RATES OF RETURN TO EDUCATION OF BLACKS IN SOUTH AFRICA

BY

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ABSTRACT

The principal objectives of this empirical study were to test the hypothesis that eduction is a major determinant of people's earnings differentials and to calculate private and social rates of return to education of blacks in South Africa excluding Transkei, Bophuthatswana, Venda and Ciskei.

Basically, the data for working men and women used in the study were extracted from the 1985 current Population survey files comprising a sample representative of the black population. Lifetime earnings profiles are constructed from these data for five educational levels, namely, no schooling up to standard 1, standards 2 to 4, standards 5 to 7, standards 8 to 9 and standard 10. Schooling is assumed to account for 60% of the income differentials between these profiles, after adjustment for the differing probabilities of finding work of persons in specific age-education groups. Imputed average household outlays on schooling are taken as the private direct cost of education supplemented by estimates of per pupil spending by the various government departments responsible for black schooling for calculation of the social costs per year of primary and secondary schooling. Indirect cost in the form of imputed foregone earnings are included from standard 5 (age 15) onwards.

The resulting private internal rates of return to education of males are about 16% at primary level and 24% for secondary schooling. Corresponding social rates of return are about 6% for primary and 15% for secondary education. The estimates for females indicate that between no schooling and standards 2 to 4 level, the private and social rates of return are -1% and -4% respectively, from standards 2 to 4 to standards 5 to 7 level, private returns of 12% and social returns of 4% are reported and for the remaining secondary school phases private returns of 32% and social returns of 15% are estimated.

It is implied that black education is receiving minimal government financial assistance compared to those of the other population groups. The evidence of the results of the study indicates that; besides education, marital status, locational, regional and occupational variables also influence earnings differentials, the governments responsible for black education should emphasize human capital investment in relation to physical capital investment, on average more educated persons are better off than the less educated ones and with the exception of female early primary schooling, generally, it is worthwhile for an individual to undertake a certain educational programme investment.

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PREFACE

This research on South African Black Education pertains to the whole of South Africa including the self governing states. Its main purpose is to test the proposition that education is a major factor of people's earnings differentials and to determine the rates of return to education for blacks. A summary of the results is given in chapter four, on page 159. I hope that the study will help in the allocation of resources and that it will go a long way in helping researchers of Human Capital in their investigations.

I am indebted to Mr A R Donaldson, Mr A Roux, Professor P Van der Watt and Mrs S E Radloff, my supervisors, whose efforts and enthusiasm were really indispensable for my study. I thank them for reviewing my work from time to time and making constructive criticisms and suggestions at different points of its developments.

I pay tribute to the Computer Centre and the Library staff of Rhodes University for their great work for me. My special thanks go to the University of Bophuthatswana for the financial assistance rendered purposely to enable me to complete the degree course. I wish also to register my sincere gratitude to Miss Jenifer Muwanga, the typist, who did neat and valuable work for me. My brothers', sisters' and friends' suggestions and encouragements were such a big impetus in my work. I thank them all.

Finally, I thank my wife Agnes, for her support, encouragement and patience without which the work would have been very difficult if not impossible.

CHAPTER 1

INTRODUCTION

1.1 The aim of the study

The purpose of the study is two-fold: firstly, to test the hypothesis that education is a major determinant of people's earnings differentials, and secondly, to calculate the private and social rates of return to education for blacks in South Africa (including the self-governing states). Transkei, Bophuthatswana, Venda and Ciskei (the TBVC countries) are included in the study for the sake of comparison only.

The study will also cast light on the following questions:

(i) What kind of educational facilities do blacks have in comparison with the other racial groups?

(ii) What are the determinants of black people's earnings differentials ?

(iii) Should the governments responsible for black education lay more emphasis on black human capital in relation to physical capital?

(iv) Are the better educated people on average economically better off than the less educated?

(v) Is it worthwhile for a particular individual to undertake a certain educational programme investment?

1.2 The concept of Human Capital

The stock of knowledge, skills and capacities embodied within a population constitutes a nation's human capital. Human capital resource development is the process whereby the knowledge, skills and working capacities of a nation are improved. The capital is analogous to physical capital and commands a potential monetary value. Harbison and Myers (1964, p.3) report that Adam Smith included in his category of fixed capital the skills and useful abilities of human beings since he believed that skills, "may be regarded as a machine that has a genuine cost and returns a profit".

There are three basic aspects of human capital that may be distinguished, namely:

i) Education,

ii) Medical care, and

iii) Migration.

The first aspect is education which has three forms: Formal education which takes place in a planned way at recognized institutions such as schools, colleges, technicons and universities; non-formal education which also proceeds in a planned and structured but highly adaptable manner in institutions, organizations and situations outside the spheres of formal and informal training , for instance, in-service training in the work situation, and informal education which

is given in situations in life that come about spontaneously in the family, community, the neighbourhood and is usually linked to the improvement of skills (e.g: woodwork, knitting etc).

The second aspect is medical care which can increase a person's working capacity in that a healthy and strong person does a job better than when he is sick and weak. Thirdly, people move from place to place looking for good or better paying jobs and cheaper commodities. This is migration.

This dissertation basically deals with formal education and training (up to matric level) only and is accordingly a partial treatment only of human capital formation.

The research is based on the "human capital theory". According to this theory, quoting from Carling, Bissarides, Sierbert and Sloane (1985, p.6)*:

> Those who have been trained more, either at school or on the job, have incurred foregone earning costs. Their productivity will also have increased which enables them to be paid more, assuming that earnings equal marginal product. The amount that productivity and earnings must increase will be determined by the foregone earnings costs of training. Since

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* It should be noted that there are no earnings foregone by attending early school classes at ages of less than 15, when, according to one of the assumptions of this dissertation, individuals have not yet entered the labour market.

> this cost is regarded as an investment, the extra payment should be just enough to secure the same return on the investment as on a comparably risky physical capital investment. The theory is therefore one of individual earning differences in a competitive labour market.

The concept of human capital is not without criticism. Some economists reject it. For example, Alfred Marshall argues that it is "unrealistic" because human beings are not marketable (Kiker, 1971, p.60). However, he admits that its estimation might be of some use.

There is an argument that education should be treated as consumption, pursued for its own sake. For instance, it is treated as consumption in the national accounts.

There are also more serious critics like Vaizey, Balogh, Streeten and Shaffer (Blaug, 1970, p.200) who argue that there are many factors affecting people's earnings such as ability, individual motivation, social class origins, education and occupation, and that one can never be sure that one has analysed all of them thoroughly. They believe that the interaction of some of these factors, including or excluding education, determines earnings differentials and that there may be no necessary causal relationship between education and earnings. However, today, many economists are in favour of the concept of human capital.

1.3 Motivation for the study

In South Africa, blacks constitute the majority of the population and of all the racial groups* they are the poorest. Figures for 1980 show that the black population numbered 15 970 000, 67,2 percent of the total South African population (excluding people in Transkei, Bophuthatswana and Venda). By 1985, the percentage of black population increased to 68,7 percent (approximately 19 515 000) of the total population. The imbalance in wealth among the population groups might have been brought about mostly by the existing differences in education among them, and if this is true, then, if a more equitable education distribution is effected, the economic situation of the black community will improve resulting in a more equitable distribution of personal income among the groups.

The question why blacks are not performing well at school especially in mathematics and physical science subjects has given rise to much controversy. This poor performance might be due to, among other things, poor school curricula and a shortage of money for black schools resulting in too few schools, overcrowded classrooms, non-availability of science laboratories, underqualified teachers and other poor educational facilities. It is alleged that the

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* Words 'racial groups' and 'population groups' will be used interchangeably.

South African government discriminates against black education. In the introduction to their book, Human, Rainey and Rajab (1986, p.1) say:

> South Africa, as we all know, is a society characterized by inequality. Racial barriers preventing equal access to the means of power, wealth, status, education and skills have led to unequal distribution of wealth and power along racial lines. Black people, in general, have been excluded from positions of power and status; they have generally been restricted to levels on the occupational hierarchy below those occupied by whites and are paid less than whites in the few jobs where races overlap
> .....

Some people criticize the entire black education system. For instance, Peter Kallaway, Frank Molteno, Pam Christie, Colin Collins and Peter Buckland believe that the problems facing black scholars should be tackled within the broader political and socio-economic framework*. Schools are seen as sites of struggle for political and social demands of blacks and a mechanism by which they are manipulated by the ruling elite and businessmen (producers and employers) to meet their own ends.

Kallaway writes (1984, P.1):

> ...Any attempt to 'plan' education for the South African future that fails to locate education issues within the broader framework

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* See Kallaway, 1984, ch.1

> of economic and political change runs the risk of naivete and irrelevance. Worse, it contains the possibility of misleading those who would undertake the important task of planning for a more just and equitable education future.

According to the HSRC Education Financing Committee report (1981), blacks are markedly under-represented at all levels of education. It indicates that in 1980, the black population formed 71,27% of the total South African population (including the TBVC countries). In 1978, 69,2% of the total pupil population in ordinary schools were blacks but surprisingly blacks contributed only 53,9% of secondary school pupils.

Regarding education financing, it is further reported in the De Lange report that in 1978, 6.1% of the total public spending on education was spent on education for Indians, 16.3% on education for blacks, 12,7% on education for coloureds and 64,5% on education for whites. On top of this imbalance, black pupils experienced double-shift classes in which case a pupil could actually learn for about three hours only per day.

According to the report, all measures of educational facilities and qualities like numbers of schools and teachers, pupil to teacher ratios, teachers qualifications, science laboratories and conditions of lavatories point in the direction of the fact that there are large discrepancies between the different population groups, particularly between

whites and blacks.

In fact, black students have expressed their discontent about the poor conditions and low academic standards through school boycotts and riots. There has been a series of school protests against the black education system from as far back as 1920. A few school disturbances will be cited. It is reported by SACHED (1988, ch.9) that from 1920 to 1954 before the introduction of Bantu education, there were a number of incidents in black schools for which, generally, the grievances were conditions in the mission schools such as poor food, compulsory manual labour and harsh punishment from teachers. Recently in the year 1980 there was a school boycott which started in Cape Town and spread throughout the country.

Some of the causes of the boycott were that students complained of poorly equipped schools and shortages of qualified teachers. In 1984, school unrest broke out in Pretoria, Cradock and Port Elizabeth in the Eastern Cape province and spread to other places across the country. For the 1985 and 1986 school boycotts, one of the demands by the pupils was the introduction of an alternative curriculum. One should bear in mind that in such uprisings, educational grievances were normally combined with some political and social rights demands.

The South African government has sometimes expressed its concern about black pupils' demands and on a number of occasions has appointed commissions of enquiry to investigate the matter and give recommendations for solving the problems. For example, sometime after the year 1920 two Commissions of Inquiry were appointed by the government to inquire into black education but the results were never published (SACHED 1988, p.223). In 1949, the Eiselen Commission recommended possible measures for an effective reform of the Bantu education system.

As a result of the Commission's recommendations, in the year 1953, the Bantu Education Act was passed which among other things curtailed financial allocations to black schooling, brought all black schools under government control and modified school curricula. In general, the act revolutionized the entire South African education system and entrenched social and cultural segregation in education. This marked the beginning of the system of apartheid education.

It is alleged (SACHED, 1985,P.268) that the reasons for setting up the de Lange Commission in 1979 were political social and economical. It is argued that political and social unrest coupled with the rise of industrial capitalism, accompanied by manpower requirements which were not adequately met by the school systems meant that the government had no choice but to act. There was thus a need for research into the entire education system of the nation. The most striking

recommendations of the Commission were that the government should form a single education department for all the racial groups, with education of equal quality for all people and corresponding change in the schooling structure.

The government responded positively to most of the De Lange guiding principles except the recommendation for one education department for all people which was in conflict with government national policy (SACHED, 1988, p. 268). Mr F W De Klerk, the then Minister of National Education (SAIRR Survey, part 2, 1986, p.421) said:

> We believe it is best for a child to go to a school which is an extension of his environment, his family, his cultural life ..... we will favour and stand by the basic approach of 'own' education in government schools.

A lot of research work has been done into black education in South Africa. Human Sciences Research Council (HSRC) surveys, Peter Kallaway's recent collection of articles (1984), the various publications of the South African Institute of Race Relations (SAIRR), Andrew Donaldson's study (1984) and G.J.Trotter's work (1984) are some examples.

The present study is concerned with specific economic aspects of black education, against the background of recent research into related socio-political aspects.

1.4 Methodology and problems

For this study, two types of data were required. The first type was education statistics and the second was black people's earnings data. Education statistics, which were extracted from South African government official (statistical) books and some other survey reports of different research organizations like the SAIRR and the HSRC, were wanted for educational facilities including costs of education. The earnings data were extracted from the South African Current Population Survey sample of May 1985. Basically, three types of analysis were done, namely, Frequency Distribution, multi-regression and finally the Rate of Return analysis.

For the Frequency Distribution analysis, the SAS Frequency Procedure was used to explore earnings distributions and the relationships existing among the factors of earnings. Multi-regression analysis in which earnings were taken as the dependent variable was used to answer some of the questions posed on the first page of this chapter. The analysis helped to show the factors that affect black people's earnings differentials, the effect of education on the earnings, and to prepare age-earnings profiles for the Rate of Return to education analysis by removing the effects of some non-educational factors on earnings.

The Rate of Return approach involves calculating an internal

rate of return on investment in education as the discount rate which equates the present value of the extra lifetime earnings attributable to a certain amount or type of additional education (beginning at the age when people normally start to work) to the present value of the costs of that extra education including foregone earnings costs. This analysis helped to answer the remaining questions which are; Should the governments responsible for black education lay more emphasis on black human capital in relation to physical capital?, Are the better educated people on average economically better off than the less educated?, and Is it worthwhile for a particular individual to undertake a certain educational programme investment? For instance, if the private marginal rate of return to middle school education (i.e. standards 5-7) was positive and greater than the return one would get from a comparably risky physical capital investment then it would be worthwhile to undertake the human capital investment. Also, if the overall rate of return on human capital investment was greater than that of physical capital investment, it would be advisable for the government to relatively encourage educational investment provided the labour market works moderately well.

The Rate of Return method has shortcomings, some of which apply to the Human Capital theory in general. These problems will be discussed in the ensuing chapters. However, it is fitting briefly to highlight the following at this juncture:

1. Education is a phenomenon which is difficult to measure. Ideally, one should consider both its quantity and quality. The conventional method of measuring education only takes account of quantity (i.e. years of schooling). Informal education is even more difficult to measure due to uncertainties regarding the actual hours or years devoted to studying.

2. Turning to the costs of education, every one faces unique costs partly as a result of imperfections within the human capital market. The costs are normally higher for poorer individuals who may even have to borrow funds than for those who can finance their own education. In calculating rates of return to education one has to resort to average costs.

3. Human capital theory is faced by the irresolvable problem of separating the investment and consumption components of the costs of education. For this reason many of its critics say that the theory is dubious.

4. There is also a problem of measuring the costs of on-the-job training. Some people choose to do jobs for which remuneration is lower than their marginal product because of educational opportunities. The training costs are shared between the employee and the

employer. The problem here is to ascertain the value of each one's share and add them to find the total cost of the training.

5. The effects of education are not confined to the educated person concerned alone but spill over to other people around him and vice-versa. This means that we should be considering net social benefits including external effects when valuing education. These include political, social and economic gains which are very difficult to identify and to evaluate.

6. There are many factors affecting people's earnings. Although one tries to include most of these factors in the analysis, because some of them are related to education and some are even related to each other, which causes a multi-collinearity problem in multi-regression analysis, it is impossible to determine exactly the effect of education on earnings.

7. Lastly, non-pecuniary net gains should be included with earnings in the returns to education. Ideally, the degree of psychological satisfaction associated with different work prospects should be taken into account.

Despite the above problems, supporters of the human capital theory do believe that the model can be used to explain fairly

well the relationship between education and people's earnings.

1.5 Outline of thesis

After this introduction, the theoretical background to the human capital approach is discussed in chapter 2. This chapter looks at the historical background to the human capital concept; a brief explanation of how human capital can be formed through education and training; age-earnings profiles and the Direct Rate of Return to Education approach.

Chapter 3 presents the results of an empirical study in which we look at the following: existing educational facilities for blacks in South Africa including costs of education; the data used in the analysis; regression analysis and age-earnings profiles, and the calculated private and social rates of return to black education.

The concluding chapter 4 consists of two sections. The first section consists of an interpretation of the calculated rates of return to education and the second gives the summary and evaluation of the study, and recommendations.

Chapter 4 is followed by statistical appendices and the bibliography.

1.6 The sources of data

Five main sources of data were used in this study.

i) For descriptive education statistics, the data used came from four main sources: namely, South Africa 1985/86 - Official Year Book, SAIRR Survey (part 2) 1985, SAIRR Survey (part 2) 1986 and SACHED 1988.

ii) For the rate of return analysis, the earnings data were drawn from the May, 1985 Current Population Survey (CPS) raw data of the Republic of South Africa. The CPS sample comprised some 92095 individuals of whom about 24278 (26%) were employed. The actual number of persons used in this study was 23278 (25%).

CHAPTER 2

A REVIEW OF THE THEORY OF HUMAN CAPITAL

2.1 Introduction

Apart from giving the historical background to the concept of human capital this chapter intends to equip the reader with some basic knowledge about the human capital model, featuring the formation of human capital, age-earnings profiles and the direct rate of return to education approach.

2.2 The historical background

The concept of human capital is not new; it can be traced as far back as the beginning of the nineteenth century. Since then it has been further elaborated as more and more economists became interested in it. In the course of time, the need to determine the value of man arose in order to indicate the power of a nation, to know the effects of investments in education, health and migration, to estimate the total costs of man so as to make people aware of the importance of life, to propose better tax schemes and to help courts and compensation boards in cases dealing with compensation for personal injuries and death.

Two methods were used for these purposes namely the "Cost of Production" approach and the "Capitalized Earnings" approach

pioneered by William Petty and William Farr respectively. The cost of production approach involved calculating the total amount of money spent on the birth, rearing, education, health and migration of a human being whereas the capitalized earnings approach meant to determine the total income (including the monetary value of all payments in kind) of a person. For instance, Kiker (1971, ch.1) reports that in the year 1922, Dublin used Farr's method and found that the value of the population of the United States of America (U.S.A.) was equal to five times the value of the stock of physical capital in the country. He made allowance for depreciation which he equated with personal living expenses.

Today, the human capital theory is still being investigated by more and more economics researchers interested in determining the effect of education on people's earnings.

Before we go any further let us see how human capital is produced.

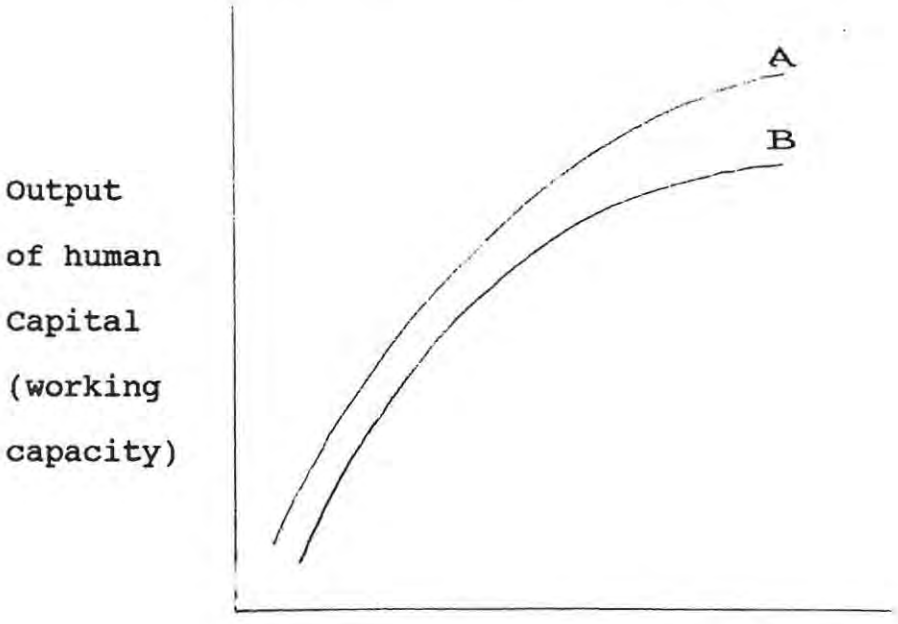
2.3 Human capital and earnings structure

2.3.1 Human capital production function

In chapter one, we saw that one way human capital can be produced is through education. For the purposes of this dissertation, education in years of schooling

is taken as a measure of human capital investment. Native ability is regarded as the most important factor controlling the output of the capital. More able people are supposed to accumulate human capital at a higher rate than the less able, all other factors being held constant. It may be assumed that there are diminishing returns to educational investments due to fixed brain capacity. This implies that when one plots "output of human capital" against "educational investment" (in terms of time actually spent on learning), on the horizontal axis, one gets a curve with an ever decreasing gradient as shown in the figure below.

Figure 2.1: Relationship between output of human capital and educational investment.



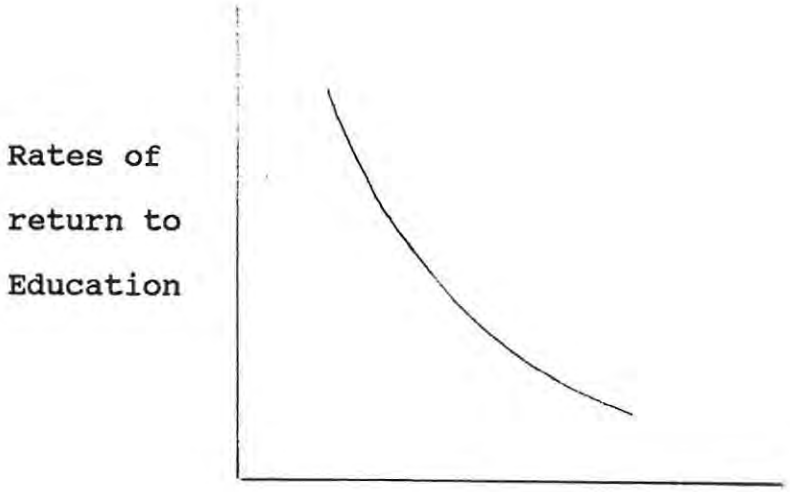
Referring to the figure above, individual A is more able than individual B therefore his curve is above that of B's. This assertion assumes that all other factors affecting education like home background, quality of schools and teachers and other educational facilities such as books and transport to school are held constant.

There is a problem of finding an appropriate measuring unit for human capital output. Estimates of 'marginal rates of return to education' based on lifetime earnings streams can be used as a proxy for human capital output though earnings have a problem of having many other factors influencing them apart from education. Hence, a human capital demand curve can be derived by plotting returns to education versus years of schooling.

Referring to figure 2.2 below, a human capital demand curve is negatively inclined because of the assumed diminishing returns to investment in education and training while its position depends on the innate abilities of the individual in question. With a given amount of time and money devoted on educational investment, more able people produce more human capital, and then are characterised by a more productive capacity and higher rates of return to

education than the less able.

Figure 2.2: Human capital demand curve



So, every individual has his own human capital demand curve such that a more able person has his or her demand curve displaced to the right of that of the other.

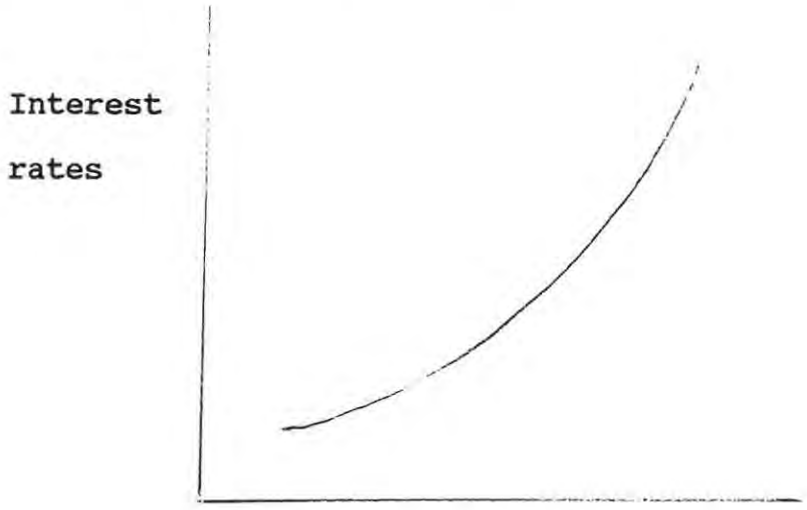
On the supply side, family circumstances are a major factor of human capital as they are the most important determinant of the accessibility of schooling as far as financing education is concerned. Poor people, on average, do not normally invest much in education since it is difficult for them to avail or to borrow money for human capital investment because; firstly,

education is expensive for them, in the sense that the marginal utility they attach to a rand spent now is higher than the present value of the future return which would be realized from it in case the rand was invested, secondly, human capital, unlike physical capital, cannot be separated from the owner and thirdly, educational investments are indivisible (for instance, it is not feasible for one to invest for a fraction of a school course). People with cheaper funds tend to invest more in human capital, and for a given capacity to benefit from the investment, they get higher returns to human capital than others.

