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**RETURNS TO EDUCATION AND EXPERIENCE IN GHANA, 1987-1999**

**Evidence from four rounds of the Ghana Living Standards Survey**

by

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**Abstract**

The study compares schooling, experience and labour market outcomes in a sample of over 20,000 Ghanaians aged 15 to 65, who have been interviewed during four rounds of the GLSS and who represent the labour force as a whole over the period 1987-1999. Estimates of the coefficient of the years of schooling in a standard human capital model are combined with data on public and private schooling expenses. We find an average social rate of return (ROR) to basic education as low as 3 per cent, while the social ROR to secondary and tertiary schooling is 16 and 3 per cent, respectively. With estimates of 6, 25 and 15, the private ROR are higher, especially for tertiary education. As regards experience, estimates suggest positive and gradually decreasing returns. The first year of experience is estimated to increase earnings by around 5 per cent, while additional experience gradually yields less until earnings reach a peak around 35 years of experience. The results suggest that educational sector reform in Ghana be highly concerned with improvements of basic education, with the upholding of the quality of secondary schooling, and with opportunities to increase the share of private expenses in secondary and tertiary education.

## 1. Introduction

Improving education has long been recognized as a key component of equitable development strategies to raise living standards and welfare. The positive relationship between education and income has been well established, both theoretically and empirically. Because education presumably is a main vehicle for the provision of skills to the labour force, and skills are essential for labour productivity, it is common to ascribe differences in individual earnings to differences in the level of education<sup>1</sup>. Besides its immediate impact on the productivity of individual workers, education also has many positive external effects. It gives access to information, it helps farmers to adopt improved seeds, fertilizers and cultivation techniques, it enhances industrial workers to better operate machines, it allows mothers to better feed their children, and so forth.

Accordingly, it can be argued that higher investment in education can contribute a lot to economic growth and development. Governments, particularly, in developing countries, therefore, devote substantial resources to their educational sector. In 1995, for instance, public spending on education accounted for about 16% of total government spending in developing countries.

The expenditures in education, like investments in other sectors, can be evaluated approximately with the help of rates of return. Additional earnings expected from additional education on the one hand can be compared with the cost of education on the other. Estimates of rates of return to education, particularly, for sub-Saharan Africa, vary widely and have been criticized, particularly, for their methodological weaknesses and their poor quality of data used. According to Bennell (1996) these factors undermine the credibility of the high returns reported in some studies and the low returns found in other. In the case of Ghana, for instance, studies have come out with conflicting findings. The high returns to education reported in Psacharopoulos (1985, 1994) and Canagarajah and Thomas (1997) contrast to those found in Glewwe and Twum-Baah (1990), who find few returns to being educated in Ghana for those employed by Government.

As regards the estimation methodology, difficulties can be illustrated directly from the definition of the rate of return to schooling. The rate is defined as the discount rate that equates the costs incurred in an additional year of schooling to the present value of the stream of additional income. Thus, estimation would require the quantification of all cost and all income associated with more schooling. Individual earnings are commonly used as the income indicator, while the current cost of schooling is considered indicative of the past cost of schooling of the current labour force. The positive externalities of education in one part of the population on earnings and living standards in other parts is usually ignored and indeed difficult to quantify and estimated rates of return can be biased downwards accordingly. As regards cost, one can distinct private from public cost and reliable data for either of the two are usually hard to find, as is the case with earnings data. When only the private expenditure for educational materials, clothing and school fees are considered, one could give the label private to the rate of return. When both private cost and Government subsidies are included, the label social is sometimes given to the rate of return, though externalities from schooling are not accounted for (Psacharopoulos et al, 1994; Chiswick, 1997; Gundlach, 1999).

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<sup>1</sup> It must be mentioned that segmented and incomplete labour markets can also contribute to differences in earnings. For example, when practised trade, profession or access to Government jobs is affected by gender, ethnicity or family background, then these factors will also contribute to earnings differentials. Also, the presence of trade unions can contribute to wage differentials between workers of similar educational attainments.

One scarcely finds studies that distinct between private and social cost of education, between women and men, between one year and another, and between the different levels of education. Yet, such a distinction is useful since it gives bases for future policy formulation about priorities for improving the quantity, the quality and the focus of educational services and for sharing the financing from private and public resources. Ghana is a case in this respect and education expenses account for an increasing share of both private and government total expenditure. The recent introduction of the functional literacy and other programs to reduce the literacy rate in Ghana, for instance, has led to a surge in government expenditure, particularly, during the last three years, from 14% in 1997 to 16% in 1999. Similarly the recent massive increases in fees and other charges such as user fees in tertiary institutions and boarding fees in both basic and secondary boarding schools have also led to increases in private costs of education.

This study employs new reliable data from the Ghana Living Standards Measurement Survey GLSS, to estimate the both private and social returns to education in the period 1987-1999, for different levels of education and for men and women separately. A discussion of the estimates will serve as a means to see whether the existing Government policy fits the observed pattern in returns to education in Ghana. It critically examines the private and social returns to investments in schooling as reflected in the earnings received by individuals at the various level of education.

The paper is structured as follows. After a cursory review of the literature in section 2, section 3 discusses the educational system in Ghana and relates it to labour market outcomes. GLSS data regarding education attainments and earnings are given for the period 1987-1999, as well as an indication of the costs at the various educational levels. In section 4 we present the human capital regression model, whereafter the data and estimation results are discussed in the penultimate section 5. A section on policy implications concludes the paper.

