on primary schooling; but for secondary schooling, the poorest received only 8% and the most affluent received 36%. All university expenditure was estimated to accrue to the richest 20% of the population (World Bank, 1995). However, non-monetary factors are also important: lack of parental education is often found to be more critical than a lack of income per se in determining child health, performance at school and eligibility for post-primary education.

Household surveys provide useful evidence on the distribution of investments in human capital. For example, survey data for Cote d'Ivoire in 1985 showed net primary school enrolment rates for boys to be 32% amongst the poorest 10% of the population but 66% amongst the non-poor (defined as the top 70% of the population). For girls, the corresponding figures were 22% and 54%. Interestingly, girls from poor households appear to have suffered more from the country's economic decline in the 1980s: by 1988, net primary school enrolments for girls in very poor households had declined to 17% whilst amongst the non-poor they had risen to 57%. Male primary school enrolments rose in non-poor households and remained constant in very poor ones. Poverty was also strongly correlated with use of curative and preventive health care, although here gender differences were less marked. In 1985, 31% of very poor males consulted a doctor or nurse when sick; amongst the non-poor the figure was 51% (Grootaert, 1994). By 1988, the inequalities had widened, with the corresponding proportions being 19% and 53%.

Poverty profiles of African countries invariably find rates of poverty decline sharply with the education of the household head. For example, in Nigeria in 1992, 39.5% of people in households with uneducated heads were poor; for those living in households with secondary school educated heads, the poverty rate was only 23% (World Bank, 1996). Education reduces poverty partly by giving access to high return formal sector employment and to higher wages within such employment. However, there is evidence that education and nutrition also raise productivity in farm and non-farm self-employment, activities in which the poor are concentrated.

Effects of education upon child schooling and cognitive development

Children are typically more likely to go to school if their parents are educated. They also tend to perform better in school and in some cases may earn higher incomes in adulthood. For example, a study of Kenya and Tanzania compared the probability of manufacturing workers having completed lower secondary schooling as a function of the education of their parents. In Kenya those entering school around 1960 were predicted to have a 21% chance of completing lower secondary if both their parents were uneducated and an 83% chance if one of their parent had at least secondary education and the other at least primary education. The figures were similar Tanzania. Since most secondary schools at that time were state schools, where access was rationed by performance in the primary-

leaving examination, these figures also suggest large differentials in academic performance by parental education. More recent research drawing upon data from Kenya in 1993, also found a large differential in performance on the primary-leaving examination - around half of which was explained by the different local neighbourhoods and primary schools which children from different educational backgrounds attended (Appleton, 1995b).

These results suggest that educating one generation will have favourable effects both on the cognitive skills and the health of the next. They also imply that there may be a “ratchet effect” to educational expansions: parents may be reluctant to see their children obtaining less education than they received. Investments in health also have long-term dynamic intergenerational effects, which are partly biological. Consequently, a mother’s nutrition affects the health not only of her children, but of her daughter’s children. Compared to much physical capital, human capital is long-lived and more irreversible: if people are not given adequate nutrition, health care and education in childhood, this will have consequences that cannot be remedied in adulthood. For these reasons, investments in human capital cannot be put off until economic conditions are better.

Conclusion

Africa has made large strides in raising literacy and school enrolments and improving health. However, in the case of both education and health these gains are lower than those in other developing countries. The percentage of the population over 15 which had completed primary school in 1990 was 25 per cent in Africa as compared with 32 per cent in South Asia. At the secondary level the gap is larger with only 4 per cent of the population over 15 having completed secondary school. The comparable figure for South Asia is 10 per cent, for East Asia it is 50 per cent. Life expectancy on the continent is now 8 years below that in South Asia. Within the overall average for Africa there is great diversity. The health and education of people in some African countries is far lower than would be expected from their income. The nature and extent of this diversity is examined.