A human capital supply curve can be drawn as shown in figure 2.3 below by plotting costs of funds, the interest rates that must be paid for different amounts of educational investment or alternatively, if one possesses these funds, the rate used would be the interest one could obtain on a comparably risky physical capital investment. The supply curve for human capital reflects the availability of finance for educational investments. It slopes upwards because the marginal cost of borrowing (or abstaining from present consumption) is likely to increase as more and more investment is undertaken. Its position depends on the individual's credit status and wealth. Lower income people are associated with a leftward shift of

the curve.

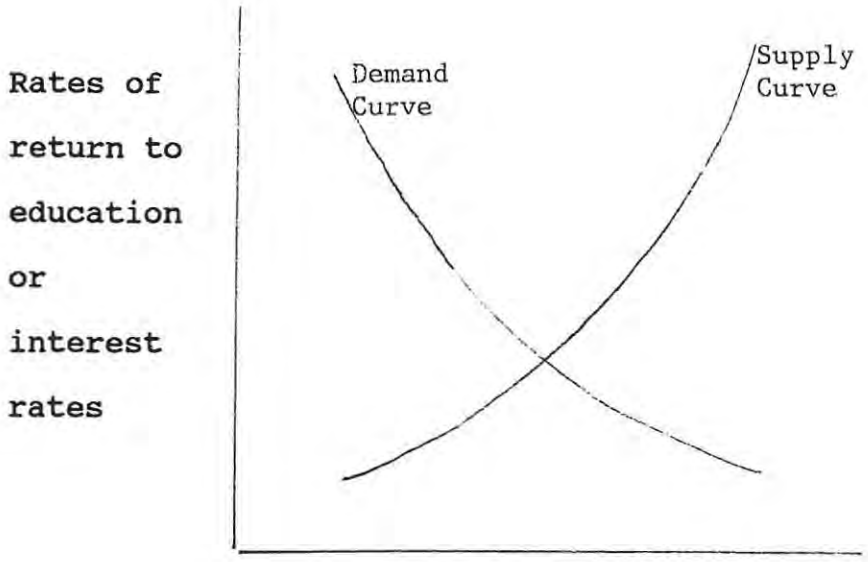
Figure 2.3: Human capital supply curve



The intersection points of demand and supply schedules of human capital give equilibrium rates of return and education investments for individuals (Refer to fig.2.4 below). People have different demand and supply curves partly depending on the factors discussed above and so they have different optimum rates of return to human capital investment. Individuals would invest in human capital up to the point where its marginal rate of return equals the marginal cost.

Human capital investments and earnings also vary according to the correlation between (human capital) demand and supply conditions of individuals. For

Figure 2.4: Equilibrium rates of return to education figure



instance, Gary Becker (King,1980,p.249) argues that, supposing the correlation between the demand and supply curves was perfect and positive, all the variation in earnings would be explained by investments, and the smaller the algebraic value of this correlation, the less the variation in earnings explained by investments, and the more earnings would vary among persons making the same investment.

The effect of government subsidization for education is to decrease the variation in the supply schedules and hence a bigger part of differences in educational

attainments would be brought about by differences in demand for education which depends greatly on natural ability. This means that, subsidization would decrease the variation in earnings differentials and so narrow the differences in the rates of return to education assuming all other factors affecting earnings are held constant.

2.3.2 Earnings structure

The way Human Capital theory can be applied to the earnings structure can best be explained with an example given by Sierbert (Carling et al, 1985, p.8) as follows. Let us consider only two grades of workers, namely, unskilled and skilled labour. Also, let us assume that the unskilled worker enters the labour market at the age of 15 with a 'subsistence' wage of R5000 per anum on average throughout his life span and the skilled man enters it with a degree at age 21. The 'subsistence' wage is determined exogenously, perhaps by minimum wage legislation.

Given the unskilled labour wage, it is possible to determine the college labour wage. The equation to be used is derived in its simplest way as follows. A wealth-maximising individual is thought to compare the present value of the cost, C, with that of the revenue,

R, from the extra year of education, obtainable for the whole of his working lifetime (after training) before he decides on further education. If the latter outweighs the former , he then goes for further training and vice versa.

The present value of the return from the extra year is

$$R = \sum_{t=1}^{N} K_t (1+i)^{-t}$$

where Kt = expected earnings increment in the t working year resulting from the extra schooling,

i = rate of discount, the rate of return available from the best alternative investment, and

N = length of working life after leaving school.

If i is taken as the 'market' rate of interest then the individual should invest if R>C. Alternatively, an internal rate of return r, can be computed where r is that rate of discount which equates R with C, that is

$$C = \sum_{t} K_t (1+r)^{-t}$$

and in this case, the individual should invest if r>i. The individual will end up investing in increased

schooling until r≃i. If the earnings increment is assumed to be constant, K, for each time period then the above equation simplifies as

$$C = \frac{K}{r}(1-(1+r)^{-N}).$$

For large N it even becomes simpler as

$$C = \frac{K}{r}$$

It can be shown that a larger C calls for a larger K and the smaller is the required rate of return r. Also, the larger N is, the larger C will be. This demonstrates an important proposition of the Human Capital theory that Human Capital investment becomes less worthwhile as one ages (if K is constant - but it may not be).

In equilibrium, r≃i; then, if i = 10 percent,

$$r = 0.1 = \frac{K}{(6*5000)}, \text{ and hence,}$$

$$K = R3,000 \text{ p.a.}$$

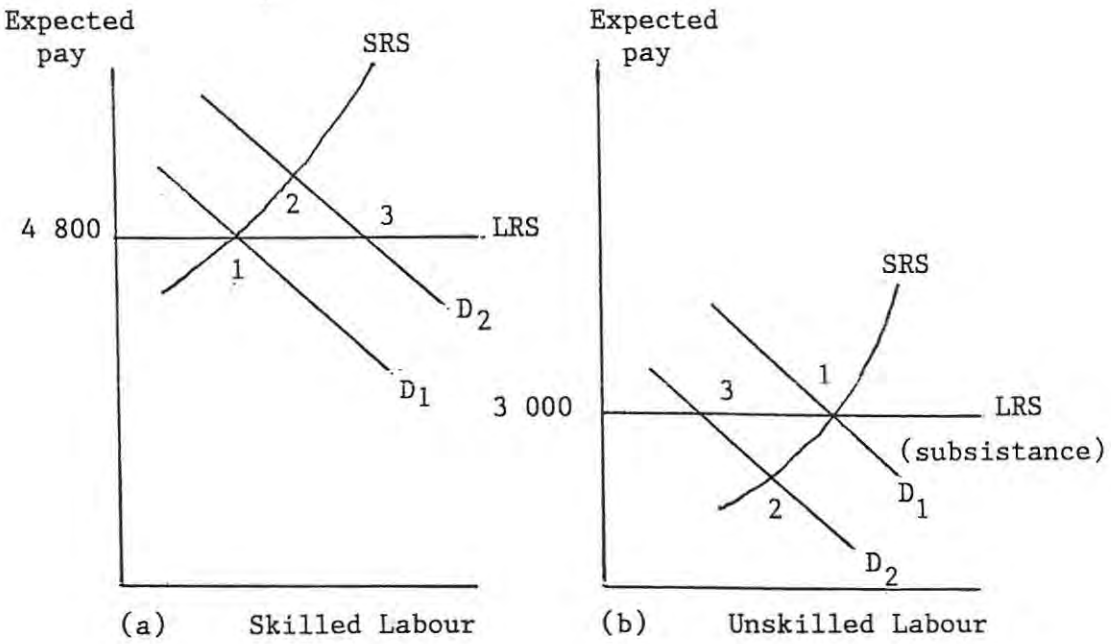
This means that given that the unskilled worker earns R5,000, the college graduate must earn R8,000 on average over his working lifetime in order for him to come forward for the training. This assumes that there are no consumption benefits of education. This also implies that in order for both categories of workers to be equally satisfied with an interest rate of 10 per cent, the unskilled worker must earn only 60 percent of the skilled wage.

The expected pay of a potential worker with a particular skill is determined by the intersection of the labour demand and supply curves assuming perfectly competitive conditions. The equilibrium quantity of labour is determined by the price of that labour, the real wage relative to the price of the other input substitute which is physical capital.

Referring to figure 2.5 below, in equilibrium, skilled labour is expected to get R4 800 per annum. Supposing there is more demand for skilled labour. There will be a shift to the right of the demand curve 1. In the short run, the pay for skilled labour will increase to 2. However, in the longrun, more and more people will be trained (assuming no restrictions on the entry into the relevant training institutions) and the labour market will be flooded with skilled labour which will

eventually force the equilibrium pay down to R4 800.

Figure 2.5 : Determinants of the earnings structure



The increased demand for skilled labour will be accompanied by a decreased demand for unskilled labour as the test for them by the employers will be lower (i.e. demand curve shift to the left) to give a lower expected pay 2. A complication arises if the unskilled labour are not permitted to earn less than R3 000 per annum say by minimum wage legislation. Unemployment of unskilled labour will then occur. The increased probability of unemployment will reduce the unskilled expected pay the consequence of which will be a tendency for the unskilled labour to move into the skilled labour market by training.

2.3.3: To what extent does education influence people's earnings?

The fact that education is a very important factor of earnings differentials cannot be over-emphasized. Blaug (1970, p.31) asserts that:

> The simplest explanation of the universal association between education and earnings across sectors, industries and occupational categories around the world is that the better educated are generally more flexible and more motivated, adapt themselves more easily to changing circumstances, benefit more from work experience and training, act with greater initiative in problem solving situations, assume supervisory responsibility more quickly and in short, are more productive than the less educated even when their education has taught them no specific skills.

Even if education is thought to influence people's earnings greatly, its effect is very difficult to quantify for earnings are affected by many other factors such as experience, traditions, nepotism, job entry restrictions, politically administered pay scales, race, economic status, occupation, motivation, social class, sex, nature of employment, mortality rate, migration and medical care. Some of these factors affect an individual's educational achievement and therefore affect earnings indirectly, others do however affect earnings directly. There are factors which are interrelated and those which may even have a

two way causation effect with earnings, that is, they may themselves be affected by the growth of earnings over time. Some factors are made known through others. Hence, we have both multi-collinearity and causation problems.

There is both negative and positive correlation between related factors and education and earnings. Multi-variate regression analysis can be used to overcome the multi-collinearity problem, but it is not an altogether satisfactory solution to it. Because education is related to most of these factors, by removing their effects on earnings, much of its effect is also removed. On the other hand, the age-earnings profile method can enable one to standardize just a few factors of earnings which tends to exaggerate the influence of education on earnings. However, a useful analysis can be obtained for predictive purposes if we assume that the inter-correlation between some of these factors and education will continue in the same direction and magnitude in the future. In this case, such factors can be ignored. For example, if ability, geographical and occupational mobility and medical care continue to increase at a constant rate and with the same magnitude in relation to education in future, then the effects of these factors need not be estimated for a good prediction of earnings differentials to be

made. These considerations need to borne in mind when interpreting regression analysis results of earnings determination.

It should be noted that while some of the factors influencing income can easily be held constant by the econometric methods for a meaningful analysis, it is very difficult to remove all the effects of ability and family background. Yet the ability effect is believed to play a big role in earnings determination of individuals.

Some economists have tried to estimate the effect of ability by using I.Q. scores which are commonly regarded as a reasonable measure of natural ability and family background. For instance, Sierbert (Carling,et al, 1985, P.30) points out that Taubman used identical twins for his study because they are expected to have the same genes and the same family environment and so presumably, the same ability. The difference in their earnings must therefore be due to differences in parental treatment, and school and work experience. According to Taubman's research, it does not seem that allowance for ability reduces the rate of return to education much.

The ability factor was also investigated by a

psychological study (Blaug, 1970, P.33) which involved giving six different groups of children I.Q. tests. The groups were composed separately of identical twins reared together, identical twins reared apart, fraternal twins reared together, siblings reared together, siblings reared apart and unrelated children reared together. It was found that the correlation coefficient between the two age specific I.Q. scores declines steadily as you go down from identical twins to unrelated children reared together.

This is due to the fact that ability comprises two parts, namely, genetic and acquired ability. The former is hereditary whereas the latter is determined by the home and other environmental factors such as occupation of the father, parents' education and facilities like quality of local school, some of which make up the social class of an individual. As one grows, acquired ability also increases and so one's general ability increases. This means that intelligence tests taken at young ages have stronger hereditary factors than those taken at older ages. Blaug (1970, P.34) says that psychologists believe that, "about 50 percent of observed intelligence at the age of seventeen is predictable at the age of four and perhaps as much as 90 percent of the variance in an individual's intelligence at the age of four is due to

inherited factors. Blaug (1970, pp.38-40) reports that Wolfle and Smith studied the annual salaries of 3000 males who had graduated from high school in three American States in the year 1930, and found that the effect of college education on earnings was bigger for those who came from rich families and with superior I.Qs at high school level. High School graduates with fathers in top occupation positions earned more than those with fathers in lower positions and this correlation was more significant at the college education level.

According to Blaug, Wolfle and Smith's study implies that high school graduates with high ability and favourable home environmental factors seem to require college education to transform these advantages into higher earnings. However, the study is criticized because it used I.Q. scores at high school level when the tests themselves were thought to have been influenced by previous education (Blaug, 1970, p.40).

Blaug (1970, p.52), says that on the basis of Wolfle and Smith's survey, Denison concluded that about 66 percent of the variance of gross earnings differentials between college and high school graduates is attributable to education and about 33 percent to ability and family environment. This conclusion was

arrived at by attributing about 3 percent of the observed earnings differentials to I.Q., 6 percent to rank in high school class, 7 percent to father's occupation and 17 percent to the difference between earnings in the sample in question and earnings in the United States of America as a whole. This means that when we multiply the gross earnings differentials by .66 we obtain the part of the differentials attributable to education. This ".66" is what we call an alpha coefficient.

In view of the fact that this alpha coefficient of .66 applies to high school graduates in a developed country, when it comes to studies concerning persons of lower education standards in developing countries, we should use a lower alpha coefficient since it may be that in these situations ability and family circumstances play a bigger role in determining earnings. In South Africa, we lack convincing evidence about the alpha coefficient. When it comes to separating the effects of ability and education on earnings, it is better to use a lower alpha coefficient value rather than attributing all the earnings variation to education. An alpha coefficient of ".60" has been used in this study.

2.4 Age-earnings profiles

Age-earnings profiles are determined by plotting mean or median earnings against ages. Their characteristics can best be explained by the 'Ben Porath model'* as follows. During childhood, all the time is devoted to human capital production through formal education due to the long working horizon. This is called phase one. After leaving school, the individual stops investing all his potential earnings but continues to invest a certain fraction thereby reducing current earnings. This is when an individual takes a lower paying job in exchange for its further educational opportunities in order to raise the future earnings. This is phase two.

Phase three starts at the time when retirement age is approaching when this kind of investment becomes less worthwhile. During this phase, a smaller fraction of earning capacity is invested and so the stock of capital grows at a slower and slower rate. The growth of earning capacity and observed earnings becomes slower and the two differ by an ever decreasing amount of time devoted to human capital

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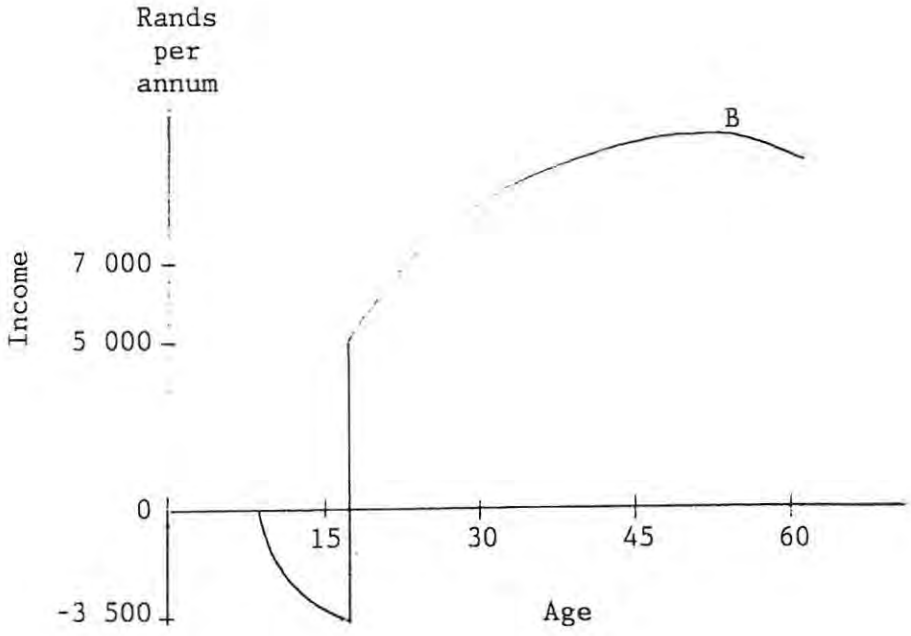
* For a rigorous explanation of the Ben Porath model, see Carling,et.al, 1985 - Chapter 2, pages 13 - 23.

accumulation. Eventually, this investment will no longer offset depreciation and the stock of capital with its earning capacity will begin to shrink. For a few years longer, observed earnings will continue to increase as the reduction in the earnings foregone to accumulate human capital offsets the shrinkage of earning capacity. But eventually, the observed pay too declines. The theory is illustrated by the figure below.

Figure 2.6 : Hypothetical figure for lifetime earnings



Referring to figure 2.6 above, at first,the individual devotes all his time to human capital production at school. His last

cost of education is R3 500 per annum. On leaving school, his starting pay is R5 000 per annum. It grows to a peak at point B then goes down when he is about to retire.

It has been shown empirically that generally, the higher the educational attainment the steeper the rise in earnings throughout the early phases of working life, usually the higher the starting pay, the later the year at which maximum points of the profiles are reached and the higher the retirement earnings (Blaug, 1970, p.27).

2.5 The Direct Return to Education approach

The direct return to education approach intends to contrast the lifetime earnings of individuals with more education with those of people who have had less education. The difference in the earnings is then expressed as an annual percentage rate of return of the costs incurred in obtaining the (extra) education. The rate of return on investment in education can be calculated as the discount rate which equates the present value of the extra lifetime earnings attributable to a certain amount or type of additional education (from the age at which people normally start to work) to the present value of the costs of that extra education.

Calculations of rates of return to education involves tabulating mean or median earnings for each education group.

Unit costs for each education level should ideally be used but usually these are not available in which case researchers resort to using costs of say primary and secondary schooling. As an example of calculating an internal rate of return to education, supposing a middle school graduate decides to attend the three year matric course, beginning at age 18. The equation should be given as:

$$\sum_{t=1}^{47} \frac{,6PtEt}{(1+r)^t} = \sum_{t=1}^{47} \frac{,6PtCt}{(1+r)^t} \quad \text{or} \quad V = \sum_{t=1}^{47} \frac{,6Pt(Et - Ct)}{(1+r)^t} = 0$$

where Pt= probability of working in year t

Et = wages earned by a matriculant from the year he or she starts working (after graduation) to the year corresponding to the retirement age of 64,

Ct = wages for a middle school graduate from the year he or she starts working (after graduation) to the year corresponding to age 64, including the costs of the three year matric course*,

t = serial number corresponding to the year concerned,

r = rate of return, and ,6 = an alpha coefficient.

With known Pt, Et, Ct and t, the equation can be solved for r. Different values of r are substituted in the equation

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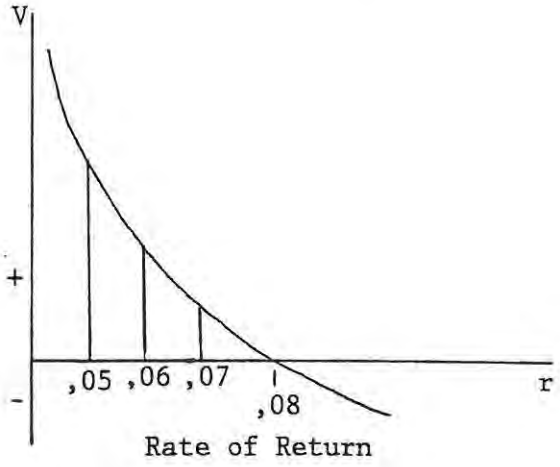
* The costs of education during the course should not be multiplied by an alpha coefficient and the probability of working.

until the net present value V, converges to zero or very near to zero. Recording the resulting values of V, in a cartesian plane that maps various rs into corresponding present values, a curve like the one shown below can be obtained.

Figure 2.7: Relationship between present values and rate of interest or return



Referring to figure 2.7, V is zero at the point of the intersection between the curve and the horizontal axis and the r which corresponds to this point, 0,08, is the rate of return to education.

The method only works if (a) the absolute sum of the undiscounted gross returns actually exceeds the absolute sum of the undiscounted costs, and if (b) the undiscounted differential net-earnings stream cuts the horizontal axis once and once only, that is, if there is only one change of

signs in the differential net-earnings profiles. If the equation cannot be solved for a unique r, one would resort to other methods of evaluating investment projects like discounting all the lifetime earnings stream and the costs of the extra education including the foregone costs to the time when one has to decide on the additional education, and then compare the sum of the present value of the earnings with that of the costs.

Rate of return analysis of education involves a time series projection of earnings from cross section data. Since education is a very long lived asset, some of it is passed on from generation to generation and this results in having a decreasing time series of earnings differentials of successive age-education cohorts provided other factors are held constant (i.e. future cohorts tend to be richer than the previous ones). So, the present cross-section method of estimating the future rates of return to education can bias earnings differentials upwards and distort estimated rates of return. The prediction of the future rates of return would require proper projections of the future quality of education, costs of education and income differentials. This is not an easy task to do as future educational requirements depend so much on innovations and advancement. However, cross-section statistics data have an advantage over the lifetime cycle data in that they do not suffer trade cycle periods such as industrial depressions or unusual activities with changes in

employment opportunities, wage rates and cost of living, so they give estimates in constant purchasing power.

It is standard practice to discount estimated future earnings using an appropriate rate of discount because present consumption is more valuable than future consumption and because investments today have opportunities foregone. The problem here is to know the right discount rate to use. Fortunately, the calculation technique used in this study takes care of this problem automatically.

The rate of return to education can be looked at in two ways, namely, (a) the personal profit orientation, and (b) the national productivity orientation. A brief explanation of each will be given below.

2.5.1 Private Rates of Return to Education

The private rate of return to education relates the benefits which an individual receives from an educational programme to the costs incurred by him personally in obtaining the education. Post tax earnings are used. For our purpose, the costs will involve tuition fees, foregone earnings as well as the direct individual costs of schooling such as costs of stationery and school uniforms. We assume that the living expenses and transport costs are the same as

when the individual is not schooling, otherwise, the net costs of living and transport should also be added to the cost of education.

For perfectly competitive conditions, the private rates of return to all forms of investment would be equalized, suitably compensated for risk. Any discrepancy would mean an inefficiency in the allocation of resources. In reality we do not have such conditions and so the rates cannot be equal hence the need for rate of return analysis which helps to give an indication of the appropriate direction of change in educational investments. The analysis should not be expected to indicate exactly the incremental magnitudes required.

2.5.2 Social Rates of Return to Education

To calculate social rates of return to education, we replace post tax earnings with pre-tax earnings.