## **2. Literature review**

Because of its importance for policy formulation, the relationship between education and training on the one hand and productivity and earnings on the other hand is among the subjects that attracts the continuous interest of economists (Mincer, 1974; Schultz, 1988; Becker, 1964, 1993; Psacharopoulos, 1985, 1994; Card, 1999; Kling, 2000). Estimates consistently confirm the hypothesis of a statistically highly significant and positive correlation between education and income.

In most studies it is held that human capital investments enhance the worker's skills, his or her productivity and therefore his or her earnings. Also, more skilful workers have higher opportunity cost in self-employment activities (Vijverberg, 1995). Critics, however, argue that the documented relationship need not be causal. Education does not necessarily generate higher incomes. Instead, it has been postulated that individuals with higher ability receive more education and more income (Arrow, 1973). Thus education and income would only be positively correlated because they share a common foundation, say, individual ability. Smith et al (1998), for instance, question whether education is simply a positional good, a queuing criterion, a signal, or are people who have more education actually more productive than those with less. Jolliffe (1998) asserts that it is not so much school attendance that intrinsically increases a worker's productivity, but skills obtained while in school.

Psacharopoulos (1985, 1994) has confirmed the apparent high potential for gaining employment and higher earnings through more education and training. According to Psacharopoulos there exists, however, diminishing returns to earnings with additional years of

schooling. In his 1994 compilation of social rates of return to education he reported 24 for primary, 18 for secondary, and 11 for higher education for Africa; 20 for primary 13 for secondary and 12 for higher education for Asia; and 18 for primary 13 for secondary and 12 for higher education for Latin America and Caribbean. Accordingly, the rate of return to education would be highest for primary education, followed by secondary education, while tertiary education ranks lowest<sup>2</sup>. Moreover, this pattern of rates of return to education would remain stable in the course of a country's development with only relatively minor declines in rates of return to education. Not surprisingly, the policy recommendation is to favour primary education as the number one investment priority. These findings and policy recommendation are commonly cited in economics of education literature and in government and aid donor documents concerned with education priorities and policies. Particularly for developing countries, they have been especially influential in shaping education and vocational training policies of not only the World Bank but also governments of developing countries.

Doubts have been raised about the quality and relevance of most estimated returns to education especially, for African countries with serious data problems. For example, according to Bennell (1996), the rates of return estimates of about eight countries were all derived not from formal surveys, as is the preferred practice, but rather from guesstimates made by the authors. Recent studies have been critical about the use of such rates of return to education in guiding resource allocation decisions for public funded education and training provision. While many accept the reliance on market-based indicators such rates of return to education in achieving allocative efficiency as entirely consistent with the neo-classical development paradigm, they are also wary about the basis of correlation estimates of many reported rates of return. According to Verner (1999) many studies of wage determination report positive coefficient estimates on the age, experience or education of employees, conditional on a variety of covariates. These estimates neither imply that older workers are more productive than younger ones, nor that wages rise faster with productivity because no bridge has been made between productivity and wages (see Hellerstein et al 1996). To overcome these problems Verner (1999) suggests that wage and productivity equations be estimated jointly and thus, comparing wages and productivity for various groups of workers. Other critics have questioned the causal relationship between education and productivity or earnings. According to Ashenfelter and Rouse (1999) education by itself generates little additional income. Instead, individuals with higher ability receive more education and more income.

In the views of Bennell (1996), much of the conflicting findings about the contributions of education to income can be attributed to the poor quality of data and the methodological weaknesses of most rate of return studies, particularly so in Sub-Saharan Africa. As a result of these deficiencies, he considers many of the studies "...of such poor quality that reliance on such a permissive inclusion criterion becomes problematic". The concern about the overall quality of data is further fed by the fact that the rate of return to education studies frequently provide too little information to assess the quality of the data used in the calculations.

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<sup>2</sup> Others find little evidence for diminishing returns to education with additional years of schooling. According to Becker (1993), for instance, the diminishing returns might not exist or the returns might even possibly show increasing returns if externalities would be accounted for and rates would be adjusted upwards accordingly.

### 3. Schooling and labour market outcomes in Ghana: an overview

Since the introduction of the Accelerated Development Plan by the Nkrumah regime in 1962 the educational system of Ghana has witnessed several reforms. The latest one of 1987, for instance, changed not only the structure of the educational system but also reduced the duration of the cycles of schooling. The system of education in Ghana now consists of up to 12 years of pre-university and 4 years of university education. The new system has classified education into two basic divisions and these are the Formal and Informal divisions. Informal division largely deals with the education of adults or people not through means that are rigid and do not follow formal classroom education culminating in the award of certificates or degrees. To a large extent, informal means of education are aimed at making people either functionally literate or enable them acquire some skill or vocation.

Formal education has been recognized as the most effective way to develop the human potential. Formal education represents all forms of education that requires people to acquire education or skills through a structured system or institution recognized by the Ministry of Education. Invariably, people who pass through these centres of education are presented with some certificate of award in recognition of the successful completion of the programme, though this cannot be said of all centres. Formal education can be divided into three divisions and these are Basic Education, Secondary Education, and Tertiary Education.