Human capital is only one factor in accounting for differences in growth rates across countries. While low starting levels of human capital may have hindered Africa’s economic growth, its poor performance cannot be attributed to a lack of subsequent investment in human capital. A more important proximate cause is the low level of investment in physical capital. Low rates of investment in physical capital have implications for the rates of return on human capital, particularly education. The conventional wisdom that the rates of return to education are very high is shown not to have held in the context of many African labour markets in the 1980s and 1990s. If human and physical capital are complements then the policy problem is enabling them both to grow rapidly. Returns to human capital investment depend on the success of policies in promoting the growth of physical capital. There is evidence from micro studies that the income returns to education reflect the effects of education in raising productivity. These effects have been observed for both industry and agriculture. For industry it is the secondary level which is important while for agriculture it is primary education. Less research has been done on the productivity effects of health and nutrition in Africa. The limited evidence is consistent with conclusions from other developing countries that these effects may be substantial. The role of human capital in Africa’s economic development is complex. Inadequate investment in education and health are clearly not the only cause of Africa’s economic difficulties. However, the poor health and education of Africa’s workers is one factor explaining her low income. Government investment in the social sectors is likely to be economically productive and indeed is likely to bring more direct benefits to the people than many other forms of government expenditure.

Government investment in both education and health may be particularly important as there are indirect benefits of such investments which individuals may not allow for in their investment decisions. Social rates of return may substantially exceed private rates.

Child illness and malnutrition inhibit attendance and performance in school. There are long term effects of educating one generation on the welfare of their future children. Africa's earlier investments in schooling mean that many more African parents are educated. This is lowering child mortality, reducing the number of births and helping to maintain school enrolments despite falling incomes. The long-term intergenerational effects of health and education are an important reason for promoting social sector investments despite tight current fiscal constraints. To this should be added the irreversible effects of failing to make such investments. Once a generation of children are exposed to life without adequate health care, nutrition or schooling, there is little that can be done during their adulthood to reverse the damage. Perhaps the main conclusion of this paper is paradoxical. Despite the many and complex interlinkages between human capital and economic development, the policy debate might benefit from a greater delinking of the two. The optimists are wrong to believe that investing in human capital will be sufficient for growth. The pessimists are equally wrong to argue that investments in health and education must wait for growth.

Notes and References

1. Note that indicators of educational attainment tell us little about the quality of education received and the extent of the skills retained by individuals. Literacy statistics do provide some basic information, but are limited both because of their binary nature and the fact that they are often self-reported. Rates of enrolment at educational institutions tell us nothing about what students learn at these institutions.
2. Unless stated otherwise, the data used in this section comes from UNDP (1997). The core sample of African countries used is fifty-one, the major exclusions - due to lack of data - are Liberia and Somalia. The South Asia statistics exclude Afghanistan. For some particular statistics, information is only available for a subset. Most statistics refer to the early 1990s, typically 1994. Where aggregates are given for Africa, these are population weighted. For conciseness, not all statistics referred to in the text are provided in the tables - additional figures are available from the authors upon request.
3. Female life expectancy relative to male life expectancy is also higher in Africa than in South Asia. Since females can be expected to live longer on biological grounds, it is still possible that there is "excess female mortality" in Africa (see the debate between Klasen, 1996, and Svedberg, 1996). Nonetheless, even if there is, it is not on the scale of the excess female mortality observed in South Asia.
4. Where predictions of a variable are made on the basis of income, they are based on a linear regression of the variable on GDP per capita (and its square, if statistically significant). The regressions are purely descriptive, making no allowance for simultaneity or non-income determinants.
5. There are conditions under which the rate of return gives incorrect signals for the best investment, see Dinwiddy and Teal (1996). However, these particular conditions are unlikely to hold for educational investment.
6. Nutritional status may be expected to raise income, but one must be careful about reverse causality - higher incomes should also improve nutritional status.
7. The study is subject to limitations: it covered only 47 workers; there was high and probably selective attrition; and the results were only significant at the 7.5% level.
8. See Deolalikar (1996) on Kenya; Sahn (1990) on Ghana; Alderman (1990) on the Côte d'Ivoire and Mackinnon (1995) on Uganda.
9. Variables controlled for are: age, age squared, area of residence, ethnicity, religion, ownership of durable goods and quality of housing. Some of these controls may be inappropriate: for example, education is likely to raise the ownership of durable goods and the quality of housing; it may also change the area of residence.

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