In this case, the cost of education, on top of the individual's private costs, includes all forms of government spending for educational facilities (i.e. public subsidies, teachers and administrator's salaries, school buildings construction and maintenance, the provision of equipment and all other

educational services).

2.5.3 Use of Rates of Return to Education in educational and economic development planning

Generally, economics concerns the creation of wealth and distribution of income. A country has to allocate its scarce resources efficiently so as to get the maximum wealth possible, and governments are concerned to promote equitable income distribution, given the prevailing technological advancement and other constraints. In order to effect changes in the socio-economic situation of a country, some educational and economic development planning has to be done.

One way to do this kind of planning, is by using the social rates of return to education since the rates depend on demand for corresponding skills, provided labour markets work moderately well. For instance, the rates of return analysis can be used to estimate full employment equilibria for labour with various educational levels from demand and supply of labour projections.

By using rates of return to education, a country can obtain information relevant to questions of which

direction and approximately what quantities of resources to allocate to education. For example, if the rate of return to primary education is higher than that of secondary education it would be more profitable to spend relatively more on primary education. Also if the overall rate of return to education is higher than the rate of return to physical capital investment the country should relatively emphasize human capital investment.

Blaug (1970, p.169) argues that the private rate of return to education can also be an important tool in the educational planning of a country if parents and students are keen about job opportunities and career prospects associated with various amounts and types of education. Blaug goes on to give an example that if the private rate of return on say a college diploma is higher than the profit parents can make on some other comparably risky investment ventures, if any, or if they can borrow funds to finance the education and can afford to pay for the funds, then there will be a higher demand for the diploma education and the government concerned will have to do future educational planning accordingly.

According to the Human Capital theory, educational planning has far reaching implications on people's

earnings differentials and the country's income distribution in general.

Major alternatives to Cost-Benefit analysis in educational planning are the Manpower Requirements and the Linear Programming approaches. The Manpower Requirements approach is normally preferred by politicians and laymen to the Cost-Benefit analysis approach because the former is straightforward, simple to do and understand and appears to give exact figures. Also its data base is easy to get. However, the Cost-Benefit approach would be preferable for a proper educational planning since its rival (i.e. the Manpower Requirements approach) does not consider the returns and costs of education.

2.5.4 Evidence on Rates of Return to Education

Cost-benefit analysis has been widely in use for a long time while people try to investigate the role education plays in the determination of earnings. Consistent results have sometimes been obtained. The following are a few examples:

Joubert (1976) calculated private rates of return to education for Coloureds, Indians and Whites for the years 1960 and 1970. He included male and female earnings together in the study. He found that in 1960,

private rates ranged from -8% (for whites holding diplomas) to 142% (for coloureds with standard 10 certificates), whereas, for 1970 the range was from -9% (for Indian diploma holders) to 56% (for Coloureds with standard 10 certificates). Over the period between the years, some rates increased and others decreased for reasons which were not given by the author. For instance, it was revealed that, on average, Indian private rates increased from 10% (in 1960) to over 15% (in 1970).

Vasar (1980) also did a survey in which he calculated rates of return to education for Indians holding a three - year teaching diploma in South Africa. His results were as follows; private rates were 14,8% for males and 20,3% for females. The corresponding social rates were 10,9% and 15,7% respectively.

Recently, another study was done on education facilities and social rates of return to education in the Durban Metropolitan region (South Africa) by Trotter (1984). The study involved males only. By calculating average rates of return to education for primary and marginal rates for secondary schooling, his findings were that primary education was the most profitable investment as far as Indians and Blacks were

concerned. For Coloureds, the best educational investment was for standards six and seven. Unlike the other three racial groups, Whites had an unusual pattern of increasing rates for increasing educational attainments.

Internal social rates of return to education for males ranged from 3.4% (for Blacks with standards six to seven) to 22.1% (for Coloureds with the same educational level). The rates of return to the highest school standards, eight, nine and ten exceeded that of education in the middle standards, six and seven for all the population groups except Coloureds. On average, the return to education fell to the minimum at around standards six and seven and then rose again at higher educational standards. Overall rates were 13.4% for Whites, 14.0% for Indians, 15.7% for Coloureds and 14.2% for Blacks.

Donaldson's Transkei survey (1984) showed that the social rates of return to education for males ranged from 6% (for people with Standards 5 - 7) to 37% (for matriculants) after standardizing for ability and some other factors. The primary education (i.e. standards 2-4) rate was 9%. The rates followed the usual pattern of falling around standard seven then rising with higher educational levels. For females, the range was

from 8% (for standards 2-4) to 28% (for standard 10). In this case, the pattern of rates of return to education was that they increased with levels of schooling.

Thias and Carnoy (1972) used the rate of return to education approach to investigate the importance of education in influencing income differentials in Kenya in the year 1968. They used male earnings only. It was found that there is a positive correlation between education and earnings, that is, those who were more educated earned more than those who were not. They also found that primary and secondary education were the most profitable educational investments with private rates of even more than 50%.

The rates of return to standards seven and eight education were the lowest. They were around 10%. As far as social rates of return are concerned, the pattern of rates was similar to that of private rates except that in this case it was university education with rates at the bottom. According to the authors, this might have been due to the relatively large amount of government expenditure for university education. They corrected the rates of return to education for taxes, socio-economic factors, examination performance, mortality, union membership, public employment and an education certificate effect.

In Venezuela, Psacharopoulos and Steir (in the journal of Economics of Education Review, Vol. 7, No.3, 1988, pp.321-332) found that between the years 1975 and 1984, returns to schooling decreased by 2 percent points. They say that this was due to a rapid expansion in education which meant that an increased supply of educated persons contributed to the narrowing of earnings differentials and hence to a more equitable income distribution.

Psacharopoulos (1973) compared rates of return to education for a number of countries. Some of his findings were as follows.

Primary education was the most profitable educational investment followed by secondary education* (Refer to fig. 2.8 below). The high return to primary schooling was due to the interaction between the low costs of primary education (relative to the other education levels costs) and the substantial productivity differential between primary school graduates and illiterates.

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* It should be noted that in some countries this is not so. For example, in Sri Lanka, Sahn and Alderman (1986) found that there was no significant difference between returns to education for primary and secondary education.

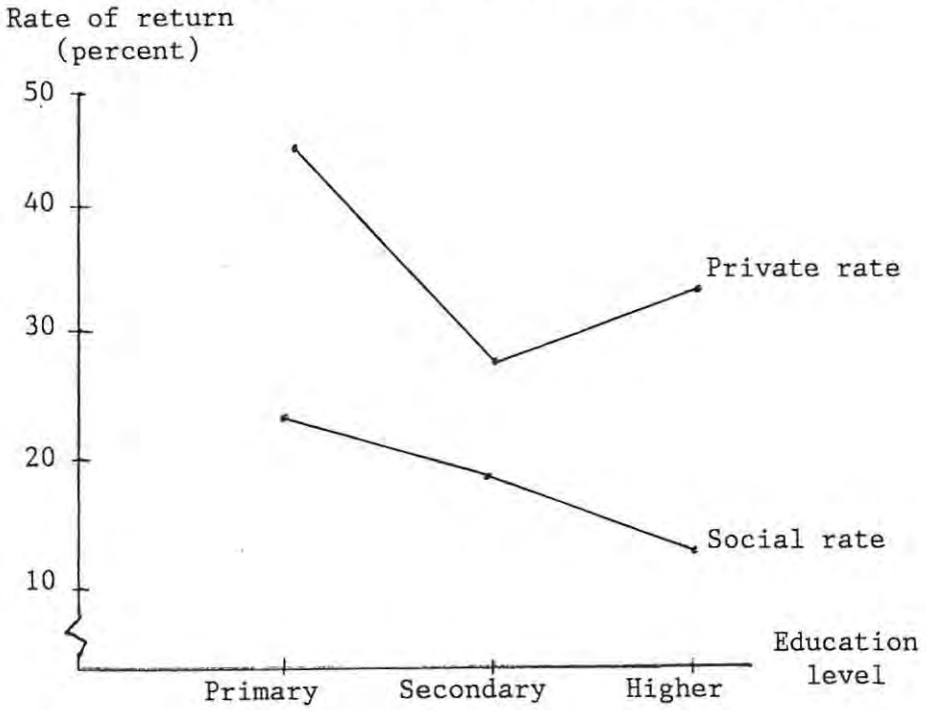
Returns to particular levels of education also vary with average per capita income of countries. For example the return to any level of education was typically higher in Africa and lowest in the advanced industrial countries. This was explained by the relative scarcity of human-to-physical capital within each group of countries.

In all countries and levels of schooling, private returns exceeded social returns because education was publicly subsidized. The private distortions were greatest in the poorest groups of countries and in the higher levels of education.

Returns on educational investment in the competitive economic setting exceeded those in the non-competitive sector by three points. This means that the earnings of workers in the non-competitive sector cause rates of return to education to be underestimated. The inclusion of public sector earnings in particular, because of the equalizing policy of pay scales, flattens the mean earnings differentials and hence depresses the returns to education. For a variety of reasons, women in all countries earned on average substantially less than men and so because the rate of return is a relative concept, it should not be surprising if profitability of investments in women's education was greater than that of men. Referring to

table 2.1 below, for developing countries, rates of return to Human Capital investment are higher than the rates of return to Physical Capital investment. It is the other way round for the developed countries. The author says that this advantage of developing countries over advanced ones diminished from the 1960s to the 1970s following the relatively greater investment in developing countries.

Figure 2.8 : Differences between private and social returns to education in Africa



Source: Psacharopoulos, 1973

Table 2.1 : Returns to Human and Physical Capital by type of country (percent)

	1960's			1970's		
	Human		physical	Human		physical
Developing	20	>	15	15	>	13
Advanced	8	<	10	9	<	11

Source: Psacharopoulos, 1973.

In this research the author is particularly concerned with Blacks in South Africa which is a developing country so their rates would be expected to be comparable to those of other developing countries.

Now we turn to the chapter which gives the results of the research.

CHAPTER 3

PRIVATE AND SOCIAL RATES OF RETURN TO EDUCATION FOR BLACKS IN SOUTH AFRICA

3.1 Introduction

In this chapter, firstly we look at the black educational facilities in relation with those of other racial groups. We then move to the section which explains about the Current Population Survey data which were used in the analysis followed by the discussion of the earnings profiles, the calculation of rates of return to black education and finally the estimated rates of return.

3.2 Existing educational facilities in South Africa

3.2.1 Introduction

In this section, at first the educational system of South Africa is discussed, then expenditure on education (culminating with private and social unit costs of education), school enrolment, pupil - school and pupil - teacher ratios and finally teacher qualifications.

3.2.2 Educational system

There are eleven departments responsible for educating

the country's population, five of which operate within the boundaries of the areas directly controlled by the South African government (white - designated areas) and one in each of the six self-governing states to cater for its nationals. Each department is headed by a minister.

Every racial group in the white areas has its own education department. So, there are three Education and Culture departments which cater for Coloureds, Indians and Whites own affairs respectively and a department of Education and Training (or Education and Development Aid) for Blacks. These four departments are co-ordinated and controlled by the Department of National Education which is regarded as the central education department.

Education departments in the states are affiliated to the Department of Education and Training which renders specialised assistance to the states and convenes regular joint meetings for overall planning and co-operation.

The South African department of Education and Training is organized on a geographical regional basis with directors stationed in various parts of the white areas. These regions are subdivided into circuits with

an inspector in charge of each. There are black inspectors of schools assisting each circuit inspector of education. To ensure direct parent involvement in the smooth running of community schools, their management is a local responsibility of school committees whose members are exclusively black. The Department of Education and Training acts as a central liaison, planning and co-ordinating authority for the education departments of the states, particularly as far as professional matters such as courses, curricula, syllabuses, examinations and general educational standards are concerned.

Bodies such as the Examination Board representing both the National Education Department and all the education departments of the states assist the Department of Education and Training on professional matters. The Council for Education and Training with its head office in Pretoria is composed of black educationists, businessmen and political and religious leaders. It advises the department on all matters pertaining to black education. There is a sub-committee of the council serving each region, while most of the states have their own education advisory councils.

Pre-primary Education

There are creches run by benevolent societies, administration boards and private concerns. All creches in the white areas must be registered with the department of Education and Training.

Primary and Secondary Education

The primary education course is divided into two phases, namely, lower primary school comprising sub A and B and Standard 1 and 2 and higher primary school consisting of standards 3-5. The admission age is 6 years. Pupils write an external higher primary certificate examination which qualifies them to proceed to junior secondary (middle school) or other forms of secondary education. The junior secondary education is a two year course leading to the external standard 7 examination. This is followed by a three year course leading to the senior certificate or matriculation.

3.2.3 Expenditure on education

Before discussing expenditure on education, let us look at the magnitude and composition of the population of South Africa as these aspects have some implications for the sub-topic above. One would expect that the

bigger the population the more money the government would spend on its education and for a fair allocation of educational resources, bigger population groups should also take bigger shares or at least there should be some positive correlation between the shares of government spending on education and the sizes of the groups. In South Africa, Blacks are in a majority and Whites are in a minority. For example, the population figures for the year 1978 were as follows. Of the total population of 27 671 000 there were 19 970 000 (72,2%) Blacks, 2 505 000 (9.1%) Coloureds, 778 000 (2,8%) Indians and 4 418 000 (16,0%) Whites (SACHED,1988,p.96). For the year 1980, of the total population of 23 765 000 the figures were 15 970 000 (67,2%) Blacks, 2 500 000 (10.5%) Coloureds, 795 000 (3,3%) Indians and 4 500 000 (18,9%) Whites (SACHED,1988,p.96). The figures for Blacks show a sharp decrease from 19 970 000 (72,2%) in 1978 to 15 970 000 (67,2%) in 1980 whereas they remain more or less the same for the other groups because the people in Transkei, Bophuthatswana and Venda are not included in the 1980's figures. This contributes to the increase of the other groups' population percentages.

Per capita expenditure

Obviously, educational expenditure has a direct effect

on school facilities like school buildings, science laboratories, pupil-teacher ratios, to mention but a few. This implies that one would expect school pupils to be associated with poor enrolment as well as bad performance if the money spent on their education is not enough which would in turn mean producing workers with a low labor productivity in future.

Per capita expenditure figures for the South African population groups in table 3.1 below show that the money the central government is spending to educate a black pupil is very little compared to those of pupils of the other groups*. This can quickly be noticed if one reads the figures across the columns.

Table 3.1: Per capita expenditure on education in South Africa (Rands)

Year	Blacks	Coloureds	Indians	Whites
1953-4	17	40	40	128
1969-70	17	73	81	288
1975-6	42	140	190	591
1977-8	54	185	276	657
1980-1	139	253	513	913
1982-3	146	498	711	1211
1984-5	292	708	1182	1926
1985-6	387	892	1386	2746

Source:SACHED 1988 and SAIRR Survey 1986

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* It should be noted that the per capita expenditure figures as calculated do not necessarily embrace all the cost items for certain expenditures are concealed in votes other than those obviously referring to education.

For instance, in the year 1980/81, per capita expenditure was R139 for Blacks, R253 for Coloureds, R513 for Indians and R913 for Whites. Reading down the columns, one gets an impression that per capita expenditure on education increases yearly for every group though at varying rates.

If per capita expenditure figures are multiplied by the enrolment figures for the year under review, 1985, we get the total expenditures on education for each group. Given school enrolments for the year as 1 756 879 for Blacks (in the white areas only), 791 312 for Coloureds, 232 468 for Indians and 969 993 for Whites (SAIRR survey, 1986, pp.431-432), the multiplications give us total expenditures of R679 912 173 for Blacks, R705 850 304 for Coloureds, R322 200 648 for Indians and R2 663 600 778 for whites. It is surprising to note that the number of black pupils is the largest but it is associated with the second smallest amount of educational expenditure. The amount of money spent on white education is about four times that spent on black education. This shows a big imbalance in educational resource allocations among the groups. For the sake of argument, if equality between Blacks and Whites was desired and the Whites' quality of education was to be maintained, about R4 144 477 561 more would be needed to be spent on black education.

Per capita expenditure on black education in the white areas

According to vote 25 of the South African government budget of the financial year 1985/86, black education for the white areas was allocated the following:

Table 3.2 : Expenditure on black education in the white areas : 1985/86

Administration	R	38 551 000
Pre primary & Primary education		353 791 000
Secondary education		216 583 000
Tertiary education		151 802 000
Vocational and trade training		21 300 000
Training of handicapped children		11 019 000
Teacher training		34 759 000
Adult education		8 661 000
Supporting and Associated Services		91 020 000
Total		917 486 000

Source : SAIRR Survey 1985.

The sum of R917 486 000 in table 3.2 was budgeted for the 1985/86 financial year to be spent on black education in the white areas. The states were responsible for their own education budgets but normally received grants from the South African government through the Department of Education and Training. For the purpose of this study, only figures for primary and secondary education were needed.

In order to arrive at the total government expenditure

on schooling, one had to add pre-primary and primary education expenditure, secondary education expenditure and the share of the pre-primary and primary and secondary education in the Administration, and Supporting and Associated Services expenditures. This share could not be obtained from any source, so to get an estimate for it, the ratio of (pre-primary and primary and secondary education expenditure) : (tertiary education, vocational and trade, handicapped children, teacher training and adult education expenditure) was applied to the total expenditure on administration, and supporting and associated services. The figure obtained for the total government expenditure on primary and secondary schooling was then divided by the total school enrolment to get the per capita expenditure.

A primary expenditure: secondary expenditure ratio was used to break the schools share in the cost of Administration, and Supporting and Associated Services into two parts; one for the estimate of primary school and the other for the estimate of secondary school Administration, and Supporting and Associated Services expenditure. The first part was then added to the pre-primary and primary education expenditure to get the total amount of money spent on primary education

by the government and the second one added to the secondary education expenditure to obtain the total secondary education government expenditure. Each figure was then divided by the corresponding enrolment figure to arrive at the primary and secondary education per capita expenditures.

By using the ratio of (pre-primary, primary and secondary education) : (tertiary education, vocational & trade, training of handicapped, teacher and adult education) of 2,51:1, the following table 3.3 was obtained:

Table 3.3 : Estimated government expenditure on Primary and Secondary school education in the white areas - 1985/86

	Current, capital expenses and transfer expenses(in Rands)
Administration for schools	27 567 809
Primary education	353 791 000
Secondary education	216 583 000
Supporting and Associated Services	579 337 379
Total	655 879 188

Source: Table 3.2

Therefore, per capita expenditure =

$$\frac{\text{Total School Expenditure}}{\text{No. of pupils/students in white areas) in 1985}} = \frac{655\ 879\ 188}{1\ 756\ 879}$$

≈ R 373.

This figure of R373 per pupil is comparable with the estimate given in the SAIRR Survey of R387. The discrepancy might have been brought about by the estimates which were made by dividing the Administration, and other Services expenditures into the shares.

Table 3.4 : Per capita expenditure (including capital expenditure) on education in the white areas (including the states) for the years 1981 - 1985

	1981	1982	1983	1984	1985*
Budgeted per capita expenditure (R)	165,23	192,34 (16,4%)	234,45 (21,9%)	293,86 (23,9%)	387,02 (32,6%)
Index	100	116,4	142,0	178,0	234,2
Producer goods price index	100	114,0	126,0	136,5	159,5
Index of real in crement of per capita expenditure	100	102,1	112,7	130,4	146,8

* Excludes the states

note: Percentage increases are included in parentheses

Source: SAIRR Surveys 1981, 1982, 1983, 1984, 1985, 1986

Table 3.4 above shows that per capita expenditure in the white areas increased steadily from the year 1981

onwards*. Per capita expenditures on education in the states and the TBVC countries are shown in table 3.5 below.

Table 3.5: Per capita expenditure on education by state and country (1984/5 - 1985/6)

	1984/85	1985/86	% Increase
		R	
Bophuthatswana	-	277,70	-
Ciskei	214,98	-	-
Gazankulu	220,02	267,24	21,5
KaNgwane	165,46	239,00	44,4
KwaZulu	149,36	241,00	61,35
Lebowa	135,97	184,00	35,3
Qwaqwa	-	-	-
Transkei	-	272,00	-
Venda	252,00	-	-
KwaNdebele	147,09	223,58	52,00

- Not available

Source : SAIRR Survey 1986.

According to table 3.5 above, generally, per capita expenditure in each region increased between the years 1984 and 1986 though in varying magnitudes. Table 3.6 below shows per capita expenditures of the white areas and other places for comparison purposes.

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* Indices of real increment of per capita expenditures (including capital expenditure) on education for individual states and countries for years 1981-1985 are given in Appendix A.

Table 3.6 : Comparison of per capita expenditures on education in different places

Year	White areas*	Bophuthatswana	Ciskei	Gazankulu	Lebowa	KaNgwane
1981	165,23	97,00	133,00	96,00	81,00	113,00
1982	192,34	173,28	146,49	127,07	122,71	129,00
1983	234,45	245,64	187,93	145,18	133,67	132,00
1984	293,86	-	214,98	220,02	135,97	165,46
1985	387,02**	277,7	-	267,24	184,00	239,00
Compound growth rate(%)***	21,73	55,00	17,54	29,11	21,76	23,38

	KwaNdebele	KwaZulu	Qwaqwa	Transkei	Venda
1981	124,00	92,00	144,00	113,00	138,00
1982	122,45	126,00	182,28	147,91	115,81
1983	112,8	150,00	217,08	171,97	180,00
1984	-	149,36	-	-	252,00
1985	223,58**	241,00	-	272,00	-
Compound growth rate(%)***	-4,55	28,82	22,40	22,60	26,28

* including the states
** excludes the states.

Source: Table 3.5 and Appendix A

A reading across table 3.6 above for each year from 1981 clearly indicates the differences in expenditures on education. On average more money was spent on blacks in the white areas than in any state or country. As far as

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*** For Bophuthatswana, KwaNdebele, Qwaqwa and Transkei the compound growth rate was calculated for 1981-83; for white areas, Ciskei and Venda for 1981-84 and for others for 1981-85.

the year under review is concerned, there was a very big difference in per capita expenditure between the white areas and the other places. A reading down the figures in each column, shows that on average, the amount increased each year by different amounts.*

Table 3.7 below which shows per capita expenditures of the different places in ratio form helps us to compare the expenditures on education more clearly.

Table 3.7: Comparison of per capita expenditures on education in different places in ratio form

Year	White areas	Bophuthatswana	Ciskei	Gazankulu	Lebowa	Kangwane
1981	1,00	0,59	0,80	0,58	0,49	0,68
1982	1,00	0,90	0,76	0,66	0,64	0,67
1983	1,00	1,05	0,80	0,62	0,57	0,56
1984	1,00	-	0,73	0,75	0,46	0,56
1985**	1,00	0,72	-	0,69	0,475	0,62

	Kwandebele	KwaZulu	Qwaqwa	Transkei	Venda
1981	0,75	0,56	0,87	0,68	0,835
1982	0,64	0,655	0,95	0,77	0,60
1983	0,48	0,64	0,93	0,73	0,86
1984	-	0,51	-	-	0,86
1985**	0,58	0,62	-	0,70	-

** A figure compared with per capita expenditure in the white areas excluding the states.

Source: Calculated from table 3.6.

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* Caution should be taken when comparing the increases in per capita expenditures over the years because these estimates were not adjusted for inflation.

If we look across table 3.7 for say 1985, we find that for every R1 spent on a black pupil in the white areas;

RO,72 was spent on a black pupil in Bophuthatswana
RO,69 was spent on a black pupil in Gazankulu
RO,475 was spent on a black pupil in Lebowa etc.

If we look down the columns we can see that, on average, the gap between the white areas per capita expenditures and those of the other places does not change much. It remains very large especially in the case of Lebowa and KaNgwane.

Private Unit Cost

To obtain estimates of the private unit costs of primary and secondary education, the ideal would have been to do a population survey of education expenditure incurred by individual pupils personally. It could have been a sample survey reasonably representative of the total population of black pupils in South Africa. This was not possible due to lack of finance and time. Trotter's (1980, P.70) estimates of private costs of R29 and R61 for primary and secondary education respectively were used. These costs apply to the year 1980 so they had to be inflated by 14% per year, which was found to be the

average rate of inflation for the period between the years 1980 and 1985. The resulting private costs for the year 1985, were therefore, R55,48 and R117,45 for primary and secondary education respectively. R55 and R117 were actually used in the analysis.