**Table 1:** Schooling system in Ghana

a. Primary school	6 years
b. Junior Secondary School	3 years
c. Senior Secondary School	3 years
d. Teacher & professional training, nursing	3 years
e. Polytechnic, university	4 years
Basic education (a and b)	
Secondary education (c and d)	
Tertiary education (e)	

Note: Before the reform of 1987, the full cycle consisted of six years of primary school, followed by four years of middle school, followed by five years secondary school and two years of tertiary education.

Source: Ministry of Education

Basic education is divided into two parts, primary school and junior secondary school. This classification is recent following the restructuring of the educational system in 1987. Children are expected to complete six years of education at the primary level and a further three years at the junior secondary culminating into a nine-year basic education programme. Almost all children are expected to complete this level of education. Earlier, before the Educational Reform, there was four years of Middle school, which was after the primary school.

Secondary education lasts for three years following the nine-year basic education program of primary and junior secondary education. Having passed the Basic Education Certificate Examination (BECE) with a cumulative aggregate of not more than 24, pupils are expected to gain admission into any of the Senior Secondary schools in the country to pursue a program in Science, Arts, Home Science or Business Management. Another dimension at this level of education is the development of curriculum for other institutions, which offer vocational programs. Children who may decide to pursue a vocational program therefore need not go on to

the senior secondary school but apply to any of the vocational or technical institutes where vocations such as tailoring, cookery, etc. are taken. However, there are some senior secondary schools, which offer both secondary and technical courses. The old educational system offered five years of secondary education and two years higher school education.

Tertiary education is the third and final stage of the educational ladder where people are expected to acquire professional skills to fill the skilled manpower requirements of the country. Tertiary education in Ghana includes the universities, polytechnics, and the professional institutions (Accounting, Law, etc). Pre-university education also includes what is termed post-secondary education, which includes three-year teacher training education, three-year nursing college.

Table 2 indicates the educational attainments of the Ghanaian labour force as well as gender differences therein.

**Table 2:** Schooling level of the labour force in Ghana, by sex, 1987-1999 (%)

Sample size = 39,881		1987-1988	1988-1989	1991-1992	1998-1999
Never been to school	Women	55.4	51.0	47.1	39.7
	Men	30.8	26.8	26.3	20.4
	All workers	43.8	39.9	37.5	30.8
Attended school but no grade	Women	10.8	13.8	14.4	12.1
	Men	13.8	16.6	14.8	10.7
	All workers	12.2	15.1	14.5	11.4
Primary school	Women	14.4	15.2	14.1	15.0
	Men	17.7	17.6	16.0	15.4
	All workers	16.0	16.3	15/0	15.2
Basic education (MSLC/BECE)	Women	15.2	14.9	20.0	26.7
	Men	27.9	29.0	32.9	37.8
	All workers	21.2	21.4	25.9	31.8
Secondary school	Women	3.7	4.7	4/2	6/2
	Men	8.4	8.5	8.4	14.3
	All workers	5.9	6.5	6.1	10.0
Polytechnic/University	Women	0.4	0.3	0.3	0.3
	Men	1.5	1.5	1.6	1.4
	All workers	0.9	0.8	0.9	0.8

Note: The labour force is defined here as all persons aged 15 to 65.

Source: Computed from GLSS 1, 2, 3 and 4.

The figures show that education has generally developed positively during the survey period 1987-1999. The distribution of education attainments reveals that currently about 31 per cent of the labour force never attended school, as compared to some 40 percent some ten years ago. An additional 26 per cent only enrolled in basic education without completing it, as compared to 30 percent in the late eighties. Of the remaining 43 per cent that completed basic education, some 10 completed secondary school and less than one attained a diploma in tertiary education.

The table further shows that there is a gender bias in education. Twice as many females (about 40%) than males (about 20%) never attended school while the share that haven't attained basic education is one quarter for both. Also fewer females than males have completed the various levels of education and are particularly underrepresented in secondary and tertiary schools. With respect to basic education it seems that females have caught up somewhat during the survey period.

Table 3 indicates that earnings are generally low but are highly correlated with educational attainments.

**Table 3:** Average earnings by schooling level in Ghana, 1987-1999 (1000 cedi per year)

Sample size =21,798	1987-1988	1988-1989	1991-1992	1998-1999
Never been to school	91	107	219	893
Attended school but no grade	99	107	245	957
Primary school	80	110	240	1198
Basic education (MSLC/BECE)	106	141	310	1420
Secondary school	145	206	403	2220
Polytechnic/University	155	285	736	3517
Overall average	99	127	269	1284
Equivalent in US dollars*	550	530	660	560

\*Nominal exchange rates of 180, 240, 405 and 2300 cedis for one US\$ are taken from ISSER (1992-2000) and averaged over the two respective years of each survey round.

Source: Computed from GLSS 1, 2, 3 and 4.

Income rises with schooling and significant increases in earnings are achieved with the movement to basic education, from basic to secondary education and from secondary to tertiary education. The figures from the recent 1998/99 GLSS4 survey indicate that the increases from moving to the three educational levels are comparable and close to 60 per cent. Accordingly it is observed that there is a great dispersion, particularly, between the part of the labour force that has followed secondary or tertiary schooling and the part with little or no educational. Employees who completed tertiary education, for instance, earn on average almost four times as much as workers without any schooling and three times more than those with basic education but only 60 per cent more than those who completed secondary schooling. The increases seem to have enlarged over time with 30 to 40 per cent earnings increases from basic and secondary education in the GLSS2 and GLSS3<sup>3</sup>.

Table 4 deals with another indicator of the impact of education on labour market outcomes and illustrates that the probability of employment outside the family is generally low, but highly correlated with schooling.

**Table 4:** Probability of wage employment by schooling level in Ghana, 1987-1999 (%)  
(all workers aged 15-65)

Sample size =28,669	1987-1988	1988-1989	1991-1992	1998-1999
Never been to school	8	8	5	4
Attended school but no grade	14	16	9	6
Primary school	12	14	8	8
Basic education (MSLC/BECE)	32	35	25	17
Secondary school	56	62	68	52
Polytechnic/University	74	90	79	84
Total labour force	18	21	15	14

Source: Computed from GLSS 1, 2, 3 and 4.

<sup>3</sup> These figures are in line with those of Canagarajah and Thomas (1997), who find that workers in Ghana who have completed tertiary education earned 2.7 times more than those who never attended school.

It is noteworthy that the share of wage employment outside the family has remained consistently low during the survey period, averaging a meagre 15 to 20 per cent. However, there are notable differences among workers with different educational attainments. While those who never attended school practically all have to resort to self- or family-employment, the lion's share of those who completed secondary or tertiary schooling is wage employed.

To complete our cursory overview of schooling in Ghana, the tables 5 and 6 give an indication of the cost and financing of the various levels of schooling.

Table 5 shows that according to the GLSS4, the private contribution to schooling averaged some 145,000 cedis in 1998/1999 over all levels of education. The average ranged from slightly over 100,000 cedi paid for a year of primary schooling, to more than 400,000 for a pupil at JSS to around 650,000 and 850,000 for students at secondary and tertiary education levels, respectively. A similar pattern of private contribution to schooling is observed in GLSS1 to GLSS3.

**Table 5:** Private school expenses by schooling level in Ghana, 1987-1999  
(1000 cedi per pupil per year)

Sample size =20,835	1987-1988	1988-1989	1991-1992	1998-1999
Primary	5	7	13	108
Junior Secondary	19	28	42	407
Senior Secondary	35	35	90	658
Tertiary	13	56	116	867
All pupils/students	6	8	16	145

Source: Computed from GLSS 1, 2, 3 and 4.

Spending on education accounted for about 20% of total government expenditure or 4.3% of GDP in 1991/1992. This compares favorably with the average of developing countries, but falls far below that of OECD or Latin American countries (Robbins, 1994). On the basis of table 6 we estimate private spending in Ghana to cover a good half of total recurrent expenditure on education in 1991/1992. This is relatively high considering that education is said to be free in Ghana and considerably higher than the average of 13% in OECD countries. An analysis of the table reveals that the relative public contribution per student is by far the highest at the tertiary level, followed by the basic level, while the sharing of the cost of secondary schooling shows a much higher proportion of private expenses as compared to public recurrent cost. This uneven bias of Government subsidies in favour of tertiary education exceeds the one in OECD and NIC countries.

**Table 6:** Cost and enrollment by schooling level in Ghana, 1991/1992  
(1000 cedi per pupil per year)

	Public*	Private**	Total expenses	Enrollment (in 1000)
Basic education	19	23	42	2,617
Secondary school	44	89	133	236
Tertiary school	412	116	528	22

\* Average recurrent cost

\*\* Weighted average (13,000 and 42,000 for a year of primary and JSS, respectively).

Source: Ministry of Education (public expenses and enrollment)

Table 5 (private schooling expenses).

#### 4. The human capital regression model

The literature is full of models purporting to describe the relation between education and earnings and compute the returns to investments in education. However, all these can be seen as variations of two types of models, namely the screening or credentialist model and the human capital model. The screening model (Arrow, 1973) uses the unobserved innate ability as the true productive asset of workers. Education screens workers and provides information to ranking them according to innate productivity. Education is then merely an instrument to rank workers. Accordingly in the pure screening model, education does not impart productive skills to workers. Underlying the credentialist model is the assumption that workers are paid not on the basis of their actual productivity, but on the basis of attained years of education or degrees. Like in the screening model, education just conveys information about the underlying abilities, persistence and other valuable traits of people<sup>4</sup>.

The human capital model HCM, pioneered by Becker (1964, 1993) and Mincer (1974), has been the most widely used model to estimate the rates of return to education. Applications produced evidence of high rates of return to investments in education, particularly, primary education in most developing countries (Psacharopoulos, 1994; World Bank, 2000). According to the theory, given that wage earners are paid their marginal product and that this marginal product rises as more human capital is accumulated, it is possible to estimate rates of return to additional years of schooling from earnings data among persons who have different levels of education.