Social Unit Costs for Primary and Secondary Education

The following is an example of how primary and secondary social unit costs were calculated considering the white areas only. By using the primary education expenditure : secondary education expenditure ratio (obtained from table 3.2) of 1,63:1, tables 3.8(a) and 3.8(b) of total government expenditures on education below were obtained.

Table 3.8(a) : Total government expenditure on primary education in the white areas

	Expenditure (in Rands)
Primary Education Administration	17 085 752
Other Primary Education Related Costs	353 791 000
Supporting and Associated Service for Primary Education	35 907 957
Total	R406 784 709

Source: Calculated from table 3.3

Table 3.8(b) : Total government expenditure on secondary education in the white areas

Secondary Education Administration	10 482 057
Other Secondary Education Related Costs	215 583 000
Supporting and Associated Services	22 028 422
Total	R249 094 479

Source: Calculated from table 3.3

Table 3.9 below shows the calculated per capita expenditures on primary and secondary education separately.

Table 3.9 : Per capita Expenditures for primary and secondary education in the white areas

	Primary	Secondary
Total Educational Expenditure	406 784 709	R249 094 479
No. of pupils	1 431 934	324 945
Per capita expenditure	R284	R767

Source: Table 3.8(a) and 3.8(b)

When the figures of per capita expenditures in table 3.9 were augmented by the private unit costs, the primary and secondary social unit costs were obtained as follows:-

Primary Social unit cost = Primary per capita expenditure + primary private unit cost
= R284 + R55,84 = R339,84 ≃ R340.00

Secondary Social unit cost = Secondary per capita expenditure + secondary private unit cost
= R767 + R117,45 = R884,45 ≃ R884.00

These figures apply only to development regions A, B, D and the hostels which are totally in the white areas. For the other regions, different figures were obtained depending on the budgets of the South African government and the various states' governments. In these regions it was presumed that educational activities were dominated by those of the states judging by the relative pupil enrolments, so it was thought suitable to use weighted averages of the states' and the white areas' per capita expenditures for the average student, rather than to assume the white areas per capita expenditure as such. Appendix B gives the calculations involved. The calculated social unit costs of education for each region are shown in table 3.10 below.

Table 3.10 : A summary of primary and secondary Social Unit Costs of education by region.

Region	unit costs (R) Primary	Secondary
A	340	884
B	340	884
C	282	717
D	340	884
E	281	713
F	277	703
G	274	695
H	273	691
Hostels	340	884

Source: Calculated from Table 3.9 and Appendix A.

Weighted averages of these unit costs , which are R302 and R774 for primary and secondary schooling respectively were used in the final calculations of the social rates of return to education. The costs of education were calculated according to development region for two reasons. One reason was that, this was the only way the information could be obtained, and the other was that the author wanted to find out whether the costs varied according to region and if so, to see if this affected people's earnings differentials since according to the human capital theory it could, as far as quality of education is concerned. Table 3.10 shows that there were variations in the costs depending on development region.

3.2.4 School enrolment, pupil - teacher ratio and other educational facilities

School enrolment

According to the official book of South African statistics (1985) and SAIRR survey (1986), after 1981, black schools increased by a growth rate of about 3% per year. School enrolment figures for the population groups shown in table 3.11 below imply that there was a steady increase of enrolment from 1970 to 1982 for every group which is expected due to population growth. According to SAIRR (1986), by 1985, the

growth rate of black school enrolment was about 4% which was still higher than the population growth rate of approximately 2,8% per year.

According to the manpower report by the Research Institute for Education Planning (No 6, 1985), comparing the 1985 and 1980 figures (including the states and the TBVC countries), the enrolment per standard and per school phase showed that a larger percentage of pupils was represented in higher standards in 1985 but black enrolment of 67% of the age 5 - 19 population (compared with about 78% for the other racial groups) was still low.

Table 3.11: School enrolment in South Africa for selected years between 1970 and 1982.

Year	Blacks	Coloureds	Indians	Whites
1970	2 738 564	490 351	161 676	859 352
1972	3 081 162	534 613	172 142	879 755
1974	3 488 043	591 850	180 800	896 819
1976	3 900 454	655 347	188 008	928 640
1978	4 311 616	722 326	205 136	962 561
1980	4 839 806	748 896	217 170	959 243
1982	5 313 016	766 179	223 745	986 276

Source:SACHED,1988

On top of the low enrolment rates, black children had very big drop-out rates (SACHED,1988,p.106). For instance, SACHED(1988,p.106) reports that,in 1983, there were high drop-out rates for blacks prior to

completion of junior primary schooling, which meant that many black children had less than 4 years of schooling. In 1982, 1 008 938 (19,0%) black children were in sub A and 72 501 (1.4%) black pupils and 55 216 (5,7%) white pupils were in standard 10. This implies that very few black children got to standard 10 compared to white children and it indicates a great educational imbalance amongst racial groups.

SACHED(1988, p.106) argues that the dropping out of school of the majority of blacks makes a big difference to the quantity of education between blacks and whites. So, the majority of black children prepare themselves for unskilled jobs and lower social and political positions. Also, because of the lack of school facilities for science subjects like science laboratories and qualified science teachers in black schools, the majority of pupils tend to study subjects like Bible Knowledge, History and languages only, which limits black children a lot in their future career advancement.

As far as Human Capital Theory is concerned, one (a parent) decides to go (send a child) to school provided it is worthwhile to do so, that is, if it is more profitable than any comparably risky physical capital investment. Tastes for investment risks

vary among people. In the South African context, many blacks lack motivation for schooling because of the circumstances which face them. They tend to believe that schooling does not pay, that their fate is already decided, however much they will struggle with schooling they will end up working in the mines or farms, do small scale businesses, work as porters, achieve low social and political positions, to mention but a few or they may even fail to get employed at all. It is likely that school curricula help to bring this about. For instance, it is not fit to study European History instead of South African History. These problems are associated with imperfections in the human capital market and discrimination against blacks in the labour market. The kind of attitude of Blacks towards education discussed above tends to lower the expected rate of return to education and hence it is likely to cause a lower black school enrolment rate than it could have been.

On the supply side of education, the government has to play a very big role in financing black schooling because the majority of black parents cannot afford to send their children to school. As we saw in chapter 2, availability of school funds is a very important factor of human capital production and earnings. Seemingly, poverty and the low government expenditure

on black education has caused blacks to have poor quantity (and quality) of education. This is so because, theoretically speaking, with a given demand curve, low income people face relatively high opportunity costs of funds, and so can supply only limited funds for schooling, so that provided there is inadequate government financial support, few children enrol for schooling beyond, say, the primary level.

In an article about a research on black education by Market Research Africa (Markinor) and Integrated Marketing Research on behalf of the Third Alternative, a group of concerned businesses, which appeared in the City Press newspaper of the 8th August 1990, the following was reported. Many black children drop out of school because of poverty. The authors say that people are so poor they cannot afford to send their children to school.

The research involved canvassing 10 000 people. According to the authors, poverty accounted for 50 percent of boys and 64 percent of girls of the total number of drop-outs. The study revealed that about 60 percent of blacks lived in rural areas where families, on average, had six children compared to those in urban areas with about 5 children. The families in rural areas survived on an average of

one-eighth of a hectare when they needed between four and five hectares a family for proper survival. They continue to say that blacks who had no formal education earned on average R175 a month, while those with matric earned an average of R772 a month, and university graduates averaged R1851 a month. They report that, in 1985, the year corresponding to this study, 22 percent of black adults had no schooling at all (so they earned on average R175 a month). This implies that education is a major factor of people' earnings differentials and that schooling can be used as a tool to narrow the differentials.

Pupil-teacher ratio

Pupil-teacher ratios for black schools are higher than

Table 3.12: Pupil-teacher ratios in South Africa for selected years

Year	Blacks	Coloureds	Indians	Whites
1971	58:1	31:1	27:1	20:1
1976	52:1	30:1	27:1	20:1
1977	50:1	29:1	27:1	20:1
1978	49:1	29:1	27:1	20:1
1980	47:1	29:1	25:1	19:1
1982	39:1	27:1	24:1	18:1
1983	43:1	27:1	24:1	18:1

Source: SACHED, 1988

those for the schools of any of the other population groups as shown in table 3.12. The figures for 1980 exclude Transkei, Boputhatswana and Venda, and those for 1982 exclude Ciskei as well. Reading the figures across the columns of the table, one realizes the great imbalance in the pupil-teacher ratios among the groups. For example, in 1980, the ratio was 47:1 for black pupils, 29:1 for coloured pupils, 25:1 for Indian pupils and 19:1 for white pupils. The imbalances in the ratios imply big differences in quality of education among the groups. Reading down the columns, one notices a general trend of decreasing ratios. However, black schools still had a high pupil-teacher ratio in 1983.

Although the situation of the black pupil-teacher ratios after 1980 is not very clear because of excluding the TBVC countries, class sizes were still big in most of the states as will be evidenced in table 3.13 below. By 1985, black schools still needed a lot more teachers if equality with white schools was desired.

Table 3.14 shows that 71% of the total black South Africans went to school in the states where it appears the situation was worse (i.e.pupil to teacher ratio could even go up to 82:1 in higher primary classes) than in the white areas. The same applies to TBVC countries.

For example, in that year 1985, the pupil-teacher ratios in Kwazulu, Transkei and Ciskei were 53:1, 64:1 and 53:1 for primary schools respectively.

Table 3.13 : Pupil-teacher ratios for the states, countries and the white areas for the years 1982 - 1985

Year		Black Schools in White Areas	Bophuthatswana	Ciskei	Gazankulu	Lebowa
1982	p	44:1	50:1	42:1	53:1	51:1
	s	-	42:1	34:1	26:1	36:1
1983	p	43:1	43:1	43:1	51:1	46:1
	s	-	43:1	31:1	26:1	33:1
1984	p	42:1	42:1	45:1	54:1	44:1
	s	-	37:1	32:1	29:1	32:1
1985	p	41:1	38:1	43:1	53:1	43:1
	s	-	-	30:1	28:1	34:1

Year		KaNgwane	KwaNdebele	KwaZulu	Qwaqwa	Transkei	Venda
1982	p	42:1	-	53:1	36:1	68:1	47:1
	s	35:1	-	38:1	40:1	26:1	26:1
1983	p	42:1	-	51:1	35:1	63:1	37:1
	s	35:1	-	35:1	38:1	23:1	25:1
1984	p	42:1	40:1	52:1	34:1	67:1	38:1
	s	35:1	34:1	35:1	32:1	23:1	25:1
1985	p	39:1	53:1	53:1	35:1	64:1	35:1
	s	30:1	37:1	37:1	31:1	23:1	26:1

p = primary

s = secondary

Source: SAIRR Surveys 1982, 1983,, 1984, 1985, 1986

Pupil - teacher ratios as shown in table 3.13 above reflect some inequalities in quality of education among

different places. However, they generally show some improvement in quality of education over time but still the situation is alarming especially in the case of Gazankulu, KwaNdebele, Kwazulu and Transkei.

A lot more teachers have to be trained and more classrooms are required to be able to standardize the quality of education to all population groups in South Africa at a reasonable level.

Table 3.14: Black pupil enrolment by standard and area : 1985

	White areas	States	Total	Proportion of total
Primary	1 431 934	3 388 184	4 829 118	80%
Secondary	324 945	867 987	1 192 932	20%
Total	1 756 879	4 256 171	6 013 050	100%
Proportional of Total	29%	71%	100%	100%

Source : SAIRR (1986)

Table 3.14 above indicates that 71% of all the black school pupils went to school in the states and 80% of them were in primary school in the year 1985. This imbalance in school enrolment between primary and secondary education is likely to be due to the high drop-out rate of blacks mainly because of poverty.

Farm and rural schools

In 1985 there were 470 084 black pupils in 5399 farm schools (of which one was a secondary school) comprising about 27 percent of the total pupil enrolment in the white areas and about 73 percent of all schools controlled by the Department of Education and Training. Farm schools usually only go up to Standard 2 and about a quarter of them have just one teacher with an average enrolment of 90 pupils. This statement implies that in 1985, educational opportunities in rural areas were very limited, unlike in urban areas.

Classroom shortage in schools

The Minister of the Department of Education and Training, Dr Viljoen said in parliament (in 1986) that on the basis of the calculation of 40 primary pupils per classroom and 35 secondary pupils per classroom, in 1985 there was a shortage of 2896 classrooms at primary and 2221 at secondary school level in the white areas alone. This implied teacher shortages of more or less the same magnitudes. However, he indicated that steps were being taken to eliminate the backlog. The situation of classroom facilities was definitely worse in the states than in the white areas.

Teachers qualifications

Teachers in South African schools are not equally qualified for the different population groups. The highest qualification of the majority of teachers in black schools is below Standard 10. Table 3.15 below shows the highest qualifications of the teachers in South African schools for different population groups for the year 1979.

Table 3.15: Teacher qualifications in South Africa, in 1979 by population group

Highest qualification	Black	Coloured	Indian	White
University degree	2,3%	4,2%	19,4%	32,0%
Std 10	15,5%	26,3%	65,3%	68,0%
Below Std 10	82,2%	69,5%	15,3%	-

Source: SACHED,1988

In the year 1979, there was no white teacher without a matric level qualification. About 83% of the black teachers and about 70% of the coloured teachers had no matric.

About 65,2% of the teachers in black schools in the white areas and the TBVC countries were not adequately qualified in 1985 (i.e. these teachers did not have the minimum teachers' qualification of a post-standard 10

Teachers Certificate or diploma). The respective figures for Transkei, Bophuthatswana and Venda were 56,1%, 62,2% and 67,9%. For Ciskei, information was not obtainable.

Compulsory and free education

The Education and Training Act, No. 90 of 1979 makes provision for the introduction of compulsory education, with free tuition and free school books. These conditions were implemented in January 1981 in 264 schools in 76 residential areas throughout the Republic of South Africa. By the year 1985 a total of 182 869 pupils up to standard 3, representing 10.4% of the total black school population in the white areas benefitted from this provision.

There was no compulsory and free education in the states. However, the government of South Africa announced that sufficient funds had been found to provide free basic stationery for all pupils in the white areas as well as the states from the beginning of 1986.

Illiteracy rate

By 'illiterate' in this study, we mean people who can't read and write. Table 3.16 below shows the

approximate numbers and percentages of adults for each population group who were classified as illiterate. 1980 figures exclude the TBVC countries.

Table 3.16: Illiteracy rates in South Africa for registered population groups for the years 1960, 1970 and 1980

	1960		1970		1980	
	%	Number	%	Number	%	Number
Blacks	62,5	4 000 000	51,8	4 500 000	33,0	3 300 000
Coloureds	38,0	276 300	23,6	260 000	15,5	247 000
Indians	28,7	76 000	16,7	62 000	7,6	39 000
Whites	1,9	40 000	0,9	23 500	0,7	23 000

Source: SACHED,1988

The table indicates that the percentages of illiterates of Blacks were the biggest and those of the Whites the smallest for each year. There is also an indication that illiteracy is decreasing with time. The situation for blacks is not clear for 1980 because of excluding the TBVC countries. However, the figures indicate an overall pattern of inequality in education amongst the South African population groups.

3.2.5 Educational Distribution of the black labour force in South Africa

Reference to the labour force includes people between

the ages of 15 and 64 years inclusive. Referring to table 3.17 below, in 1985, about 20% of the black labour force were illiterate, 62% had below standard 5 education and just about 38% had secondary education and above.

Table 3.17 : Educational distribution of the black labour force in the white areas (including the states) in 1985.

Educational Level	% of the total labour force	Cumulative %
No Education	19,25	19,25
Primary	42,60	61,85
Secondary	36,65	98,5
Higher	1,5	100,00
Total	100,00	100,00

Source: Estimated from the 1985 CPS data.

According to the discussion aforesaid, it is likely that poverty, coupled with the insufficient government expenditure on black education have resulted in low school enrolment rates, high drop-out rates, high pupil - teacher ratios and other poor educational facilities which have been some of the basic causes of large numbers of black workers (measuring about 62% of the

total black labour force) to have very low quantity and quality of education which in turn most probably has caused them to be associated with low labour productivity and consequently low earnings.

3.3 Multi-regression analysis and adjustments of age - earnings profiles

3.3.1 The Current Population Survey data

The 1985 South African Current Population Survey raw data were used in this analysis. The survey is conducted monthly by the department of Statistics for blacks and coloureds in order to obtain current short term information on the structure of the economically active black and coloured population particularly as far as employment and unemployment are concerned. The relevant variables for the investigation were; people's earnings, educational level, age, sex, marital status, area of current residence, development region*, place

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* note: Development regions are as follows. Region A consists of Western Cape, region B consists of Western Transvaal, Nothern Cape and parts of Orange Free State(O.F.S), region C consists of parts of O.F.S and Qwaqwa, region D consists of Eastern Cape and parts of O.F.S, region E consists of Natal and KwaZulu, region F consists of Eastern Transvaal, Kangwane and parts of Lebowa and Gazankulu, region G consists of Nothern Transvaal and parts of Lebowa and Gazankulu, region H consists of P.W.V. and KwaNdebele.

of work, work hours, economic status, job, and employment sector. Only the data focussing on blacks were used in the present study.

Observations corresponding to the following variables were excluded from the investigation.

Income: All zero earnings as well as those which were more than R7600 per month were excluded in order to exclude people who were non economically active, those able but unemployed and those who were earning extraordinarily large amounts of money. The probability of finding work is, however, part of the return on schooling.

Age: All people aged less than 15 and greater than 64 were excluded. The idea behind this was to include only people of working age.

Education: All education standards for more than 12 years of schooling including diploma certificate and unspecified academic qualifications were excluded. Observations for people of age of less than 20 years and with education of standard 10 were also excluded because they were regarded as

extraordinary cases.

Economic status: Unemployed, not economically active and 'other' were excluded.

Place of work: People working in Transkei, Bophuthatswana, Venda and Ciskei and neighbouring countries were excluded.

Job: 'Other' occupations were excluded.

Sector: 'Other' sectors of employment were excluded.

The purpose for excluding unspecified education, unemployed and not economically active variables was to avoid distortions in the regression results which would give false impressions. The TBVC and neighbouring countries were discarded because they were not included in the target population of this study. The other remaining variables were discarded because the number of cases pertaining to the groups were too small and it was not appropriate to combine them with any other groups for a proper statistical analysis.

In the case of females, some job variables (i.e: supervisor, artisan and driver) and the sector

variable, mining had very few cases. However, it was decided not to discard them as their inclusion seemed to improve the analysis.

Monthly earnings were grouped to simplify calculations as follows: 0, 1-19, -----, 140-159, 160-199,-----, 360-399, 400-479,-----, 720-799, 800-999,-----, 1200-1399, 1400-1599, 1600-1999,-----, 2400-2799, 2800-3599, 3600-4399, 4400-5999, 6000-7599, 7600-10800. Also, educational levels were grouped in order to have a reasonable number of individuals in each category and to enable a distinction to be made between five educational phases, namely, 'zero to standard one', 'standards two to four', 'standards five to seven', 'standards eight to nine', and standard ten. These phases indicate illiteracy, incomplete primary, junior secondary or middle school, incomplete senior secondary and complete senior secondary schooling or matriculation respectively.

Before statistical analysis was done the CPS sample data were investigated for outliers and influential observations by means of 'Studentized Residuals (Rstudent)' and 'Partial - Regression Coverage Plots ' diagonostic techniques as suggested by David A Belsley, Edwin Kuh and Roy E Welsh (1980). As a result, some more observations were excluded.

The analytical work distinguished between males and females. This was done to remove the effect of sex on the earnings differentials. Since, unlike men, a large proportion of women do not enter the labour market and many of those who do are employed on a part time basis only, doing this analysis for males and females combined together would involve difficulties of interpretations.

Earnings were the dependent variable and the sets of the variables* listed below were the independent variables involved in the investigation. The table also shows the number of observations per variable.

	Variable	No of observations	%
1. Sex:	Male	15810	68
	Female	7468	32
	Total	23278	100
		Male (%)	female %
2. Marital status:	Single	4921 (31,0)	2961 (39,6)
	Married & living together	10600 (67,0)	3547 (47,5)
	Divorced & widowed	289 (0,2)	960 (12,9)
	Total	15810(100,0)	7468(100,0)

* The variables in the same category which had almost equal mean and variance of earnings were combined to minimize a possible multi-collinearity problem. E.g. Regions A,B,C and D were combined as they were somehow related and had more or less the same mean earnings.

3. Education level	illiterates	5045 (31,9)	2016 (27,0)
	std 2 - 4	4088 (25,9)	1642 (22,0)
	std 5 - 7	4486 (28,4)	2327 (31,2)
	std 8 - 9	1659 (10,5)	1116 (15,0)
	std 10	532 (3,4)	367 (5,0)
	Total	15810(100,0)	7467(100,0)
4. Age	15 - 19	421 (3,0)	321 (4,0)
	20 - 24	1831 (11,5)	926 (12,0)
	25 - 34	5163 (33,0)	2556 (34,0)
	35 - 44	3997 (25,0)	1945 (26,0)
	45 - 54	2948 (19,0)	1262 (17,0)
	55 - 64	1450 (9,0)	458 (6,0)
	Total	15810(100,0)	7468(100,0)
5. Economic status:	Gen. Govt., SA Railways and Harbours SA Airways & Gen. Post office	2569 (16,2)	1297 (17,4)
	Seasonal work & Domestic work	301 (1,9)	2716 (36,4)
	Private Business	12940 (81,8)	3455 (46,3)
	Total	15810(100,0)	7467(100,0)
6. Place:	Metropolitan	8551 (54,1)	3222 (43,1)
	White town	3793 (24,0)	1388 (18,6)
	State town	2622 (16,6)	2101 (28,1)
	W & S farm	844 (5,3)	757 (10,1)
	Total	15810(100,0)	7467(100,0)
7. Work Hours:	<= 20	67 (0,4)	208 (2,8)
	20<whrs<=60	14515 (91,8)	6717 (89,9)
	> 60	1228 (7,8)	543 (7,3)
	Total	15810(100,0)	7468(100,0)
8. Area:	Metropolitan & Town - urban:	4968 (31,5)	3896 (52,1)
	Farm & Rural - Rural:	4604 (29,2)	3435 (46,0)
	Hostels	6238 (39,5)	137 (1,8)
	Total	15810(100,0)	7468(100,0)

9. Region:	A, B, C & D:	2799 (17,7)	2172 (29,0)
	E	2249 (14,2)	1634 (21,9)
	F & G	1558 (9,9)	1271 (17,0)
	H	2966 (18,8)	2254 (30,2)
	Hostels	6238 (39,5)	137 (1,8)
	Total	15810(100,0)	7468(100,0)
10. Job:	Prof. & Superv.	862 (5,5)	830 (11,1)
	Admin. & Cler.	1313 (8,3)	438 (5,9)
	Sales &		479 (6,4)
	Service work	2441 (15,5)	3528 (47,2)
	Farm work	2528 (16,0)	1007 (13,5)
	Artisan		29 (0,4)
	& Semi-skilled	4970 (31,4)	
	Driver	1493 (9,4)	15 (0,2)
	Unskilled	2203 (13,9)	
	& Semi-skilled		1142 (15,3)
	Total	15810(100,0)	7468(100,0)
11. Sector:	Agriculture	2576 (16,3)	1034 (13,8)
	Mining	3038 (19,2)	24 (0,3)
	Manufacturing, Electricity &		
	Construction	5183 (32,8)	1115 (14,9)
	Trade	2032 (12,9)	1332 (17,8)
	Transport	858 (5,4)	37 (0,5)
	Finance & Gov.		
	service	1876 (11,9)	1593 (21,3)
	Household service		
	& Pivate service	247 (1,6)	2333 (31,2)
	Total	15810(100,0)	7468(100,0)

3.3.2 Preliminary investigation of the effect of education on people's earnings

A preliminary investigation was done to assess the contribution of formal education to the earnings of employed people using least squares linear regression analysis on years of schooling as a continuous independent variable. Quite distinct relationships

were revealed between schooling and earnings for women compared to men as will be shown below in regression equations***.