Letting  $E_s$  be the annual earnings of a worker who has had  $s$  years of schooling,  $C_s$  the cost of the  $s$ -th year of schooling, and  $r_s$  the rate of return to the  $s$ -th year of schooling, we can write the HCM as

$$E_s = E_{s-1} + r_s C_s = E_{s-1} (1 + r_s K_s) = E_0 \prod_{t=1}^s (1 + r_t K_t) \quad (1)$$

where  $K_s = C_s / E_{s-1}$  represents the cost of the  $s$ -th year of schooling relative to a full year's earnings if investments were not made in that level of schooling. By taking the natural logarithm of both sides and using the approximation  $\log(1+x) \approx x$  for small values of  $x$ , equation (1) can be approximated as

$$\log (E_s) = \log (E_0) + \sum_{t=1}^s r_t K_t \quad (2)$$

It is common to group education into certain cycles of length  $S_j$  with  $\sum_j S_j = s$  (where, as before,  $s$  denotes the total years of schooling of a worker). Accordingly, when the relative investment cost and the rate of return are assumed to be the same during the  $j$ -th cycle, equation (2) can be rewritten in terms of the rates of return  $r_j$  by type of schooling, rather than by every separate year  $r_s$ .

$$\log (E_s) = \log (E_0) + \sum_j r_j K_j S_j \quad (3)$$

Accordingly,  $r_j K_j = \partial \log (E_s) / \partial S_j$ , and, when  $K_j = 1$ , a regression of the logarithm of earnings on the years of schooling of the different types gives an immediate estimate of the rate of return to schooling  $r_j$ . When all years of schooling are presumed to be of the same type (i.e.,  $r_j = r$  and  $K_j$

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<sup>4</sup> The hiring strategy implied by the screening or credential model seems risky. The hiring through credentials only might be less efficient than a recruitment that also tries to look at actual productivity. This may impair on profits and on staying in business in the long run (Becker, 1993).

= K), the equation (3) converts into the HCM in its simplest form. A regression  $\log (E_s) = \log (E_0) + b s$  then gives a first indication of the average rate of return  $r$  of a schooling system for a given value of the relative investment cost  $K$ <sup>5</sup>.

The estimation of simple earnings functions has done a surprisingly good job as a first assessment of the rate of return to schooling. Nonetheless, many extensions and modifications have been proposed, both from a theoretical point of view, and depending on the focus of study and the availability of data. In particular, since the seminal study by Mincer (1974) showed that the estimate of the rate of return is biased downward if experience is left out of the equation, it is common to include the years of experience and its square as explanatory variables that affect earnings. Therefore, a common specification of the constant term of equation (3) reads

$$\log (E_0) = \log (E_{00}) + a_1 A + \frac{1}{2} a_2 A^2 \quad (4)$$

where  $A$  denotes the years of experience of the worker and  $E_{00}$  is an estimate of annual earnings without schooling and without experience.

As noted by Chiswick (1997), the interpretation of the coefficient of schooling in the earnings function warrants careful attention. For example, one would like to separate the private rates of return from social rates of return to education to allow analysis of efficiency and equity considerations with regard to allocation of private and government resources in education. In other words the distinction between public and private rates of return centres on those who bear the cost of financing the investment in education. Another aspect of schooling that can be informative for policy formulation is the distinction between men and women. A final distinction regards the stratification of the sample, for example into self-employed and wage workers. The idea is that schooling has both a direct effect on the productivity of a given activity, and an indirect effect on the type of activities that a worker is involved in. To see how this affect the estimation of the return to schooling, suppose that we want to estimate the rate of return from a regression of earnings on both schooling and a dummy for being wage employed.

$$\log (E_s) = \log (E_0) + b_1 S + b_2 OCC$$

where  $OCC=1$  if a worker is wage employed and zero if self-employed or a family worker. The rate of return  $r$  is no longer solely dependent on the coefficient  $b_1$  as in equation (3) where  $r = b_1 / K$ , but also on the coefficient  $b_2$  and the effect of schooling on the probability to be wage-employed. Accordingly,  $r = [ b_1 + b_2 \partial OCC / \partial S ] / K$  would be an appropriate estimate of the rate of return to schooling. Unless  $K = 1$  and either  $b_2 = 0$  or  $\partial OCC / \partial S = 0$ , the coefficient  $b_1$  of the years of schooling is a biased estimate of the rate of return to schooling  $r$ . Still,  $b_1 / K$  provides a lowerbound that would prevail if schooling does not affect the type of employment. A like bias is implied by the inclusion of any variable that is likely to be affected by the schooling level, such as for example variables for living in higher income area. Schooling not only affects earnings in the current job and the current locality, but is also likely to increase probability to migrate to more remunerative jobs and to localities with more opportunities.

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<sup>5</sup> Following the empirical literature (Willis, 1986), the HCM in its simplest form can be linked to a model of a worker who maximises the present value of utility defined as  $u = \log (E) - c$ , where  $c$  is the cost of education. The (log-)linear specification  $\log (E) = a + b s$  and  $c = c_0 + r K s$ , then implies  $b = r K$  so that the estimated effect of schooling is an immediate estimate of the ROR at given relative investment cost  $K$ . Non-linear specifications complicate the interpretation of the coefficient of schooling, see for example Kling (2000) for an application with cost of education increasing quadratically with school length. Here we assume piece-wise linearity by considering the distinct schooling levels.

## 5. Data and estimation results

The analysis uses data from the Ghana Living Standards Survey (GLSS), a nation-wide household survey carried out by the Ghana Statistical Service with technical assistance from the World Bank. The four rounds of the survey currently completed span the period 1987-1999 and contain data for over 17,000 households and some 80,000 household members. The survey is unusually rich and contains detailed information on the socio-economic characteristics of every households, including demography and income and expenditure patterns, as well as the education, health, occupation and earnings of its members (GSS, 1989, 1995, 2000).