Simple linear model

Firstly, a simple linear model was fitted for which

$$Yi = a + bSi + ui$$

where

Yi are the observed earnings,

Si are the years of schooling,

u is the error term, which is assumed to be random and independently distributed.

a is the intercept term, and

b is the regression coefficient of years of schooling.

The following results were obtained.

All males, $Y = 2288,90^{**} + 194,28^{**}S$, $r^2 = 0,13$

All females, $Y = 659,06^{**} = 247,18^{**}S$, $r^2 = 0,34$

*** For all regression equations which follow, '*' will be used to mean that the parameter is statistically different from zero at 95% level of significance, and '**' will mean that the parameter is statistically different from zero at 99% level of significance.

Referring to the equations above, the effect of education on earnings differentials is shown to be highly significant. Judging by r^2, the measure which indicates the predictive power of a regression model, schooling seems to be affecting women's earnings greatly compared to men's.

By regressing earnings on years of work experience***, the following equations were obtained.

All males, $Y = 3063,35^{**} - 2,3^{*}X$, $r^2 = 0,00$

All females, $Y = 1895,66^{**} - 9,18^{**}X$, $r^2 = 0,01$

where X is the years of experience.

According to the above results, even if the effect of years of experience on earnings is highly statistically significant, it does not seem to be an important determinant of earnings differentials especially in the case of males.

Including both schooling and experience together in the linear regression model gave the equations which

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*** Years of experience are estimated by subtracting the age at which a person in a particular education group is assumed to have started working (i.e: 15 for education = zero, but 21 for the std 10 group) from his or her present age.

follow.

All males,

$Y = 1802,81^{**} + 223,93^{**}S + 18,50^{**}X, \quad r^2 = 0,15$

All females,

$Y = 305,74^{**} + 266,76^{**}S + 14,68^{**}X, \quad r^2 = 0,36$

Still, there is a big imbalance between men and women as far as the explanatory power of the model is concerned. This seems to be due to the relative importance of education to the earnings differentials as r^2 does not improve much.

Adding the years of experience^{2}*** term to the equation above increases the r^2 value as shown in the equations below, giving a negative coefficient value for the term as expected.

All males,

$Y = 1083,14^{**} + 226,70^{**}S + 104,08^{**}X - 1,85^{**}X^2, \quad r^2 = 0,19$

*** The years of experience^{2} term captures the tendency for earnings to increase with experience, at a decreasing rate, up to some peak above which earnings fall as individuals approach retirement age.

All females,

$Y = 153,05^{**} + 253,10^{**}S + 41,55^{**}X - 0,64^{**}X^2, \quad r^2 = 0,42$

Log-linear regression model

A log-linear regression model was also used in the investigation of the effect of schooling on earnings, the equation of which is

$$Y = aS^b$$

where b this time, is the earnings elasticity of years of schooling.

The model yielded the following equations.

All males, $Y = 7,36^{**}S^{,38^{**}}$, $r^2 = 0,13$

All females $Y = 6,07^{**}S^{,78^{**}}$, $r^2 = 0,31$

According to the results, the log-linear model also indicates that schooling affects women's earnings more than men's. Comparing the linear model with the log-linear model, one finds that the former seems to explain the influence of schooling on people's earnings better than the latter, judging by r^2. This might imply that if education is measured in terms of years of schooling, it would be linearly related to earnings.

However, this statement needs further investigation since there are many other non-linear types of the relationship which have not been tried.

A log-linear model involving only years of experience yielded the following equations.

All males, $Y = 7,72^{**}X^{,03^{**}}$, $r^2 = 0,001$

All females, $Y = 7,21^{**}X^{-,04^{**}}$, $r^2 = 0,001$

The striking feature of these equations is the low r^2 value, indicating that the equations are mis-specified. When the years of schooling term was added to the model, the values of the earnings elasticity of experience for both males and females increased significantly and the females term became postive, and there was a big improvement in r^2 as shown in the equation below. The males' elasticity of experience is still larger than that of females which might imply that experience influences males' earnings more than females'.

All males, $Y = 6,77S^{,43^{**}} \cdot x^{,20^{**}}$, $r^2 = 0,18$

All females, $y = 5,6S^{,82^{**}} \cdot x^{,16^{**}}$, $r^2 = 0,34$

3.3.3 Adjusting age-earnings profiles

In order to assess the influence of formal education on peoples' earnings differentials, it is desirable to remove the influence of non-educational factors on earnings. For this purpose, age-earnings profiles can be adjusted for the variation of earnings due to marital status, locational* and employment structure factors. Occupational factors can also be standardized but it is likely that this would remove much of the effect of education on earnings differentials as well. However, their effects were also investigated. The adjustment was done by firstly fitting a multi-regression model** of type

$$Y_i = B_0 + \sum_j B_j X_{ij} + \sum_k C_k Z_{ik} + U$$

Yi are the observed earnings of individuals, i = 1, ..., n,

Xj are age variables, j = 1,2, ...,m,

Zk are all other independent variables

K = 1,2,.....,l

U is the error term, which is assumed to be normally and independently distributed, (i.e. $U \sim IND(0, \sigma u)$),

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* In this study, 'locational' variables will mean 'area and region' variables.

** This method was adapted from the Donaldson study.

for a proper least squares regression analysis, Bo is the intercept term and Bj and Ck are other regression coefficients corresponding to age and other independent variables respectively.

Since we have separate age-earnings profiles for the different education groups, the regression equation was estimated for each education group separately. The estimation of the regression equation was done in stages as follows. Firstly, only age variables were used in the model. Secondary, marital status and the locational variables were introduced and thirdly, the employment structure and occupational variables were also added to the model.

This implies that three stages of adjustment of the age earnings profiles for the variation in the independent variables were effected, and for every stage, a set of five regression equations involving categories of independent variables in the form of dummies was obtained. For every category of dummy variables, a variable was left out to avoid linear dependence.

At the first stage of the regression estimation, five age groups, namely, '15 - 19', '20 - 24', '25 - 34', '45 - 54', '55 - 64' were used in the model, leaving out '35 - 44'. For the second stage, the following

categories of variables were introduced: Two dummies, namely, single and 'divorced or widowed' for 'marital status', one dummy which is urban for 'area' and four dummies, regions 'A, B, C, & D', E, H and hostels for 'region'. The reason why regions A, B, C and D were grouped together was because they had more or less equal mean earnings possibly due to their being related to each other (as each of them involves the Cape or/and Orange Free State province).

For the third phase, employment structure and occupational dummy variables were added. These involved the following: Two dummies were used for 'economic status', namely, 'general government, SA Railway and Hourbours, SA Airways and General Post office' and 'Private Business'. Three dummies for 'place of work' were included; they were metropolitan, white town, and state town. Two dummies, 'less than or equal to 20' and 'greater than 20 and less than or equal to 60' were used for 'work hours'. For the 'job' category, some variables were grouped differently for sexes. For males, six dummies were used, namely, 'administrative and clerical work', 'sales work and service work', farm work, 'artisan and semi-skilled work', driver, and unskilled work, whereas for females, they were seven, 'administrative and clerical', sales work, service work, farm work, artisan, driver and 'semi-skilled and unskilled work'. For the

'employment sector' category, six dummies were included, namely, mining, 'manufacturing, electricity and construction', trade, transport, 'finance and general government', and 'household and private services'. The whole model including the dummy variables excluded from the analyses is shown in tables 3.18.(a) and 3.18(b) for males and females respectively.

At the final stage, education and experience were also added to the model but this was done just for the sake of regression estimation not for adjustment of the age earnings profiles.

The regression procedure yields measures of statistical significance of the parameters and r^2, which indicates the predictive power of the equation.

The fitted regression equation is used to adjust age-earnings profiles in the following way. The sum of the products of the age variables regression coefficients in table 3.21(a)1 say, (in the case of males) and their corresponding average values shown in table 3.18(a) is subtracted from the mean earnings of each education group taken from table 3.18(a).

This corrects the mean earnings for variations in

independent variables within education groups and results in predicted values of earnings for the age group, 35-44, which was excluded from the model.

A further correction is made by adding the sum of the products of the regression coefficients of the other independent variables in table 3.21(a)1 and the differences between the frequencies of the variables in the whole sample and in the education group concerned to the remainder of the mean earnings (after subtracting the age effect). This adjustment yields a predicted value for the age group, '35-44' with the independent variables held constant at their mean values over all education groups. So, the two adjustments standardize the variables both within and among education groups. The predicted values for the other age groups are then derived by adding the value of age group '35-44' to their corresponding regression coefficients hence forming a full profile of adjusted predicted earnings figures for an education group. Appendix D illustrates how the calculations were done.

Table 3.18(a): Mean values of independent variables by education group - males

variables		illit	std 2-4	std 5-7	std 8-9	std 10	All
Age group:	15 - 19	,03	,04	,02	,01	,01	,03
	20 - 24	,07	,13	,135	,145	,23	,12
	25 - 34	,23	,32	,38	,43	,52	,33
	45 - 54	,26	,18	,15	,13	,08	,19
	55 - 64	,15	,08	,06	,04	,03	,09
Marital:	single	,20	,31	,36	,43	,56	,31
	Div.& Wid.	,02	,02	,02	,01	,01	,02
Area:	urban	,14	,245	,44	,54	,65	,31
	hostels*	,42	,46	,37	,29	,15	,395
Region:	A, B, C & D	,23	,175	,14	,13	,11	,18
	E	,11	,13	,16	,20	,25	,14
	H	,10	,155	,26	,31	,37	,19
	Hostels	,42	,46	,37	,29	,15	,395
Econ:	govt.	,14	,14	,17	,205	,41	,16
	Priv. Business	,83	,83	,82	,79	,59	,82
Place:	met	,39	,53	,66	,69	,635	,54
	W town	,25	,26	,24	,21	,13	,24
	S town	,03	,03	,04	,06	,19	,04
Work Hours:	<=20	,00	,01	,00	,00	,00	,00
	20<WH<=60	,88	,91	,95	,97	,97	,92
Job:	Admin & Clerical	,02	,03	,09	,28	,38	,08
	Sales & Serv.	,13	,15	,18	,18	,12	,16
	Farm work	,32	,16	,05	,01	,00	,16
	Artisan & Semi-skilled	,28	,365	,36	,24	,11	,31
	Driver	,06	,09	,13	,11	,06	,09
	Unskilled	,14	,16	,15	,08	,06	,14

* The coefficient of the 'hostels' variable for Area in the regression model was pre-set to zero to avoid linear dependence since it is exactly the same variable appearing for Region. The same applies to females.

Sector: Mining	,19	,215	,185	,20	,11	,19
Man.,Elec. & Cons.	,25	,34	,40	,35	,25	,33
Trade	,09	,12	,16	,17	,12	,13
Transport	,04	,045	,07	,07	,085	,05
Fin.& Govt Hse & Priv. Service	,08	,09	,13	,20	,42	,12
	,02	,02	,01	,00	,00	,016
Mean earnings	2360	2834	3409	3959	4317	3014
Mean Age	41	36	35	34	31	37
n =	5045	4088	4486	1659	532	15810

Dummy variables excluded from the model to avoid linear dependence

	illit	std 2-4	std 5-7	std 8-9	std 10	All
Age group:35-44	,26	,26	,26	,24	,15	,25
Marital:married	,78	,67	,62	,56	,43	,67
Area: rural & farm	,43	,29	,18	,175	,20	,29
Region: F & G	,14	,085	,07	,07	,12	,10
Econ. Seasonal & Domestic work	,03	,03	,01	,00	,00	,02
Place:W & S farm	,33	,185	,06	,045	,05	,18
Work Hours >60	,12	,08	,05	,03	,03	,08
Job: Prof. & Superv.	,04	,05	,04	,10	,26	,055
Sector:Agric	,33	,16	,05	,02	,01	,16

Source: CPS sample data

Table 3.18(b):Mean values of independent variables by education group - females

	illit	std 2-4	std 5-7	std 8-9	std 10	All
Age group:15-19	,055	,07	,03	,02	-	,04
20-24	,09	,13	,12	,16	,20	,12
25-34	,26	,31	,35	,48	,48	,34
45-54	,23	,16	,16	,105	,09	,17
55-64	,09	,06	,06	,025	,01	,06
Marital:single	,265	,39	,44	,50	,545	,40
Div.& Wid.	,165	,135	,125	,08	,07	,13
Area:urban	,23	,44	,72	,70	,67	,525
hostels	,01	,02	,01	,03	,05	,02
Region:A, B, C & D	,385	,34	,26	,165	,14	,30
E	,15	,23	,21	,29	,36	,22
H	,16	,27	,405	,38	,32	,30
Hostels	,01	,02	,01	,03	,05	,02
Econ: Govt.	,06	,08	,14	,43	,69	,17
Priv.Bus.	,33	,44	,60	,50	,29	,46
Place: met.	,17	,36	,60	,60	,59	,43
W town	,16	,19	,22	,17	,12	,19
S town	,04	,05	,06	,14	,20	,07
W Hours:<= 20	,05	,03	,02	,00	,00	,03
20<WH<=60	,84	,87	,93	,96	,98	,90
Job: Admin.& Cler.	,01	,02	,06	,15	,23	,06
Sales work	,03	,05	,09	,095	,04	,06
Serv.work	,57	,59	,50	,19	,06	,47
Farm work	,29	,18	,05	,01	,00	,135
Artisan	,00	,00	,01	,005	,00	,00
Driver	,00	,00	,00	,00	,00	,00
Semi-skill. & Unskilled	,08	,14	,23	,16	,075	,16

Sector: Mining	,00	,00	,00	,01	,005	,00
Man, Elec & Construction	,07	,14	,22	,16	,09	,15
Trade	,08	,15	,265	,24	,12	,18
Transport	,00	,01	,01	,00	,005	,005
Fin. & govt.	,08	,11	,19	.48	,75	,21
Hse & Priv. Service	,46	,41	,265	,09	,03	,31
Mean Earnings	897	1237	1938	2838	3693	1724
Mean age	38	35	35	33	32	36
n =	2016	1642	2327	1116	367	7468

Independent variables excluded from the model to avoid linear dependence

	illit	std 2-4	std 5-7	std 8-9	std 10	All
Age group: 35-44	,28	,265	,27	,21	,22	,26
Marital: married	,57	,475	,43	,42	,38	,475
Area:rural & farm	,76	,535	,27	,27	,275	,46
Region: F & G	,29	,15	,11	,12	,13	,17
Econ:Seas. & Dom. work	,61	,485	,26	,07	,02	,36
Place: W & S farm	,63	,39	,12	,09	,085	,31
W. Hours >60	,11	,10	,05	,04	,02	,07
Job: Prof. & Superv.	,02	,01	,06	,38	,59	,11
Sect: Agric	,30	,18	,05	,01	,005	,14

Source: CPS sample data

Table 3.19(a)1: The unadjusted age-earnings Profiles by Education group - males

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	874	1157	1996	2767	--
20 - 24	2108	2344	2746	3084	3823
25 - 34	2548	2872	3406	3876	4203
35 - 44	2453	3105	3629	4365	5109
45 - 54	2424	3084	3752	4469	4595
55 - 64	2234	2878	3516	4268	5445

Source: Derived from the CPS sample data.

Table 3.19(a)2: Number of males for the age-education cohorts.

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	161	166	76	18	-
20 - 24	346	515	607	241	122
25 - 34	1166	1311	1691	720	275
35 - 44	1294	1051	1172	402	78
45 - 54	1308	726	660	213	41
55 - 64	770	319	280	65	16

Source: Derived from the CPS sample data.

Table 3.19(b)1: The unadjusted age-earnings profiles by education group - females

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	672	563	1238	1717	-
20 - 24	779	897	1633	2361	2914
25 - 34	903	1214	1978	2802	3586
35 - 44	820	1419	2046	3163	4292
45 - 54	983	1426	2016	3108	4500
55 - 64	1139	1538	2003	3579	4248

Source: Derived from the CPS sample data.

Table 3.19(b)2: Number of females for the age education cohorts.

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	110	115	73	23	-
20 - 24	173	214	288	177	74
25 - 34	520	508	819	533	176
35 - 44	560	435	632	238	80
45 - 54	469	265	379	117	32
55 - 64	184	105	136	28	5

Source: Derived from the CPS sample data

Table 3.20(a): Regression coefficients: Age variables only-males

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	-1579**	-1948**	-1633**	-1598**	-
20 - 24	- 345**	- 761**	- 883**	-1281**	-1286**
25 - 34	95	- 233**	- 223**	- 489**	- 906**
45 - 54	-30	-21	123	104	- 514
55 - 64	-220**	-227**	-112	-97	336
Intercept	2453**	3105**	3629**	4365**	5109**
r^2	0,04	0,07	0,06	0,10	,10
Adj r^2	0,04	0,07	0,06	0,10	,09
n =	5045	4088	4486	1659	532

Source: CPS sample data

Table 3.20(b): Regression coefficients: Age variables only - females

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	-148	-856**	-809**	-1446**	-
20 - 24	-41	-523**	-413**	-802**	-1377**
25 - 34	83	-205**	-69	-361**	-705**
45 - 54	-162**	7	-31	-55	209
55 - 64	318**	119	-43	416	-44
intercept	820**	1419**	2046**	3163**	4292**
r^2	0,02	,07	,03	,07	,16
Adj. r^2	0,01	,07	,02	,06	,15
n =	2016	1642	2327	1116	367

Source: CPS sample data

Table 3.19(a)1 and 3.19(b)1 were derived by finding the arithmetic mean of earnings for each age-education cohort. They could as well be derived using tables 3.20(a) and 3.20(b) by adding the relevant regression coefficients to the corresponding intercepts. In this

case, the predicted value for the age group, '35-44' is the intercept. Tables 3.19(a)2 and 3.19(b)2 show the number of individuals in each age-education cell.

According to tables 3.18(a) and 3.18(b), for males, the mean earnings are R197, R236, R284, R329 and R360 per month for illiterates, people with standards 2 to 4, standards 5 to 7, standards 8 to 9 and standard 10 respectively. The corresponding mean earnings for females are R75, R103, R161,5, R236,5 and R308 respectively. The median level of education for males is standards 2 to 4 while that of females is standards 5 to 7. So, in the year 1985, on average, a black male earned R236 and a black female earned R161,5.

The regression analysis results in table 3.20(a) and 3.20(b) show that the coefficient of age is statistically significant but age above 25 does not affect people's earnings differentials much. Basically, there are two possible reasons for the effect of age on earnings differentials. The first one is that, the effect might be a reflection of the effect of work experience on earnings as age is believed to be highly associated with work experience. The second is that, people who invest in human capital or study for a long time, also take long to benefit from the investment which would also imply a

direct proportionality between the accumulation of human capital and age.

Assuming that the effect of age on earnings differentials is a reflection of the effect of experience on earnings, the increasing r^2 with increasing education would mean that the more educated one becomes, the more experience becomes an important determinant of one's earnings.

Table 3.21(a)1: Regression coefficients: Age, and marital status and locational variables - males

Variable	illit	std 2-4	std 5-7	std 8-9	std 10
Age group:15-19	-516**	-877**	-983**	-1181**	-
20-24	-250**	-561**	-671**	-1012**	-513*
25-34	-11	-249**	-183**	-366**	-440*
45-54	-21	6	188**	89	-533*
55-64	-182**	-222**	-64	-90	256
Marital:single	-322**	-252**	-347**	-352**	-827**
Div.&Wid	-287**	-687**	-333*	-290	1
Area: urban	1644**	1285**	821**	365**	444**
Region:A,B,C&D	-426**	-521**	-701**	-505**	-321
E	503**	650**	234**	-23	-234
H	848**	934**	548**	205	-25
Hostels	2094**	1813**	1345**	800**	294
intercept	1308**	1813**	2712**	3977**	4921**
r^2	,49	,38	,22	,17	,16
Adj. r^2	,49	,38	,21	,16	,14
n =	5045	4088	4486	1659	532

Source: CPS sample data

Table 3.21(a)2: Age-earnings profiles by education group adjusted for variation due to age, marital status and locational variables only - males

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	2217	2164	2423	3077	-
20 - 24	2483	2480	2735	3246	4321
25 - 34	2722	2792	3223	3892	4394
35 - 44	2733	3041	3406	4258	4834
45 - 54	2712	3047	3594	4347	4301
55 - 64	2540	2819	3342	4168	5090

Source: Derived from tables 3.18(a) and 3.21(a)1

Table 3.21(b)1: Regression coefficeints: Age, and marital status and locational variables - females

variable	illit	std 2-4	std 5-7	std 8-9	std 10
Age group:15-19	-138	-299**	-478**	-1061**	-
20-24	-48	-209**	-304**	-462**	-831**
25-34	70	-23	-85	-198*	-452**
45-54	8	-31	-44	-113	223
55-64	-40	10	-78	225	-363
Marital:single	128**	75	9	-393**	-653**
Div.&Wid.	109**	84	-12	136	80
Area:urban	858**	815**	598**	293**	459**
Region:A,B,C&D	-385**	-348**	-487**	-396**	-236
E	279**	201**	222**	89	-356*
H	597**	563**	623**	240*	-51
Hostels	994**	1349**	1076**	205*	69
Intercept	600**	762**	1369**	2932**	4265**
r^2	,46	,47	,25	,12	,25
Adj. r^2	,46	,46	,25	,11	,23
n =	2016	1642	2327	1116	367

Source: CPS sample data

Table 3.21(b)2: Age-earnings profiles by education group adjusted for variation due to age, marital status and locational variables only - females

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	1167	1096	1407	1887	-
20 - 24	1257	1186	1581	2486	3272
25 - 34	1375	1372	1800	2750	3651
35 - 44	1305	1395	1885	2948	4103
45 - 54	1313	1364	1841	2835	4326
55 - 64	1265	1405	1807	3173	3740

Source: Derived from tables 3.18(b)1 and 3.21(b)1

Table 3.22(a)1: Regression coeffiecients: Age and all other independent variables excluding work hours, economic status*** and education - males

Variables	illit	std 2-4	std 5-7	std 8-9	std 10
Age group:15-19	-283**	-440**	-583**	-1221**	-
20-24	-237**	-455**	-541**	-823**	-488*
25-34	-14	-166**	-154**	-360**	-425*
45-54	-4	15	165**	105	-402
55-64	-149**	-241**	-51	-37	334
Marital: Single	-242**	-202**	-265**	-312**	-592**
Div.& Wid.	-225*	-483**	-242	-370	199
Area: urban	515**	212**	134*	197	276

*** 'Work hours' and 'economic status' variables were excluded from the analysis not because they were not statistically significant but because, statistically speaking, more or less the same r^2 could be obtained whether they were included or not. Some other variables could have been discarded instead but these were particularly chosen because, of all the factors of earnings investigated in this study, they seemed least important especially in the case of males. Using fewer variables made the analysis more understandable and its implications easier to explain.

Region:	A,B,C&D	-234**	-290**	-484**	-511**	-458
	E	37	192**	-68	-184	-214
	H	455**	552**	331**	-49	-120
	Hostels	686**	428**	628**	554**	6
Place:	met	841**	1189**	963**	646**	1323**
	W town	489**	844**	666**	335	833*
	S town	404**	679**	715**	580**	742*
Job:	Admin &Cler.	-807**	-985**	-561**	-452**	-816**
	Sales work & Service work	-1435**	-1132**	-967**	-903**	-1354**
	Farm work	-1729**	-1569**	-1595**	-2016**	-2754**
	Artisan & Semi-skill.	-1316**	-1179**	-963**	-982**	-1224**
	Driver	-548**	-581**	-372**	-413**	-1536**
	Unskill.	-1591**	-1625**	-1292**	-1200**	-1736**
Sector:	Mining	728**	619**	245	721*	692
	Man, Elec & Const.	757**	684**	726**	1201**	813
	Trade	375**	189	216	623*	384
	Transport	567**	706**	644**	868**	839
	Fin. & Govt	319**	177	234	881**	619
	Hse & Priv. Service	-42	-244	-131	-2	15
Intercept		2621**	2621**	2928**	3438**	4030**
r^2		,63	,53	,35	,28	,33
Adj. r^2		,63	,53	,35	,27	,30
n =		5045	4088	4486	1659	532

Table 3.22(a)2: Age-earnings profiles by education group adjusted for variation due to age, marital status, locational and occupational variables-males

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	2628	2574	2656	2541	-
20 - 24	2674	2559	2698	2939	3339
25 - 34	2897	2848	3085	3402	3402
35 - 44	2911	3014	3239	3762	3827
45 - 54	2907	3029	3404	3867	3425
55 - 64	2762	2773	3188	3725	4161

Source: Derived from tables 3.18(a) and 3.22(a)1

Table 3.22(b)1: Regression coefficients: Age and all other independent variables excluding work hours, economic status and education - females

Variables	illit	std 2-4	std 5-7	std 8-9	std 10
Age group:15-19	-64	-97	-275**	-650**	-
20-24	-53	-109*	-200**	-210	-773**
25-34	-16	2	-114*	-155	-413**
45-54	17	30	-11	21	120
55-64	-11	56	-134	211	-39
Marital:Single	50	32	5	-216**	-377**
Div/Wid	68*	61	37	302*	22
Area:urban	278**	266**	318**	407**	624**
Region:A,B,C&D	-241**	-231**	-345**	-159	-463*
E	90**	-21	56	53	-249
H	352**	363**	367**	321**	-186
Hostels	586**	623**	327*	-47	210
Place:Met.	594**	557**	557**	480**	418
W town	148**	263**	208**	259	389
S town	101	153*	312**	463**	160
Job:Admin & Cler.	-1514**	-994**	-804**	-559**	-440**
Sales work	-1818**	-1432**	-1477**	-880**	-793*
Service work	-1924**	-1617	-1604**	-1455**	-1652**
Farm work	-1994**	-1450**	-1586**	-1330	-1030
Artisan	-1189**	-555	-973**	-1032*	0
Driver	-11	373	831*	1177*	0
Semi-skill.& Unskill.	-1754**	-1165**	-1289**	-1014**	-1009**
Sector:Mining	380	-280	330	615	539
Man.,Elect. & Const.	531**	499**	386*	431	570
Trade	495**	636**	383*	432	753
Transport	599*	735**	620*	-385	660
Fin. & Govt.	313**	656**	374*	564	915
Hse & Priv. service	-154*	74	-148	-30	-238
Intercept	2534**	2009**	2424**	2418**	3150**
r^2	,69	,65	,50	,42	,42
Adj. r^2	,68	,64	,50	,41	.38
n =	2016	1641	2327	1116	367

Table 3.22(b)2: Age-earnings profiles by education group adjusted for variation due to age, marital status, locational and occupational variables - females

Age group	illit	std 2-4	std 5-7	std 8-9	std 10
15 - 19	1562	1498	1532	1585	-
20 - 24	1573	1486	1607	2025	1944
25 - 34	1610	1597	1693	2080	2304
35 - 44	1626	1595	1807	2235	2717
45 - 54	1643	1625	1796	2256	2837
55 - 64	1615	1651	1673	2446	2678

Source: Derived from table 3.18(b) and 3.22(b)1

Tables 3.21(a)1 and 3.21(b) show regression coefficients for age, and marital status and locational variables. According to the tables, when the marital status and locational variables were added to the model, there was a tremendous increase in r^2. This indicates that marital status and locational variables influenced people's earnings greatly. The results also imply that these variables influenced earnings of male illiterates more than their female counterparts' but it was generally the opposite for educated people. Looking at r^2 across both tables, one finds that as years of schooling increase, the explanatory power of the regression model decreases. For males, the adjusted r^2 drops from ,49 to ,14 whereas for females, it drops from ,46 to ,11 though in this case the minimum happens at

standards '8-9'. This might imply that marital status and locational variables explain earnings of people who are less educated more than those of people who are better educated (especially in the case of males) and that there is an interaction effect of education and these variables on earnings differentials.

It is interesting to note that when marital status and locational variables were added to the model, the effect of age on earnings decreased, which might imply that part of the variation in earnings which was originally explained by the model before was actually due to the association of age with these variables. Bearing in mind that area was highly related with occupational variables according to the SAS relationship analysis, this might support the argument that age determines earnings indirectly through association with favourable and unfavourable job opportunities, and does not greatly affect earnings differences within particular job opportunities*.

It is worthwhile to note that there was a multi-collinearity problem which affected some of the regression coefficients because of the relationships among the independent variables. The effect of this

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* See Donaldson's paper(1987)

problem is basically to degrade the parameter estimates concerned by way of increasing their sampling variances and covariances. Large figures of variances of ordinary least squares (OLS) estimates make it difficult to find the relevant coefficients statistically significant. The problem causes small variations in the data (for instance, dropping or adding a few observations) to produce substantial variations in the coefficients and causes r^2 to be lower than it should have been.

The SAS FREQ procedure was used to investigate the relationships among the variables. According to the frequency analysis, the following associations were found statistically significant and hence thought to cause a multi-collinearity problem. Marital status was highly related with area, work hours and education. For instance, married people were associated more with rural areas, many work hours and low education than single persons. Area was highly related with education, place of work, region, sector and job. For instance, urban areas were highly associated with high education, which is expected due to there being more and better education facilities in urban areas than in rural areas.

Urban area residents were more likely to work in urban places than in rural areas and vice versa, which must

of course be expected. Hostels were highly related with mining and urban places of work, for the simple reason that the mining industry is mainly situated in urban areas. There was a strong relationship between urban areas and administrative and clerical work jobs. Rural areas were highly associated with farming and agriculture, for obvious reasons.

Economic status had a high relationship with place of work and sector. For instance, government jobs were concentrated in urban places and private businesses were highly related with mining, manufacturing and trade sectors.

Place of work was highly related with work hours, education, job and sector. For instance, rural places were highly associated with many work hours, less education, farming and agricultural sector. Job was highly related with work hours, region and sector. For instance, farming was highly related with the agricultural sector which is obvious. The mining sector was highly associated with the hostels. Work hours was highly associated with education in such a way that the better educated generally worked for less hours than others.

There are remedies for the multi-collinearity problem like Baye's and Rig - regression methods but none of

these was feasible for this study. However, the problem was minimized by excluding further variables.

As already seen above, since education was related to some other explanatory variables, it is likely that by holding the other variables constant in the adjustment process of the age-earnings profiles, also some of its effect on the earnings was removed and the more of the other variables the author standardized, the more influence of education on earnings was removed. This problem must be borne in mind when interpreting the rates of return to education in chapter 4.

According to the regression results in tables 3.21(a)1 and 3.21(b)1, for males , marital status was an important factor of earnings and married people on average earned more than the single. This might be explained by the fact that generally married people tend to have a lower labour turn over rate than others, and by sticking to their jobs for a long time, they tend to acquire skills through the 'learning-on-the-job education process' and consequently become more productive than others. As a result, they get better job promotions more quickly and in the final analysis earn more than their counterparts. Because of having a lower labour turn over rate, employers tend to prefer married people to single persons.

The analysis indicates that people earn more in urban than in rural areas, and that rural-urban migration has not eliminated this gap. People working in urban places are likely to earn more than those working in rural areas because of the possible differences in education and labor productivity associated, for example, with the variation in capital to labour ratio, assuming that wages are equal to marginal product (in equilibrium conditions).

The explanation for the variation in earnings due to variation in region is not straightforward; the effect may have been caused by the differences in the costs of education among the regions as seen in section 3.2.3 or it may be just a reflection of the effect of area on the earnings differentials because of the high association between area and region or both. Some regions are more urbanized than others and as a result there may be significant regional variations in labor productivity and technology. This argument assumes that earnings vary according to labour productivity. Area variables are subsets of region variables and this, as mentioned earlier on, created a collinearity problem in the regression analysis and must have degraded the area and region coefficients. It is worthwhile to note that people in hostels earned far more than others.

Generally, the adjusted age-earnings profiles in tables 3.21(a)2 and 3.21(b)2, indicate that the effect of adjusting earnings for marital status and locational factors is to narrow the earnings differentials for people with low levels of education but to increase them for those with senior secondary schooling. This is consistent with the general argument of this investigation that people's earnings differentials are influenced by many different factors. Unfortunately, the adjustment caused age-earnings profiles corresponding to males' education of standards 8-9 and standard 10 to cross each other twice after the age of 44 (which makes it impossible to calculate the rate of return to education using the calculation technique applied in this study, which was explained in chapter 2). However, this problem disappeared when the earnings were adjusted for employment probabilities.

Tables 3.22(a)1 and 3.22(b)1 show the regression analysis results after adding the occupational variables to the model. According to the results, the variables improved the explanatory power of the model dramatically and the differences between urban and rural areas were greatly reduced but there was still a trend of decreasing r^2 with increasing years of schooling which cropped up when the marital status and locational variables were introduced in the model. So,

occupational variables affected earnings differentials greatly.

For males, the highest adjusted r^2 is ,63 for illiterates and the lowest is ,27 for standards '8-9'. For females, the corresponding adjusted r^2 are ,68 and ,38 respectively. The reason why we have a decreasing r^2 with increasing years of education is not obvious. It may be that the more educated people become, the larger the significance of the factors of earnings which were not analysed in this study becomes. This proposition can be supported by the fact that imperfections in the labour market are greater for highly educated people than for the less educated according to Psacharopoulos (1973). An alternative explanation is that, more schooling worsens the multi-collinearity problem since education is a common factor of almost all the independent variables analysed in this study such that when it increases the association amongst the variables also increases.

Place of work seems to be an important determinant of earnings especially in the case of males. There are large differences in earnings between metropolitan

areas, towns, farms and the states. People working in urban places, tend to earn more than those working in rural places as explained above. Those who work on farms earn the least. There was no significant earnings difference between white farms and state farms and so these variables were combined together in the regression analysis.

Sector is shown to be an important factor of earnings differentials for people with low levels of education. For both males and females, generally, the results do not show significant earnings differences between the agricultural sector and house service and Private service sectors. These are the sectors in which people are paid the lowest wages.

Job affects people's earnings very greatly. Professionals and supervisors rank the highest on the earnings ladder then drivers, then other formal occupations with semi-skilled and unskilled work, farm work and domestic service jobs ranking the lowest, when other factors are held constant. For males, sales workers and service workers seem to earn equally well. Also, in the case of females, semi-skilled workers and unskilled workers seem to be earning more or less the same amount of money. For these reasons, these variables were also combined together in the analysis.

Table 3.23(a): Regression coefficients: All explanatory variables excluding work hours and economic status variables - males.

Variables	Coefficients			
Educ	194**	201**	156**	86**
Age gr.15 - 19		-1777**	-801**	-443**
20 - 24		-791**	-564**	-465**
25 - 34		-198**	-174**	-143**
45 - 54		-1	35	25
55 - 64		-210**	-144**	-157**
Marital: Single			-346**	-275**
Div.& Wid.			-399**	-308**
Area: urban			1173**	275**
Region A, B, C & D			-573**	-346**
E			457**	26
H			642**	335**
Hostels			1730**	549**
Place: met				957**
W town				620**
S town				654**
Job:Admin & Cler.				-751**
Sales work &				
Service work				-1290**
Farm work				-1717**
Artisan & Semi-skill.				-1248**
Driver				-640**
Unskill				-1600**
Sector: Mining				549**
Man, Elec &				
Const.				734**
Trade				264**
Transport				624**
Fin. & Govt				360**
Hse & Priv.				
Service				-121
Intercept	2289**	2487**	1527**	2642**
r^2	,13	,18	,41	,54
Adj. r^2	,13	,18	,41	,54
n =	15810	15810	15810	15810

Table 3.23(b): Regression coefficients: All explanatory variables excluding work hours and economic status variables -females

Variables	Coefficients			
Educ.	247**	252**	187**	51**
Age gr.:15 - 19		-706**	-372**	-173**
20 - 24		-466**	-267**	-178**
25 - 34		-110**	-41	-73**
45 - 54		44	-9	14
55 - 64		141*	-19	-32
Marital: Single			-86**	-45*
Div/wid			47	76**
Area: urban			584**	363**
Region A, B, C & D			-483**	-277**
E			174**	34
H			462**	326**
Hostels			868**	363**
Place: met				470**
W town				149**
S town				238**
Job:Admin & Cler				-820**
Sales work				-1450**
Service work				-1719**
farm work				-1684**
Artisan				-1052**
Driver				556**
Semi-skill. & Unskill.				-1371**
Sector: Mining				267
Man, Elec & Const				385**
Trade				407**
Transport				501*
Fin. & Govt				445**
Hse & Priv. serv.				-99
Intercept	659**	748**	614**	2268**
r^2	,34	,37	,49	,69
Adj. r^2	,34	,37	,49	,69
n =	7468	7468	7468	7468

Table 3.24(a): Regression coefficients: Some explanatory variables including experience - males

Variables	Coefficients		
Educ	92**	96**	87**
Exp.	6**	51**	47**
Exp * Exp		-1**	-1**
Educ * Exp			0
Marital: Single	-373**	-235**	-236**
Div/wid	-330**	-309**	-310**
Area: urban	276**	265**	263**
Region A, B, C & D	-358**	-349**	-349**
E	25	18	17
H	328**	339**	340**
Hostels	553**	541**	542**
Place: met	974**	953**	954**
W town	637**	619**	621**
S town	658**	668**	672**
job: Admin & Cleric	-772**	-756**	-756**
Sales work & Service work	-1318**	-1295**	-1297**
farm work	-1758**	-1723**	-1727**
Artisan & Semi-skill.	-1270**	-1261**	-1264**
Driver	-654**	-657**	-662**
Unskill	-1628**	-1611**	-1614**
Sector: Mining	515**	545**	542**
Man.& Elec.& Const.	716**	728**	726**
Trade	248**	259**	256**
Transport	618**	624**	622**
Fin & Govt	337**	359**	357**
Hse & Priv. Service	-156*	-109	-115
Intercept	2428**	1954**	2014**
r^2	,54	,54	,54
Adj. r^2	,54	,54	,54
n =	15752	15752	15752

Table 3.24(b): Regression coefficients : All explanatory variables including experience - females

Variables	Coefficients		
Educ.	55**	56**	47**
Exp.	4**	18**	15**
Exp * Exp		-0,3**	-0,3**
Educ * Exp.			0,5
Marital: Single	-62**	-34	-35
Div/Wid	65*	82**	79**
Area : urban	365**	364**	364**
Region A, B, C & D	-278**	-276**	-277**
E	28	30	30
H	327**	329**	329**
Hostels	379**	364**	366**
Place: met	470**	465**	463**
W town	157**	152**	152**
S town	255	255**	254**
Job: Admin & Cler.	-831**	-825**	-822**
Sales work	-1466**	-1463**	-1465**
Service work	-1732**	-1728**	-1733**
Farm work	-1707**	-1692**	-1699**
Artisan	-1003**	-1012**	-1011**
Driver	540**	542**	536**
Semi-skill & Unskill	-1382**	-1379**	-1381**
Sector:Mining	262	260	262
Man., Elec& Const.	379**	381**	382**
Trade	407**	408**	410**
Transport	491**	503**	499**
Fin.& Govt.	437**	441**	444**
Hse & Priv. Service	-102	-99	-96
Intercept	2145**	2011**	2068**
r^2	,69	,69	,69
Adj. r^2	,69	,69	,69
n =	7418	7418	7418

Referring to tables 3.22(a)2 and 3.22(b)2 which show adjusted age-earnings profiles for all the explanatory variables (except work hours, economic status and education) one finds that, like in the case of locational variables, generally, the effect of the adjustment for the occupational factors is to narrow the earnings differentials for people with low levels of education, but to increase them for those with senior secondary education. The explanation for this will be given in chapter 4.

When multi-regression analysis involving all the explanatory variables including education (with the exception of work hours and economic status) was done for the whole sample, the results shown in tables 3.23(a) and 3.23(b) were obtained. The tables show that education has a highly significant positive contribution to people's earnings differentials, and that also all the other explanatory variables investigated in this study do affect them.

Tables 3.24(a) and 3.24(b) show regression coefficients for the model when it includes work experience as well. The results indicate that although work experience is statistically significant, it seems to affect people's earnings slightly. The negative sign of the coefficient of experience implies that

experience contributes to the downward curving of earnings profiles. The coefficient for the interaction between education and experience implies the interaction's positive contribution to earnings determination. A statistically significant coefficient for the interaction would mean that experience affects earnings differently for different education standards which would be consistent with the argument about the effect of experience on earnings on page 110 but in this particular case, the variable is not significant at 95 percent level of significance.

3.3.4 Other adjustments to lifetime earnings streams

On top of standardizing some socio-economic variables, two more adjustments were introduced into the analysis as follows.

When projecting earnings for successive age-education cohorts, employment opportunities must be taken into consideration. This is done by estimating employment probabilities for the individuals and multiplying them by the corresponding earnings to get the lifetime expected earnings. In this study, basically Trotter's estimated probabilities of finding work shown in table 3.25 below were used (Trotter, 1988).

Some part of the earnings variation is normally believed to be attributable to natural ability which has a positive correlation with educational achievements. Adjustments attributing 60% of the earnings differentials (associated with both primary and secondary schooling) to education were made. This is in accordance to the Wolfle and Smith's study referred to in section 2.5 and the report on the Demand for Technical and Vocational Education in Transkei by Donaldson (1987).

Table 3.25: Projected lifetime employment probabilities for school leavers

	MALES					
Educational level	Age 15-19	20-24	25-34	35-44	45-54	55-64
Illiterates	0,2	,6	,7	,7	,7	,65
Std 2 - 4	0,2	,7	,8	,8	,75	,65
Std 5 - 7	0,2	,7	,8	,8	,75	,65
Std 8 - 9	0,2	,8	,8	,8	,75	,7
Std 10		,8	,9	,9	,8	,7
	FEMALES					
Illiterates	,15	,3	,4	,4	,35	,2
Std 2 - 4	,10	,3	,4	,4	,35	,2
Std 5 - 7	,15	,3	,4	,4	,4	,2
Std 8 - 9	,15	,35	,45	,45	,4	,2
Std 10		,4	,45	,45	,4	,25

Source: Trotter (1988)

Adjusting for taxes paid by individuals as contributions to public revenue was not done because of lack of information.

Also, other adjustments like that for probabilities of survival were not made as they are commonly known to have little effects on the rates of return to education (Thias and Carnoy, 1972, ch. 4).

Expected mean annual earnings

The following tables 3.26(a) and 3.26(b) show the expected mean annual earnings obtained by multiplying earnings taken from tables 3.19(a)1 and 3.19(b)1 by the corresponding probabilities of employment from table 3.25.

Table 3.26(a): Expected earnings according to age and educational level for black males (in Rands per year)

Age	Educational Level				
	Illiterates	Std 2 - 4	Std 5 - 7	Std 8 - 9	Std 10
15-19	175	231	399	553	-
20-24	1265	1641	1922	2467	3058
25-34	1784	2298	2725	3101	3783
35-44	1717	2484	2903	3492	4598
45-54	1697	2313	2814	3352	3676
55-64	1452	1871	2285	2988	3812

Source: Calculated from tables 3.19(a)1 and 3.25

Table 3.26(b): Expected earnings according to age and educational level for black females (in Rands per year)

	Educational Level				
Age	Illiterates	Std 2 - 4	Std 5 - 7	Std 8 - 9	Std 10
15-19	101	56	186	258	-
20-24	234	269	490	826	1166
25-34	361	486	791	1261	1614
35-44	328	568	818	1423	1931
45-54	344	499	806	1243	1800
55-64	228	308	401	716	1062

Source: Calculated from tables 3.19(b)1 and 3.25

Graphs 3.1(a) and 3.1(b) below illustrate the lifetime expected earnings. The males graphs give a typical example of the behaviour of streams of people's lifetime earnings. The earnings profiles of the more educated lie above those of the less educated. They indicate that the higher the education level, generally the higher the starting pay, the more earnings one is associated with and the higher the retirement age pay. An interesting characteristic of the streams is that generally, the higher the educational standard of an individual the higher the rate at which earnings or pay rises. In general, peak earnings come around the ages of '35-44' years.

Figure 3.1 (a): Lifetime expected earnings for males

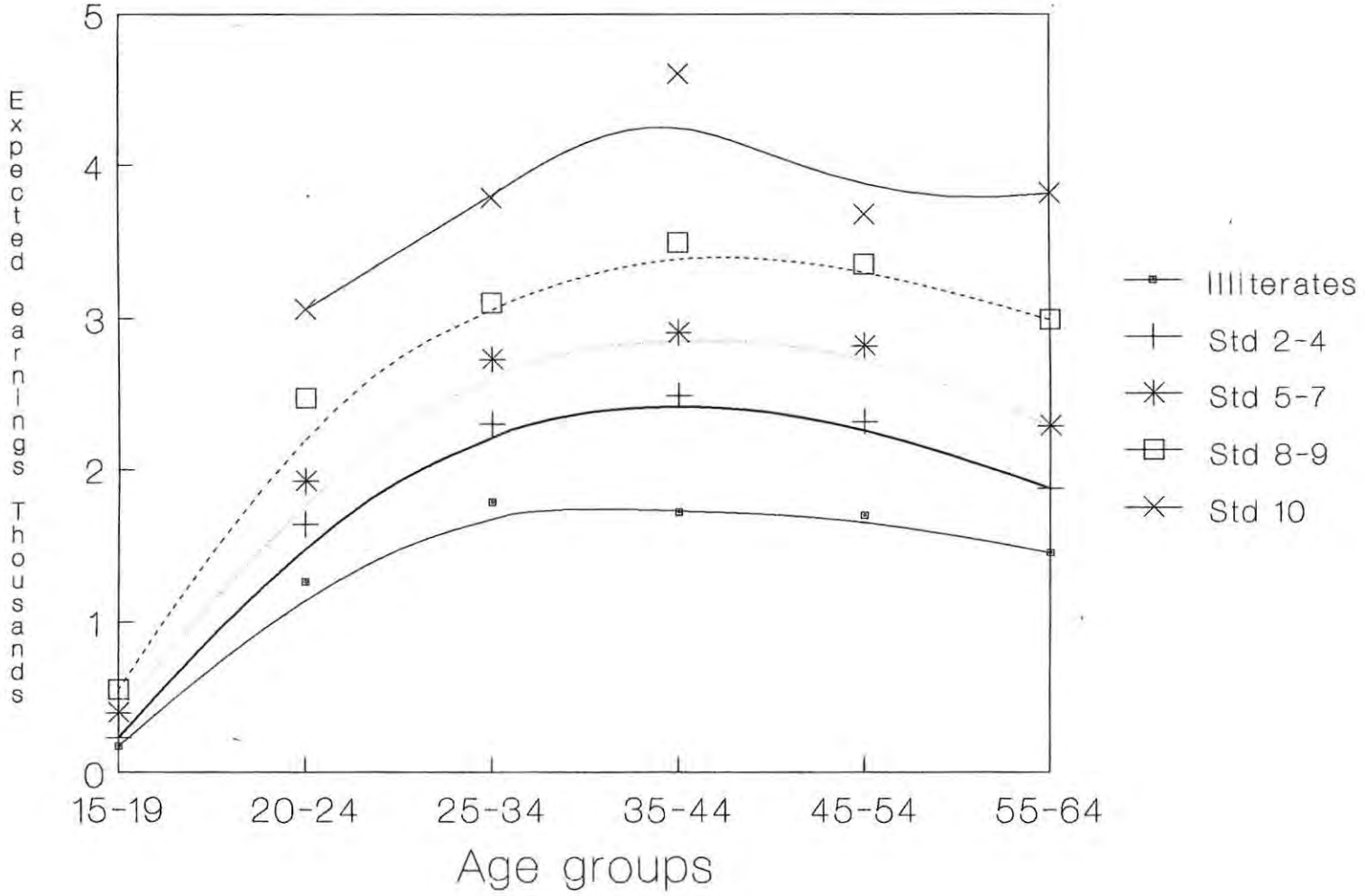
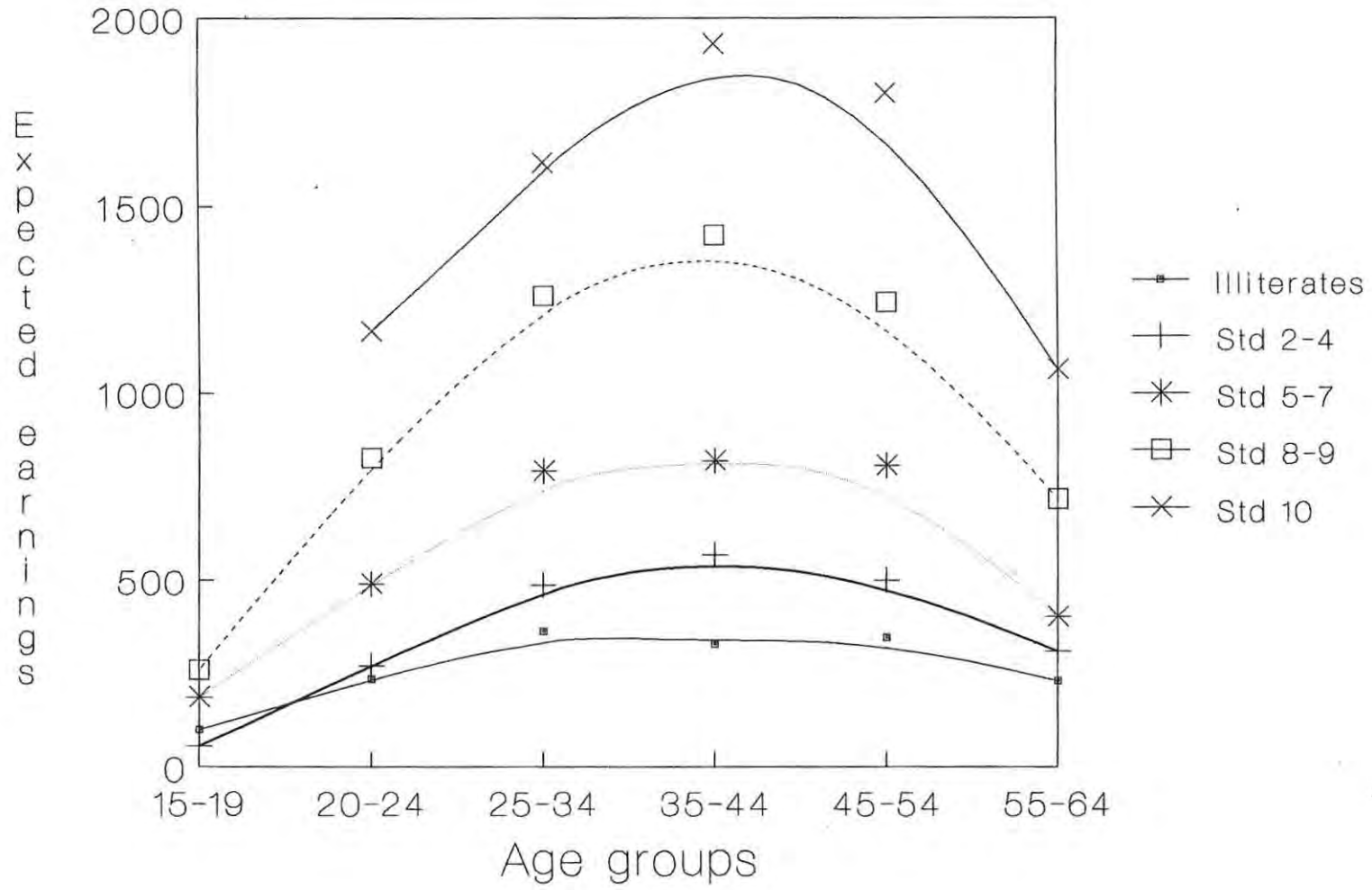