The above mentioned educational categories comprise three cycles of education levels. The first cycle comprises 6 years of primary education, followed by 3 years junior secondary school<sup>6</sup>. The second cycle involves an additional 5 years of secondary schooling, 3 years of senior secondary school plus attendance at the teacher training and nursing training colleges. The last cycle consists of several types of post secondary education. This includes 'A' level and professional diploma of the old system, polytechnic and university education and other types of tertiary education. It can also include post-graduate education.

**Table 7:** Earnings, education and experience of the Ghanaian labour force, 1987-1999 (all workers aged 15-65 with some receipts from main or secondary job)

Sample size = 21,798		1987-1988	1988-1989	1991-1992	1998-1999
Earnings (1000 cedi)	Women	95.64	118.30	247.30	1091.02
	Men	103.17	132.90	287.84	1492.70
	All workers	99.59	126.03	267.10	1280.69
Years experience	Women	26.82	26.19	27.51	28.08
	Men	24.57	24.46	27.76	26.88
	All workers	25.64	25.27	27.63	27.51
Years schooling	Women	3.17	3.59	3.57	4.38
	Men	5.51	5.74	5.54	6.68
	All workers	4.40	4.73	4.53	5.47
Years primary school	Women	2.32	2.64	2.61	3.16
	Men	3.75	3.95	3.74	4.37
	All workers	3.07	3.33	3.16	3.73
Years JSS/Middle school	Women	0.67	0.73	0.78	1.00
	Men	1.33	1.36	1.38	1.72
	All workers	1.02	1.06	1.08	1.34
Years secondary school	Women	0.16	0.20	0.16	0.21
	Men	0.36	0.36	0.34	0.52
	All workers	0.27	0.28	0.25	0.35
Years tertiary school	Women	0.02	0.02	0.02	0.01
	Men	0.07	0.07	0.08	0.07
	All workers	0.04	0.05	0.05	0.04

Source: Computed from GLSS 1, 2, 3 and 4.

<sup>6</sup> The figures for junior secondary school include attendance to middle school in the schooling system before 1987.

Table 7 summarizes the sample characteristics. The sample consists of well over 20,000 Ghanaians aged 15 to 65 and covers three quarters of the total labour force interviewed in the GLSS 1, 2, 3 and 4. The sample retains the representativeness of the GLSS at large, both with respect to geography (distribution over regions, over agroecological zones and over urban and rural localities) and with respect to the size and composition of households.

The data are employed to estimate the log-linear earnings function

$$\log (E_i) = b_{0i} + \sum_j b_j S_{ij} + e_i \quad (5)$$

where  $i = 1, 2, 3, \dots, N$  is the index of workers and  $j = 0, 1, 2, 3$  represents the four types of schooling (primary, JSS/Middle, SSS and training colleges, polytechnics and university). The term  $e_i$  is the disturbance term, while  $S_j$  is the length of the  $j$ -th type of schooling when worker  $i$  has accomplished the particular type of schooling  $j$ , and zero elsewhere.

To see how the rate of return to schooling has developed in the survey period, we allow the parameters  $b_j$  to vary over time and specify

$$b_j = \sum_t b_{jt} R_t \quad (6)$$

where  $R_t$  is a dummy that takes the value one in the  $t$ -th round of the survey,  $t = 1, 2, 3, 4$  and zero elsewhere. Next, we recall equation (4) and make the constant a quadratic function of the years of experience of a worker.

$$b_{0i} = a_0 + a_1 A_i + \frac{1}{2} a_2 A_i^2 \quad (7)$$

Like the coefficient for schooling, the effect of experience is allowed to vary over time. Thus, we specify for  $k = 1, 2$

$$a_k = \sum_t a_{kt} R_t \quad (8)$$

and a separate effect  $a_{kt}$  is estimated in each survey round  $t$ .

Finally, to account for inflation and recalling that the term  $a_0$  represents the *logarithm* of the earning that would prevail when the worker has neither schooling nor experience, the specification of the constant term  $a_0$  is as follows.

$$a_0 = \log (\sum_t a_{0t} R_t) \quad (9)$$

Accordingly, the constant earnings amount  $a_{0t}$  (with zero schooling and zero experience) is estimated separately for each of the four survey rounds. This established the necessary neutrality for inflation.

The model (5) with the specification (6), (7), (8) and (9) has been estimated for men and women separately. Estimation results are summarized in table 8.

It appears that the coefficients for both education and experience are highly significant in each survey round and for each level of education, except for tertiary education for women in the first two rounds. The latter is probably due to the small size of the subsamples. The number of women in the sample with tertiary education is only 9, 10, 12 and 15 in the four respective survey rounds, as compared to 34, 42, 59 and 64 men.