Figure 3.1 (b) : Lifetime expected earnings for females



Basically, the behaviour of the streams of both the males and females lifetime earnings is the same. The profiles do rise with age to a peak and then decline irrespective of the educational standard. Both sets of curves show that as the academic standard becomes more advanced, the gradient of the curves on both sides becomes steeper and (especially for females) the earnings differentials become wider between education levels. For example, the difference in earnings between standards four and six seems to be less than that between standards eight and ten. It is worth noting that these lifetime earnings profiles indicate that women in general earn less than men.

3.4 Rates of return to black education in South Africa

3.4.1 Calculation of rates of return to education

The method used to calculate the rate of return to education has been explained in chapter 2. Costs of education and yearly earnings of an individual with a given education level were tabulated from the age at which he or she starts a school course to age 64, assuming that blacks start schooling from the age of seven.

Also, since it is believed that on average blacks start working at the age of fifteen, the total cost of

education up to the age of fourteen includes only costs of schooling, which means that from age seven to fourteen all net benefits are zero or negative. For proper calculations, age is matched with the academic standard at which a pupil is at school. According to official government statistics, a black pupil is normally in standard five at the age of fifteen and in standard eight at the age of eighteen.*

Since the data were analysed according to age and earnings groups, if a person happened to fall in a certain group, he was associated with a particular level of earnings corresponding to the group regardless of his or her particular age in that group. For instance, referring to table 3.19(a), in the year 1985, on average, a person with standard four at the age of 27 earned R2872 per annum. R2872 is the mean earnings of that age - education cohort.

Regarding costs of education, the unit costs calculated in section 3.2.3 were used. The primary education cost was meant to stretch up to standard five.

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* See South African Census 1985 book, P. 541.

Differential net-earnings had to be adjusted by an alpha coefficient of 0,60 to obtain the part of the earnings attributable to education.

Adjusted differential net earnings were discounted to the beginning of the school course going to be studied. This is the point in time when the decision to invest in education is taken. Marginal rates were calculated between the five phases of education. To get a marginal increase in net earnings, the average earnings of the previous phase are subtracted from that of the educational level which is being dealt with.

The following is an example of how the calculations for social rates of return to education were actually done.

Table 3.27: Age - education net earnings profiles for a male who goes back to school for a standards 8-9 course

Age	Std 5 - 7 net earnings (unadjusted)	Std 8-9 net earnings (unadjusted)	Differential net earnings of level '8-9'over '5 - 7' (unadjusted)	Adjusted (0.60 x earnings in column four)
18	399	-774	-1173	-1173
19	399	-774	-1173	-1173
20	1922	2467	545	327
21-24	1922	2467	545	327
25-34	2725	3101	376	226
35-44	2903	3492	589	353
45-54	2814	3352	538	323
55-64	2285	2988	703	422

Source: Table 3.26(a)

Referring to the table above, column one gives ages from 18 to 64. Column two gives expected net earnings for people with standards 5 to 7 education; column three gives expected net earnings for people with standards 8 to 9 education; column four, the differential net earnings of education level '8-9' over '5-7' and column five, the adjusted differential net earnings.

The table shows how the rate of return to education for a person with an educational level of standard seven (i.e. junior secondary), who decides to go back to school for a standards 8 to 9 educational course (i.e. incomplete senior secondary education) is found. To obtain the differential net earnings between the education levels in column four, earnings in column two are subtracted from those in column three and the difference is multiplied by 0.60 to get (differential) earnings adjusted for ability in column five. It is these adjusted differential net earnings which are substituted in the formula discussed in chapter 2 which is solved for a unique rate of return to education. Since the individual's social secondary unit cost is R774 per year, for the two years course, years 1 and 2 for ages 18 and 19, correspond to negative earnings of - R774, and - R774 respectively. These costs are increased by the foregone earnings,

the salaries the scholar would be receiving if he chose to continue working with the academic achievement of standard 7 instead of going back to school. The foregone earnings are R399 per year. If these figures (in column five) are substituted in the formula, the first two figures (i.e. -1173 and -1173) would correspond to ts 1 and 2 and from figure R327, at the age of 20 when the graduate is assumed to start working after completing the course, the powers go up from 3 to 47. This means that the very last figure of R422 at the age of 64 would correspond to power 47.

Private rates of return to education are calculated in a similar way except that in this case, education costs would involve only the personal costs and the pre-tax earnings should be replaced with post tax earnings.

3.4.2 The estimated rates of return to education

One type of rate of return to education was calculated. It is the 'marginal rate'. For the purpose of this study, the word 'margin' refers to the following incremental levels of schooling; illiterate to standards 2-4, standards 2-4 to standards 5-7, standards 5-7 to standards 8-9, standards 5-7 to standard 10 and standards 8-9 to standard 10.

Two sets of internal rates of return to education shown in table 3.28 below were obtained. The first one refers to age-earnings profiles adjusted for sex, probability of finding work and ability only whereas the second one refers to the profiles adjusted for marital status and locational variables also.

Table 3.28 : Private and social rates of return to education. Summary of results.

	Earnings adjusted for sex, employment probability and ability		Earnings adjusted for marital status and locational variables also	
	MALES			
Educational level	Private rate	Social rate	Private rate	Social rate
Illiterate - Std 2-4	,21	,09	,16	,065
Std 2-4 - Std 5-7	,16	,08	,08	,045
Std 5-7 - Std 8-9	,26	,12	,28	,14
Std 5-7 - Std 10	,20	,13	,24	,15
Std 8-9 - Std 10	,16	,13	,19	,15
	FEMALES			
Illiterate - Std 2-4	,085	,02	-,01	-,04
Std 2-4 - Std 5-7	,23	,06	,12	,035
Std 5-7 - Std 8-9	,32	,12	,33	,13
Std 5-7 - Std 10	,29	,13	,32	,15
Std 8-9 - Std 10	,225	,14	,26	,16

For the first set of results, private male rates of

return to education range from 16% to 26% and social rates from 8% to 13%. For females, private rates range from 8,5% to 32% and social rates from 2% to 14%.

In the case of the second set, private male rates range from 8% to 28% and social rates from 4,5% to 15%. For females, the corresponding rates range from -1% to 33% and -4% to 16% respectively. We shall concentrate on the second set of results from now on.

By using the rates adjusted for sex, employment probability, ability, marital status and locational variables, the private male rate is 16% for incomplete primary schooling, 8% for junior secondary and 24% for senior secondary schooling (considering standards 5-7 to standard 10). The corresponding social rates are 6,5%, 4,5% and 15% respectively. For females, the resulting private rate for incomplete primary education is -1%, 12% for junior and 32% for senior secondary education. The corresponding social rates are -4%, 3,5% and 15% respectively. The overall rate for males was found to be 15,43% and 8,02% for females.

The results in the table show that for both males and females, schooling from standards 5-7 to standards 8-9 has the highest private rate of return to education and in general, schooling from standards 8-9 to standard 10 is the most profitable educational investment in the

case of social rates. Middle schooling (of standards 5-7) yields the lowest return on educational investment in the case of males. For females, it is standards 2-4 education which is associated with the lowest return. In the case of males, private rates decrease with standards 5-7, go up with standards 8-9 and then down again with standard 10. For females, the corresponding rates increase with years of schooling up to a peak at standards 8-9 and then go down with standard 10. Males social rates also decrease with standards 5-7 then increase with increasing years of schooling. Social rates for females increase with increasing schooling throughout.

Private and social rates of return to male early primary education are higher than those of female's but it is the opposite for matriculation. Social rates are lower than private rates which is expected due to schooling being publicly subsidized.

As already seen above, the effect of the adjustment of the rates of return to education for marital status and locational factors is generally to narrow people's earnings differentials up to standards 5-7 schooling but to widen them after these education levels. The interpretation for this will be given in chapter 4, which we now turn to.

CHAPTER 4

IMPLICATIONS OF THE EDUCATIONAL ANALYSIS

4.1 Introduction

This chapter presents the conclusion of the research including an interpretation, a summary and evaluation of the educational analysis and some recommendations which follow.

4.2 Interpretation of the educational analysis

In this section, the author tries specifically to answer the questions posed in the study based on the educational analysis done.

(i) The first question is, 'What kind of educational facilities do blacks have in relation to other population groups?'.

In chapter 3, it was seen that seemingly black education is financially discriminated against by the South African government, that is, it receives very low government financial support compared to the support given to education of the other population groups. This might have resulted in poor black education due to the non-availability of proper educational facilities (such as teachers and science laboratories) to the black community. As a consequence, this poor education is likely to have caused low labour

productivity, high unemployment rates and (as an end result) poverty of the majority of blacks in relation to the other groups.

(ii) The second question is, 'What are the determinants of black peoples'earnings differentials?'.

The factors of people's earnings differentials and their effects vary according to sex and education level. The multi-regression analysis indicated that education, age, marital status, area of current residence, development region, place of work, job, and employment sector do affect black males'earnings differentials greatly.

It must be pointed out that because of multi-collinearity problems, some estimates of the coefficients were degraded. However, still reasonable conclusions can be drawn according to the results.

In the case of illiterate males, judging by the magnitudes of the coefficients, job ranks number one, and then place, sector, region, area, age and marital status follow in that order. On the other extreme side of matriculation, job dominates, then place, marital status and age. So, unlike for males with low levels of education, for matriculants, locational variables do not seem to play a major role in earnings determinations.

For females, both locational and occupational variables seem to be important factors of earnings differentials for all education levels.

The narrowing of the earnings differentials associated with education of people with elementary education due to the adjustment of the differentials for marital status, locational and occupational variables supports the statement that these variables do affect earnings differentials and that some of the relationship between education and earnings can be explained by the association between these variables and education. This holding of some non-educational factors of earnings constant is thought to have removed some educational effect as well because of the association. On the other hand, when it comes to senior secondary schooling, holding these non-educational variables constant widens the differentials which strengthens the proposition that the relationship between education and earnings cannot be explained by the association between education and these variables which is consistent with Psacharopoulos's argument that rates of return to education distortions are greatest in the higher levels of education. It is likely that the higher the education level the larger the significance of schooling becomes as far as earnings determination is concerned. The rates of return analysis indicates that high school education is more profitable than primary education.

When all explanatory variables including education were used in the regression model, adjusted r^2 became ,54 for males and ,69 for females implying that the significance of the factors of male earnings differentials which were not included in the model was larger than that of the factors which were left out in the case of females. Education seems to be a major determinant of people's earnings and it appears to explain female earnings differentials more than males'. It is possible that still a certain part of the effect of education on earnings (shown in the study) is actually due to some other factors which were not included in the model since education may somehow be influenced by them.

It is already implied above that there are alternatives to the human capital theory, a few of which will be cited below. According to Bagwati and Srinivasan, a Job Ladder model can explain the relationship between education and earnings differentials. They argue that jobs are likely to have particular educational level requirements. According to their theory, there are two possible explanations of the relationship. It may either be that higher job positions require higher educational qualifications or employers can choose either uneducated or educated labour for the positions but they believe that it is fair to choose the latter first. This model is not very different from the Human Capital theory as far as the first alternative is concerned.

Thurow's Competition theory states that, education as such does not determine individual wages or salaries directly. Workers are recruited according to relevant costs which will be incurred by employers for their necessary training programmes in particular skills. These costs depend on the worker's education background and potential abilities. Wages are predetermined and so a worker's productivity either equals or exceeds his or her wage. Trotter (1984, p.15) says that this model "--- may well be relevant as a short-term explanation in the South African context, given our institutional and socio-political imperfections". This theory could be related to the human capital model as it accepts the fact that education can influence individual earnings differentials even if it does it indirectly. One way education is supposed to affect earnings is by increasing people's potential abilities.

According to the Screening Hypothesis, it is believed that schooling as such is not an important determinant of income distribution; what it does is to help employers choose people with the right abilities for particular jobs. It is further argued that if a cheaper substitute can be found for the screening process, education could be socially inefficient. Trotter (1984, p.15) reports that Layard and Psacharopoulos attack the theory by arguing that:

i) If screening was the only explanation for wage differentials, there would be

measureable private returns to certificates as such and not to years of schooling. In fact the rates of return to uncompleted courses have been shown in several studies to be as high as those to completed and certified courses.

ii) Given the screening hypothesis, the partial effect of education on earnings would fall with experience as employers came to have better information about employees' productivity. The fact is that educational differentials rise with increasing age. Of course, this does not disprove the screening hypothesis if education is a good screen, in the sense that it is highly correlated with ability.

iii) If screening is the main function of education it could be done far more cheaply by carefully devised tests, and agencies would surely have developed to reap the large profits that would then be available for this activity.

In conclusion the writers maintain that, "pending further work, we conclude that the theory of human capital is not after all in ruins" (Layard and Psacharopoulos, 1973, p.998).

The theory of Crowding states that a privileged group of people in a country with institutional control over educational expenditures will try to limit other groups accessibility to scarce resources and will tend to have higher incomes, using education as a pretext. Trotter (1984, p.16) reports that M. Carnoy and his colleagues (1982) investigated the effect of education on income distribution and found that it is minor as compared to the effects of factors like wage structure, regional disparity and rates of unemployment.

In this study, the author has tried to investigate the effect of education on earnings inequalities among and within groups of people and has found that the theory of human capital does partly apply to the South African situation.

This dissertation takes the view that of all the theories discussed above, the "human capital model" is the theory which tries to explain the relationship between education and black people's earnings most satisfactorily. The superiority of the "human capital" model over the others especially the first three is apparent considering the nature of analysis required for each. If one compares it with the theory of crowding, it has the advantage that it also addresses the reasons why the earnings of people within the same privileged groups vary.

Although many possible determinants of people's earnings exist and not all have been investigated for this study, strong support has been found for the view that education is a major factor of earnings determination, and so this empirical investigation tends to support the Human Capital Theory. However, the study has also found that marital status, locational and occupational factors are important determinants of earnings and that earnings vary according to whether a person works in a self-governing state or white area.

(iii) The third question is, 'Should the governments responsible for black education lay more emphasis on Human Capital in relation to Physical Capital?'.

Social rates of return to education are directly concerned with this question and can guide governments in their educational planning exercises. Decisions are supposed to be made by comparing the rates for various education levels and by comparing the overall rate of return to education with the rate of return on comparably risky physical capital investments assuming perfectly competitive economic conditions.

So, in order to answer the question above, one should first ask how well the labour market is functioning as far as the requirement of perfectly competitive conditions for comparison of investment options is concerned.

Normally, labour markets are far from being perfectly competitive. In South Africa we have labour discrimination between population groups as well as between genders. This discrimination tends to degrade black and female rates of return to education because the workers are paid less than their marginal products. As was mentioned in the answer for question two, by holding non-educational factors of earnings differentials constant, some educational effect is also removed. On the other hand, the rates calculated in this study were not adjusted for some other factors of earnings

like an education paper certificate and social gains due to government income equalization policy which tend to overstate rates of return to education. This means that our social rates calculated in this study cannot give us the true picture of black labour productivity to enable us to offer a reliable answer to the question. However, the rates can give an approximation of the returns to black education which is better than using guess work with no stated assumptions.

Comparing the overall rates of 15,43% for males, which were estimated in this study, using the method which was applied in Trotter's survey (1984) where the rate of return to physical capital investment was taken to be 12,3%, it is possible to conclude that greater emphasis on human capital investment instead of physical capital investment is warranted. This decision is based on the male overall rate as it is considered more reliable than the female one because of the females poor labour market participation.

Another reason why these social rates of return to education may be misleading is that there are also human capital market imperfections in the sense that black pupils are restricted in one way or another from studying certain academic courses, for example, because of imposed school curricula or inavailability of proper school facilities. Perhaps if black labour productivity was given chance to develop to its full potential it could yield a far higher rate of return

to education than that of physical capital. In chapter 3, we saw that government expenditure on black education is minimal compared to that of the other racial groups. This small educational expenditure has caused black schools to have poor educational facilities and hence a poor education quality which in turn has generally generated a low black labour productivity. Even if the labour market was functioning perfectly well, if the human capital market situation is not improved blacks will continue earning little which will keep the rate of return to black education low (holding other factors constant).

The author believes that government expenditure on education could positively affect the rates of return to black education greatly. According to Trotter's study quoted above, the education unit costs for the different population groups were, R150 for Blacks, R255 for Coloureds, R320 for Indians and R920 for Whites for primary education. Corresponding unit costs for secondary schooling were R300, R580, R725 and R1370 respectively. The rates of return corresponding to the unit costs given above for secondary schooling were 12,4% for Blacks, 13,8% for Coloureds, 13,3% for Indians and R17,7% for Whites (Trotter, 1984, p.75). Even if the relationship between unit costs and rates of return, considering Coloureds and Indians only, is contrary to the above statements, it is possible that an increase in government per capita expenditure on education brings about an increase in the rate of return to education assuming that other factors are held constant.

According to this study, pupil to teacher ratios of the classes of around standards 5-7 are the highest and they are characterised by the lowest rate of return to education in the case of males. If this situation of pupil to teacher ratios is more or less the same as that for the years around 1978 when the people involved in this analysis did their educational courses then the suggestion of emphasizing human capital in relation to physical capital would be strengthened.

(iv) The fourth question is, 'Are the better educated people on average economically better off than the less educated?'.

Positive marginal rates of return to education calculated in this study are indicative that on average better educated people are economically better off than others. However, female early primary school leavers are the exception to this argument as their rate is negative. Two possible explanations can be offered for this exception. One is that generally, women are discriminated against in the labour market and the second is that in most cases women are not full time workers, which can distort their rates of return to education. So, in the case of women we cannot be sure of the answer to the question.

(v) The last question is, 'Is it worthwhile for a particular individual to undertake a certain educational programme investment?'.

This question is not straightforward because people are different and educational programmes differ in which case we have to look at various types of people and education levels when answering it. To start with, let us review the theoretical part of the question in relation to the South African context. Going to school in South Africa is generally not compulsory for black children, so, it is up to the individual (or parent) to decide whether he or she goes (or sends his or her child) to school or not. This gives us a chance to test the human capital theory because it means that people would need to be motivated to opt voluntarily for educational investments. Practically, black children are associated with low school enrolment rates. This might be explained by many blacks not being well motivated for this kind of investment. According to the theory underlying this study, the human capital investment decision is a function of the expected marginal rate of return to education which has to be compared to the opportunity cost of available funds to the household. If the former is higher then educational investment is made and vice versa.

Even if a positive marginal rate of return to education is a necessary condition to justify that education is profitable, it is not sufficient to warrant making an educational investment. Before the investment is decided on, basically, one has to convince oneself that education increases earnings by a rate of return greater than the supply cost of funds for education and that the rate is also greater than that

which would be obtained on a comparably risky physical capital investment. The analyses done in this study cannot give comprehensive answers to this problem as individuals are associated with different education demand and supply conditions and certain factors of earnings have not been investigated; the results just give rough implications about it. However, this study does show, as do most studies of this kind, that education increases earnings provided the labour market functions fairly well.

The question specifically refers to the private rates of return to education. Since rates of return to education depend on demand and supply of both education and labour, in order to use the rates calculated in this study to answer this question, we must assume the year 1985 South African political, social and economic conditions. Under these conditions, this study has found the private rates of return to education to be greater than 5% (which is taken as the assumed rate of social discount per annum), with the exception of the return to early primary schooling of females. Therefore, apart from the early primary schooling in the case of females (with a negative rate), educational investment is worthwhile for any level of schooling. As it was implied earlier on, rates of return to education differ from person to person depending on an individual's demand and supply curves for education, and every one has to have a rough idea of how his or her curves would look for a more reliable answer to the question.

One way to decide roughly on further education is, for instance, to ask teachers, employment agents and friends what the starting pay would be after graduating from a school course and what subsequent earnings improvements could be expected over a lifetime.

Then an age-earnings profile can be obtained for which present value would be compared with the present value for the costs of the extra education including the foregone earnings costs. If the present value of the lifetime earnings stream is greater than the present value of the costs of the course the educational investment is then made and vice versa.

4.3 Comparison of the study with other studies of a similar nature

The author is aware of five studies that have been done with the aim of calculating the rates of return to education in South Africa. There is one by Van Zyl (1972) and another by Smuts and Terblanche (1974) both of which referred to higher education only. Dr Joubert's research (1976) concerned only Whites, Coloured and Indians and was done for males and females combined together. The fourth was done by Vasar (1980) but this one also did not concern blacks. All these cannot be compared to this study.

The only studies which can somehow be compared with this

study are those of Trotter (1984) and Donaldson (1984). For his study, Trotter used statistical data which came from a 'five percent sample' of the 1980 South African population census related to Durban Metropolitan region. His study involved all population groups. For the purpose of comparison, we shall look at only those rates referring to Blacks. He obtained a social rate of return of 3,4% and 12,4% for junior secondary education of standards '6-7' and senior secondary education of standards '8-10' respectively. Corresponding rates in this study are 4,5% and 15% for standards 5-7 and 10 respectively. In the former study, the overall rate for males was 14,2% whereas in this study it is 15,43%. There is a slight difference between Trotter's rates and those calculated in this study which might be due to the fact that Trotter's study involved a metropolitan region only. It is also likely that the increase in the rates from the year 1980 to 1985 was brought about by the increase in government educational expenditure as shown in table 3.1 of chapter 3.