**Table 8:** Earnings function parameter estimates, Ghana 1987-1999

Coefficient			Women	t-score	Men	t-score
Constant term	A0	1987-1988	17.5	(6.75)	13.9	(9.27)
		1988-1989	15.2	(7.42)	15.3	(9.43)
		1991-1992	46.2	(8.19)	39.7	(10.11)
		1998-1999	208.8	(9.81)	211.3	(11.28)
Experience / 100	A1	1987-1988	4.1	(4.17)	6.0	(8.41)
		1988-1989	5.7	(6.38)	7.6	(10.89)
		1991-1992	5.0	(6.29)	7.6	(12.17)
		1998-1999	4.7	(7.26)	5.9	(10.35)
(Exper / 100) squared	A2	1987-1988	-11.2	(3.55)	-13.2	(5.30)
		1988-1989	-15.8	(5.53)	-19.9	(8.23)
		1991-1992	-15.5	(6.11)	-21.0	(10.21)
		1998-1999	-13.9	(6.79)	-17.6	(8.90)
Primary	B0	1987-1988	6.6	(3.90)	3.4	(2.35)
		1988-1989	8.8	(5.58)	5.5	(3.81)
		1991-1992	6.1	(4.80)	1.9	(1.52)
		1998-1999	7.0	(6.55)	7.6	(6.37)
Junior Secondary	B1	1987-1988	7.7	(2.19)	16.8	(6.57)
		1988-1989	9.5	(2.99)	8.3	(3.57)
		1991-1992	11.7	(4.56)	11.2	(5.11)
		1998-1999	7.8	(3.81)	6.6	(3.37)
Senior Secondary	B1	1987-1988	16.3	(3.29)	11.1	(3.81)
		1988-1989	19.8	(4.60)	23.1	(8.32)
		1991-1992	20.0	(5.41)	20.4	(8.30)
		1998-1999	24.9	(8.87)	20.7	(11.38)
Tertiary	B3	1987-1988	15.2	(1.40)	10.2	(1.98)
		1988-1989	13.9	(1.37)	16.7	(3.60)
		1991-1992	17.9	(1.92)	16.9	(4.25)
		1998-1999	18.0	(2.19)	14.4	(3.95)
Basic education*		1987-1988	5.4	(5.45)	6.9	(10.47)
		1988-1989	6.4	(7.27)	4.7	(7.74)
		1991-1992	6.4	(9.16)	4.5	(8.31)
		1998-1999	5.3	(9.70)	5.0	(10.31)
All school years*		1987-1988	8.1	(9.12)	8.8	(13.75)
		1988-1989	10.4	(12.77)	9.4	(15.34)
		1991-1992	9.1	(13.74)	7.9	(14.63)
		1998-1999	9.1	(16.86)	9.8	(20.20)
All rounds*	Basic		5.8	(16.17)	5.1	(18.26)
	Secondary		21.5	(11.65)	19.8	(16.61)
	Tertiary		15.7	(3.30)	14.4	(6.79)
	Years schooling		9.2	(26.86)	9.0	(32.09)
R-square (%)			46.5		54.3	
Sample size (N)			10,983		10,815	

\* Estimates from separate regressions with slightly lower R-square and estimates of constant term and experience parameters remaining practically the same.

The estimate of the constant term  $a_{0t}$  indicates that the earnings of a worker who has never been to school and who has no experience is extremely low. The estimate for 1998-1999, for example, is only 210,000 cedis which is the equivalent of less than 100 US dollars and compares to an average of some 550 dollar.

Estimates of the linear and quadratic experience effect  $a_t$  and  $a_{2t}$  indicate positive but decreasing returns from experience and slightly higher returns for men. The first year of experience is estimated to increase earnings by some 5 per cent, while additional experience gradually yields less until earnings reach a peak  $a_{1t} / a_{2t}$  between 35 and 40 years of experience. Since experience is measured as the worker's age less 6 less the years of education, the peak is presumably reached later as workers have more schooling. For example, taking the estimates from 1998-1999, workers who never attended school reach their maximum earnings at the age of 40, while those with basic education can benefit from experience up to the age of 49.

The estimates for the effect of schooling  $b_t$  show that earnings increase consistently as one moves along the education ladder. To interpret the estimates relative to the rates of return ROR  $r_j$  in the human capital model HCM (3), one has to account for the relative cost of investment  $K_j$  of which estimates are presented in table 9.

**Table 9:** Cost of schooling relative to earnings without schooling in Ghana, 1991/1992  
(K-factor in earnings function)

	Earnings with less schooling*	Social cost**	K-factor***	
			Social	Private
Basic education	219	378	1.72	0.39
Secondary school	310	399	1.29	0.82
Tertiary school	403	2112	4.62	1.02

\* See column 1991-1992 of table 3 above.

\*\* Social cost includes both public and private expenses. The respective figures from table 6 above are multiplied by the length of education, see table 1 above.

\*\*\* The K-factor is defined as the cost of schooling relative to the earnings without schooling, see equation (1). The private K-factor derives from the K-factor after multiplication by the share of private in the total schooling expenses (0.55, 0.67 and 0.22 for basic, secondary and tertiary education, respectively, see table 6 above).

The estimate of the K-factor suggests that it is rather close to one when only private expenses are accounted for. Thus the parameter estimates are indicative of the private ROR to schooling in Ghana. Over the full cycle the ROR is close to 9 per cent, with marked differences at the distinct levels of education. The second cycle education has the highest private ROR of around 20, followed by the tertiary schools with 15 while basic education is estimated to have an average private ROR as low as 5 to 7 per cent. The break down of basic education in 6 years of primary school and 3 years of JSS suggests that this low average may partly be caused by the very low ROR estimates for the men during the first three rounds of the GLSS. Nonetheless, the estimates for the fourth round remain low and do not exceed 8 per cent.

According to our estimates, secondary and tertiary education provide much more interesting opportunities for private investment in education. With a private ROR of 20 and more for secondary school and 15 to 20 for polytechnic schooling and university, the additional earnings from investing in post basic education seem attractive.

As regards the public returns to education, the picture need to be modified in line with the earlier observation that Government subventions show large relative differences between the various levels of education. From table 10 we can conclude that secondary schooling remains by far the most attractive type of investment in schooling.

**Table 10:** Social and private rate of return to schooling in Ghana, 1987-1992  
(adjusted for K-factor)

	Unadjusted ROR (K=1)	Social ROR*	Private ROR*
Basic education	5.5	3.2	5.9
Secondary school	20.7	16.0	25.2
Tertiary school	15.0	3.2	14.7

\* Social and private ROR derive from the unadjusted ROR after division by the respective K-factors, see table 9 above.

Accounting for both private and public expenses, the public ROR is estimated to be 16 per cent, as compared to the private ROR estimate of 25. However, due to the high public expenditure in tertiary education, the public ROR estimate to post secondary schooling is quite low at a meagre 3 per cent, comparable to the low public ROR to basic education.

## 6. Discussion and policy implications

### *Discussion*

The comparison of schooling and labour market outcomes has indicated that the lion's share of the labour force in Ghana is still hardly educated with associated low earnings and little opportunities to move to more remunerative jobs. The estimation of the returns to education showed that the overall public ROR to education is high in secondary education (16 per cent on average), but ranks very low in basic and tertiary education (around 3 per cent on average).

To account for the sharing of the cost of education, a distinction has been made between the public and the private ROR. To compute the social ROR, all cost, both private and public, are considered. The private ROR only considers private educational expenses and private benefits of an additional year of education (as reflected in additional earnings accruing to an individual as a result of that additional education). Due to the allocation of public resources to education, the private ROR is higher than the social ROR, especially in tertiary education where the private ROR is almost 5 times as high as the social ROR. The private ROR to basic education is almost twice the public ROR, but remains lowest in rank. These findings conform to the general pattern of social rates of return through out the world (Bennell, 1996).

Certain phenomena about the estimated ROR draw particular attention. The first is that the level of our ROR estimates are consistently lower than those reported in other studies for Ghana and other countries (Psacharopoulos, 1994; Canagarajah and Thomas, 1997)<sup>7</sup>. Also, contrary to the assumed pattern of rates of returns with highest rate for primary education, our estimates depict highest rates for the secondary school level. Our estimates also contrast the

<sup>7</sup> For instance an average ROR of 17 per cent was found for Mexico. The higher estimates reported in other studies are based on much smaller samples and less reliable data. The studies by Glewwe and Twum-Baah (1990), Glewwe (1996) and Jolliffe (1998) form an exception and report zero returns to primary education in Ghana using the GLSS1. This compares to our very low ROR to primary education of men in the GLSS1 and GLSS3.

widely held view that ROR to education in developing countries (especially Africa) are higher than in the advanced market economies (Bennell, 1996).

Secondly, the private ROR to basic education ranks lowest and is estimated to be less than half of the private ROR to tertiary education and only one fifth of the private ROR to secondary education. The public ROR to basic education compares to the public ROR to tertiary education, but both are quite low and much lower than the public ROR to secondary education.

Third, the ROR estimates remain fairly constant over time and gender differences in the ROR found in the early rounds of the GLSS survey seem to have almost disappeared in the fourth round.

### *Policies*

According to neo-classical principles, resources are best shifted towards investments that yield the highest rate of return. Under diminishing marginal returns, the marginal rates of return then equalize among alternative investments. The application of this rule to education would imply equalizing rates of return across different levels of education. This rule has probably been at work in the basic and tertiary education levels in Ghana. Before the introduction of the new educational reform programme in 1987 (public) education spending was very biased in favour of higher education and investments in basic education with higher ROR were relatively ignored. Since then emphasis has shifted from higher to basic education and the relative allocation of resources to basic education increased, though the total budget has been under constant pressure of the adjustment policies. Accordingly, the ROR at the higher and basic levels of education converged, though to a low level. Apart from efficiency gains, the shift towards basic education has also promoted equity. In the meantime, secondary education has remained by far the most attractive form of education in terms of its contribution to additional earnings.

Given the low public and private ROR to basic education, the success of a continuation of a more equitable (and more efficient) spending in education critically depends on improvements in the basic educational system. Since the mobilization of additional resources from the public is likely to run into fiscal constraints, the necessary improvements will have to come mainly from educational reforms within the current budget, and from greater private sector participation. An option could be to look reallocate resources to the most effective school inputs, which is an area for more research (Tan *et al*, 1997; Case and Deaton, 1999).

As regards secondary education, the findings point to substantial returns. Both private and public ROR are high and the private sector appears to be highly involved in the financing. Given these relatively high returns, substitute part of the subsidies with increased private expenses. The corresponding shift can probably free some public resources to be employed for the improvement of basic education.

This division of roles among public and private sector wins favour if one considers the rationale for public provision of tertiary education. Though the estimated public ROR is low, the private ROR to tertiary education is fairly high and here also a case could be made for increasing the level of cost-recovery from private contributions and thereby allow an additional flow of resources to basic education. However, the lack of credit facilities to finance investments in higher education represents an important obstacle to increasing the share of private financing. The Challenge here is to develop credit and savings markets and design policies that help the financial sector to develop and to better assume its role in the financing of tertiary education. For example, Government could set up student loan programs or means-tested financial aid and scholarships, which are practically non-existent in Ghana.

In conclusion, the results suggest that educational sector reform in Ghana be highly concerned with improvements of basic education, with the upholding of the quality of secondary

schooling, and with opportunities to increase the share of private expenses in secondary and tertiary education.

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