For Donaldson's findings it is the rates of return to education adjusted for family background only and for people working in both the formal and informal sectors which are compared with the rates calculated in this study. In Donaldson's study, alpha coefficients of ,60 and ,80 for primary and secondary schooling respectively were used. The comparisons are summarized in table 4 below.

Some of the differences between the rates of return in these two studies must be because Donaldson's study was for the Transkei region only and because different alpha coefficients were used. Excluding the informal sector and not standardizing family background factors in this study might also have contributed to the differences. Male primary education rates of return and returns to female schooling from standards 5-7 to 10 compare relatively well.

Table 4: Comparisons between Donaldson's Survey results and the rates obtained in this study.

MALES				
Private Rates			Social Rates	
Educational level	Donaldson's study	This study	Donaldson's study	This study
Illiterate - 4	,14	,16	,09	,065
Std 4-7	,07	,08	,06	,045
Std 7-10	,30	,24	,21	,15
Std 9-10	,45	,19	,37	,15
FEMALES				
Private Rates			Social Rates	
Educational level	Donaldson's study	This study	Donaldson's study	This study
Illiterate - 4	,13	-,01	,08	-,04
Std 4-7	,15	,12	,10	,035
Std 7-10	,21	,32	,14	,15
Std 9-10	,36	,26	,28	,16

Other Countries

Here, the reader is referred to Psacharopoulos's (1973) summary of international rates of return to education. Only studies referring to developing countries will be considered. Psacharopoulos's average private rate of return is 26% and the social rate is 17% for secondary education. The corresponding private rates (for standards 5-7 to standard 10) found in this study are 24% for males and 32% for females and social rates are 15% for males and 15% for females.

Psacharopoulos found that the overall rate is 11% for males and 15% for females. The comparable rates in this study are 15,43% for males and 8,02% for females.

One must be cautious when making such comparisons because authors use different kinds of samples, age-education groups, assumptions and methodologies according to which estimates are made. Also we should be aware that Psacharopoulos's rates refer to a fairly wide time span because the studies were done at different times. On top of this, unlike this study, some of these studies included both males and females combined together.

4.4 Summary

4.4.1 Introduction

This work was done using raw data from the May 1985 South African Current Population Survey. Only people working voluntarily for remuneration were included in the investigation. They were people with ages from 15 to 64. The analysis was done for males and females separately to try to avoid distortions in the rates of return to education.

The main reason and importance of this study was to test the proposition that education is a major determinant of people's earnings differentials and to calculate the rates of return to education for South African Blacks including those in the six self-governing states namely, Gazankulu, Lebowa, KaNgwane, KwaNdebele, KwaZulu and Qwaqwa.

4.4.2 Lifetime earnings streams

Lifetime earnings profiles were based on mean personal incomes. It was found that generally lifetime earnings profiles give concave curves from below if plotted, with higher rates of earnings to which the schedules rise for higher education levels. Higher schooling levels have their curves above those

corresponding to lower levels. An interesting characteristic is that the higher the education level, the more steep the two sides of the curve becomes. All profiles rise with age to a peak and then decline or level off irrespective of the education standard.

4.4.3 Unit costs of education

Private unit costs were estimated by inflating Trotter's figures used in his Durban Survey (1984).

Weighted averages of the social unit costs of the various regions, which were obtained by adding the regional per capita government educational costs to the private unit costs were used in the analysis.

Rates of return to education were not very sensitive to the changes in the unit costs. For instance, a decrease of four percentage points in the rates needed an increase of about 10 percentage points in the unit costs.

4.4.4 Rates of Return to education

Rates of return calculated in this study were adjusted for sex, probability of finding work, ability, age, marital status, area of residence and development region. Male private rates range from 8% to 28% and

social rates from 4,5% to 15%. For females, the corresponding rates range from -1% to 33% and -4% to 16% respectively. The overall rates are 15,43% for males and 8,02% for females.

For incomplete primary schooling, the private male rate is 16%, 8% for junior secondary and 24% for senior secondary schooling (i.e. standard 7 to 10). The corresponding social rates are 6,5%, 4,5% and 15% respectively. For females, the resulting private rate on incomplete primary education is -1%, 12% for junior and 32% for senior secondary education. The corresponding social rates are -4%, 3,5% and 15% respectively.

For both males and females, standards 8-9 have the highest private rate whereas standard 10 ranks the best for social rates. For males, junior secondary schooling (i.e.standards 5-7) yields the lowest rate of return but it is the early primary schooling with the lowest return in the case of females. All except female social rates, increase up to a certain peak around standards 8-9 then decline as the number of years of schooling increased.

Female early primary schooling yields a negative value for both private and social rates. The private and social rates to male early primary schooling are high

compared to females' but it is generally the other way round for secondary education. Social rates are lower than private rates as expected because education is publicly subsidized.

Education has been found to be a major determinant of black people's earnings differentials. It has been found that black education is getting minimal government financial assistance compared to those of other population groups and as a result, black pupils do not have sufficient educational facilities which is thought by the author to be one of the basic factors that have caused the majority of Blacks to live in poverty compared to the other groups. Apart from education, marital status, locational, regional and occupational variables have also been found to influence black people's earnings differentials. It has been found that the governments responsible for black education should emphasize human capital investment in relation to physical capital.

On average, better educated people are better off than the less educated ones. For instance, in the year 1985, male illiterates earned an average of R197, those with standard 4 earned R236, standard 7 certificate holders averaged R284, standard 9 R330 and matriculants earned R360 per month. For females , the corresponding salaries were R75, R103, R161,5, R236.5 and R308 per

month respectively. It has also been found that apart from female early primary schooling, generally, it is worthwhile for an individual to undertake a certain education programme investment. Senior secondary schooling has been found to be the best educational investment option as it has been found to have the highest rate of return to education and junior secondary or middle school the worst (in the case of males). Female early primary schooling is the least profitable. Male education has been found to be more profitable than female education in the case of primary education but it is the other way round for senior secondary education.

It has been found that very low social returns to black education for primary school (especially those of females) might partly indicate the seriousness of the labour discrimination between population groups as well as sexes. In conclusion, this work tends to support the Human Capital Theory.

4.5 Evaluation

In general, the rates do conform to the already observed behaviour of the profits of educational investments in other studies of a similar nature.

According to the theory of human capital, a person's

productivity increases as a result of an additional academic achievement which in turn makes him or her earn more as the pay must be equalized to the marginal productivity. The increase in productivity must have been brought about by some human capital investment. Nowhere in the whole world is a country's economy anywhere near perfectly competitive conditions.

Generally, because of the imperfections in an economy, earnings differentials do not reflect real corresponding differences in marginal products. Normally, especially in the public sector, wages and salaries are pre-set depending on the country's institutional framework, education paper certificates and other political, social and economic factors which form our usual labour markets. In the South African context, occupational discrimination is an important obstacle as far as this problem is concerned.

It is a well known fact that a graduate from a high quality institution of learning is likely to be of a higher productivity than one from a low grade institution. In practice their school certificates are equally valued and so they may qualify for the same salary, particularly in the public sector. This emphasizes the need for thorough interviews and probation periods for job seekers. Final examinations do not reflect acquired ability or productivity exactly. However, it may be the best way in which an individual's productivity can be judged.

People who do difficult or unpleasant jobs tend to be paid more than those who have simpler jobs and/or work in pleasant environments although they require the same academic qualifications. The non-pecuniary aspects of jobs should be valued and be included in the rates of return to education calculations. If non-pecuniary aspects are included in the analysis, the effect would be to increase the rates of return to education, as on average, their advantages increase with education. Fringe benefits costing employers more money like paid holidays and housing subsidies should also be added to earnings.

Educational progress is intimately related to advances in knowledge and it is a well known fact that advances in knowledge can have very important and far reaching economic, social, political and cultural effects. This presumably is why some governments carry out literacy campaigns. The return to education approach ignores these benefits.

The existence of collective power in certain sectors may influence relative earnings. For, example, it is said (Bowen,1968,p.86) that in part the relatively high earnings enjoyed by medical doctors in the United States of America can be attributed to the American Medical Association which restricts entry into the profession and keeps fees high . In South Africa, trade Union activity does affect remuneration though this concerns only low education level individuals.

The direct rate of return to education approach ignores the consumption component of education. Education presumably has purposes besides that of increasing a person's potential economic productivity yet it is only the economic productivity that is included in the calculations. The consumption component is either for current or future needs. The ideal would be to value the current consumption component, deduct it from the education cost and use only the remainder which is the investment component in the calculations. Likewise, the future consumption component should be valued and deducted from the earnings and so leave only the part attributable to productivity. It is difficult to estimate the consumption component of education, as Bowen (1968,p.89) argues:

> ... to a large degree the consumption and investment components of a person's education are inextricably bound up. Even if we somehow succeed in isolating a pure consumption element, subtracting this portion of costs is a valid procedure only if we are prepared to assume that society values educational consumption as highly as it values all alternative kinds of consumption ranging from cars to public parks.

The problems discussed above are serious difficulties. A defence of the approach begins with the considerable empirical evidence that people who have incurred more education or training costs in acquiring their special skills, earn substantial rewards in the labour market.

To overcome the problem of "wages versus productivity",

shadow wages and salaries calculated for a perfectly competitive and distortion-free labour market should be used. The degree of distortion of the rates of return to education caused by this problem depends on how much labour market imperfections differ from perfect conditions. This problem is more serious in developing countries like South Africa than in developed countries because most educated people, unlike in the developed countries, work in the public sector and wages in the private sector are often strongly influenced by their respective governments. It should be noted that in this country, a big fraction of educated female workers are employed in the public sector (e.g. nursing and teaching jobs). Shadow wages and salaries were not used in this study, hence, this problem is likely to have distorted the results somehow.

The remedy for the "non-pecuniary aspects of jobs" problem is simply to value them and include them in the rates of return calculations. This was also not done in this study.

It is hard to evaluate external economies, but the general belief is that education brings about positive responses in social, political and cultural spheres. If these responses could be valued, the human capital theory would gain more support.

The "collective power" factor can be entered in the regression equation in order to adjust for the effects of labour

organization membership. The labour union factor was not standardized for the rates of return to education calculated in this study.

It is very difficult to value the consumption component of education costs and earnings. No attempt was made in this analysis whatsoever to alleviate this problem.

Also, educational investments should ideally be based on projections of future lifetime productivity or earnings patterns instead of current earnings patterns. As indicated in chapter 3, in this study, pre-tax earnings were used for calculating the private rates of return to education instead of post-tax earnings because of lack of information.

However, although rough estimates of rates of return to education are all that is empirically possible due to some choices and decisions which have to be taken subjectively somewhere along the line during the analysis, it is commonly accepted that the analysis is not all in vain. The cost-benefit analysis can be useful as a basis for making reliable educational and/or economic decisions, particularly when we are primarily interested in predicting the direction of future income distribution. The magnitudes of the rates as such do not have much meaning but what matters is to look at them in comparative terms.

For this study, the effect of ability, which is one of the

major determinants of people's earnings differentials, has been removed, unemployment has been adjusted for, and sex, age, marital status and locational variables have also been standardized.

4,6 Recommendations

The author recommends that the governments responsible for black education should increase expenditure on schooling in order to improve both the quantity and quality of the education. It is possible that improved quality of primary schooling could lead to increased rates of return to black education. This argument can be supported by the fact that, according to the findings of this study, education of around standards 4 and 5 was characterised by the highest pupil - teacher ratios and it was associated with the lowest rates of return to education for males.

The rates of return to black education (calculated in this study) for the year 1985 are higher than those for 1980 with lower education expenditures which were obtained in Trotter's study (1984). If this is really true then the recommendation of increasing educational expenditure is strengthened. The author thinks that, if more expenditure were made for black primary education, there would be an increase in the rates of return provided the funds were utilized wisely and both human capital and labour markets functioned moderately well. The fears that further government expenditure would lower the

social rates of return to education do not appear to apply to the South African case*.

Discrimination in the labour market should be scrapped and women should be allowed to participate fully in it. Pupils should be encouraged not to stop at primary school but to continue with schooling in order to derive a worthwhile economic gain from education.

Since the country's real rate of return to physical capital is thought to be about 12,3%, with the overall rate of return to black education of 15,43% (for males), it is imperative that human capital investment should be relatively encouraged.

High private rates of return to secondary education imply that government subsidies for secondary schooling can be reduced by making pupils pay a bigger share for it, and the money saved can be transferred to primary education financing. School curricula for blacks should also be revised in order to cater for the socio-economic needs/desires of the black community.

The author believes that if the recommendations given in this study were implemented, the quantity and quality of black education would increase which would lead to a more equitable

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* See G.Psacharopoulos's paper - Returns to Education: further international update and implications, in 'The journal of Human Resources, p.592, 1985'.

personal income distribution amongst the population groups in South Africa like in Venezuela (Psacharopoulos, 1988).

4.7 Suggestions for further research

The study could be improved upon by using different education costs for different education levels and adjusting the rates of return to education for tax rates, educational certificate effects, labour union membership, social gains due to an income equalizing formula and probability of survival. Also, the possibility of using shadow wages and salaries should be explored and possibly, different alpha coefficients for primary and secondary schooling should be used. This implies that a psychological study should be done in South Africa to find suitable alpha coefficicients to be used. Comparative studies of the rates of return to education for the racially segmented school systems in South Africa would contribute to interpretation of these results.

APPENDIXES

APPENDIX A

Government per capita expenditures on education for the states and countries for years 1981 - 1985 (percentage increases are given in parentheses).

The source for all the following tables are S.A.I.R.R surveys of the years 1981 - 1986 and South Africa 1985/86 - Official Year Book. '- ' means that the figure was not available.

Table a.1 Bophuthatswana

Year	1981	1982	1983	1984	1985
Budgeted per capita expenditure (R)	97	173,28 (78,6%)	245,64 (41,7%)	- -	277,7 -
Index	100	788,6	253,2	-	286,3
Producer goods price index	100	114,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100	156,7	200,95	-	179,5

Table a.2 Ciskei

Year	1981	1982	1983	1984	1985
Budgeted per capita expenditure (R)	133	146,5 (10,1%)	187,9 (28,3%)	215,0 (14,4%)	- -
Index	100	110,1	141,3	161,6	-
Producer goods price index	100	144,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100	96,6	121,1	118,4	-

Table a.3 Gazankulu

Year	1981	1982	1983	1984	1985
Budgeted per capita expenditure (R)	96	127,1 (32,4%)	145,2 (14,25%)	220,0 (51,5%)	267,2 (21,5%)
Index	100	132,4	151,2	229,2	278,4
Producer goods price index	100	114,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100	116,1	120,0	167,9	174,5

Table a.4 Kangwane

Year	1981	1982	1983	1984	1985
Budgeted per capita expenditure (R)	113,0	129,0 (14,15%)	132,0 (2,3%)	165,5 (25,3%)	239,0 (44,4%)
Index	100,0	114,15	116,8	136,5	159,5
Producer goods price index	100,0	114,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100,0	100,1	92,7	107,25	132,6

Table a.5 Lebowa

Year	1981	1982	1983	1984	1985
Budgeted per capita expenditure (R)	81	122,7 (51,5%)	133,7 (8,9%)	136,0 (1,7%)	184,0 (35,3%)
Index	100	151,5	165,0	167,9	227,2
Producer goods price index	100	114,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100	132,9	130,95	123,0	142,4

Table a.6 Kwandebele

Year	1981	1982	1983	1984	1985
Budgeted Per capita expenditure (R)	124,0	122,45 (1,25%)	112,8 (7,9%)	- -	223,6 -
Index	100,0	98,75	91,0	-	180,3
Producer goods price index	100,0	114,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100,0	120,2	129,4	118,9	164,3

Table a.7 Kwazulu

Year	1981	1982	1983	1984	1985
Budgeted per capita expenditure (R)	92	126,0 (37,0%)	150,2 (19,0%)	149,4 (0,04%)	241,0 (61,35%)
Index	100	137,0	163,0	162,3	262,0
Producer goods price index	100	114,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100	120,2	129,4	118,9	164,3

Table a.8 Owaqwa

Year	1981	1982	1983	1984	1985
Budgeted per capita expenditure (R)	144,0	182,3 (26,6%)	217,1 (19,1%)	- -	- -
Index	100,0	126,6	150,75	-	-
Producer goods price index	100,0	114,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100,0	111,05	119,6	-	-

Table a.9 Transkei

Year	1981	1982	1983	1984	1985
Budgeted per capita expenditure (R)	113,0	147,9 (30,9)	172,0 (16,3)	- -	272,0 -
Index	100,0	131,0	152,2	-	240,7
Producer goods price index	100,0	114,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100,0	114,9	120,8	-	150,9

Table a.10 Venda

Year	1981	1982	1983	1984	1985
Budgeted per capita expenditure (R)	138,0	115,8 (16,1%)	180,0 (55,4%)	252,0 (40,0%)	- -
Index	100,0	83,9	130,4	182,6	-
Producer goods price index	100,0	114,0	126,0	136,5	159,5
Index of real increment of per capita expenditure	100,0	73,6	103,5	133,8	-

APPENDIX B

Calculation of unit costs for regions C, E, F, G and H

In the regions involving both white areas and states, namely C, E, F, G and H, the costs of education were estimated as the weighted averages of costs in the white areas and the states.

An example of how the calculation of unit costs of education was done - using region E (i.e. Kwazulu and Natal).

By using the white areas primary and secondary enrolment ratio of 4:1, the following two mathematical equations were used to determine estimates of the Kwazulu primary and secondary education expenditures.

1. $$\frac{M/Y}{L/X} = \frac{X \times M}{Y \times L} = \frac{4M}{L} = 2.7$$

2. $$\frac{L + M}{X + Y} = 241{,}00$$

Where

X represents primary enrolment

Y represents secondary enrolment

L represents primary education expenditure

M represents secondary education expenditure

From (1)

$$M = \frac{2.7\ L}{4} = 0,675L.$$

Substituting M = 0,675 L and Y = 0,25 X in (2), we get

3. $$\frac{L + 0,675\ L}{X + 0,25\ X} = 241,00$$

$$\frac{1,675\ L}{1,25\ X} = 241,00$$

$$\frac{L}{X} = 180,00$$

So, primary per capita expenditure of Kwazulu is equal to R180,00.
Substituting L/X = 180,00 in (1) we get the secondary per capita expenditure as M/Y = R486,00.

Average primary per capita expenditure of Region E = weighted 'Natal Primary per capita expenditure' + weighted 'Kwazulu primary per capita expenditure'. Since Natal is regarded as a white - designated area, it has a primary per capita expenditure of R284 (which was calculated in the text).

Weights used were 0,43 for Natal (i.e.white areas) and 0,57 for Kwazulu depending on the relative primary pupil enrolments of the white areas and the states.

Substituting in the equation above, we get;
Average primary per capita expenditure for region E

= 0,43 x 284 + 180
= 122,12 + 102,60
= 225

For secondary education, weights used were ,39 for Natal and ,61 for Kwazulu again depending on the relative secondary pupil enrolments of the white areas and the states.
Therefore, the average secondary per capita expenditure for Region E

=,39 x 767 + 61 x 486
= 299,13 + 296,46
= 596

assuming that the Natal's secondary per capita expenditure is R767.

<u>Region F (i.e: Eastern Transvaal, Kangwane and parts of Lebowa and Gazankulu)</u>

Average primary per capita expenditure for Region F = weighted

'Eastern Transvaal' primary per capita expenditure + weighted 'Kangwane and parts of Lebowa and Gazankulu' primary per capita expenditure. With weights of .50, .25 and .25 for Kangwane, parts of Lebowa and parts of Gazankulu and primary per capita expenditures of 179, 138 and 200 for Kangwane, Lebowa and Gazankulu respectively. Substituting in the equation, we get,

Average primary per capita expenditure for Region F

= 0,43 x 284 + 0,57(0,50 x 179 + 0,25 x 138 + 0,25 x 200)
= 0,43 x 284 + 0,57 x 174
= 221

Similarly, the average secondary per capita expenditure of Region F = weight of white areas x secondary per capita expenditure of Eastern Transvaal (i.e.white areas) + weight of the states (weight of KaNgwane x KaNgwane secondary per capita expenditure + weight of parts of Lebowa x Lebowa secondary per capita expenditure + weight of parts of Gazankulu x Gazankulu secondary per capita expenditure)

= ,39 x 767 + 0,61 (.50 x 483 + 0,25 x 373 + 0,25 x 541)
= 299.13 + 0,62 x 470
= R586

Region G (i.e: Northern Transvaal and parts of Lebowa and Gazankulu)

Average primary per capita expenditure for Region G = weight of white areas x Nothern Transvaal primary per capita expenditure + weight of the states (weight of Lebowa x Lebowa primary percapita expenditure + weight of Gazankulu x Gazankulu primary per capita expenditure).

= ,43 x 284 + 0,57 (0,50 x 138 + 0,50 x 200)
= 122,12 + 96,33
= R218,45

Average secondary per capita expenditure = weight of white areas x Nothern Transvaal secondary per capita expenditure + weight of the states (weight of Lebowa x Lebowa secondary per capita expenditure + weight of Gazankulu x Gazankulu secondary per capita expenditure)

= 0,39 x 767 + 0,61 (0,5 x 373 + 0,5 x 341)
= 229,13 + 0,61 x 457
= R578.

Region H (i.e. P.W.V. and Kwandebele)

Average primary per capita expenditure for region H = weight of white areas x white areas per capita expenditure x weight of

Kwandebele (i.e. the states) x Kwandebele primary per capita expediture

= 0,43 x R284 + 0,57 x R167,00
= R122,12 + R95,19
= 217,31
= 217

Similarly, the average secondary per capita expenditure for region H

= 0,39 x R767 + 0,61 x R450,00
= R229,13 + R274,50
= R573,63
= R574

Region C (i.e Nothern O.F.S and Qwaqua)

Qwaqwa's per capita expenditure could not be known, so the average per capita expenditure of all the states (including Transkei and Bophuthatswana) was used. The average was R243.5

Hence, using the above formulae, Average primary per capita expenditure

= weight of Northern O.F.S (white areas) x white areas primary percapita expenditure + weight of

Qwaqwa (i.e. the states) x Qwaqwa primary per capita expenditure.

= 0,43 x 284 + 0,57 x 183

= 122,12 + 104,31

= 226,43.

Average Secondary per capita expenditure for region C = weight of white areas x white areas secondary per capita expenditure + weight of the states x Qwaqwa secondary per capita expenditure.

= 0.39 x 767 + 0,61 x 493

= 299,13 + 300,73

= 600

White areas were given smaller weights than the states because pupils' enrolment for white areas was smaller than that of the states. So, weights were set up depending on the relative contribution of the different places to the educational activities within the region.

Again, these per capita expenditures had to be augemented by the private costs of education to get social unit costs as follows:-

Region C:	social primary unit cost	= R226 + R56
		= R282
	social secondary unit cost	= R117 + R600
		= R717
Region E:	Social Primary Unit Cost	= R225 + R56
		= R281
	Social Secondary Unit Cost	= R596 + R117
		= R713
Region F:	Social Primary Unit Cost	= R221 + R56
		= R277
	Social Secondary Unit Cost	= R586 + R117
		= R703
Region G:	social primary unit cost	= R218 + R56
		= R274
	social secondary unit cost	= R578 + R117
		= R695
Region H:	social primary unit cost	= R217 + R56
		= R273
	social secondary unit cost	= R574 + R117
		= R691

APPENDIX C

Calculation of age-education mean earnings

Since age and earnings data were collected in terms of age and earnings groups per month, in order to obtain the mean earnings estimates of particular age-education cohorts, grand total earnings had to be found first by adding the relevant products of mid-earnings and their corresponding numbers of individuals and then dividing them by the total numbers of people.

For example, supposing some information had been collected as follows (-giving hypothetical figures);

Age	Education	No. of people	Earnings group	Mid-earnings	Total earnings
15-19	Illit.	4	1 - 19	10	90
15-19	Illit.	2	20 - 39	30	60
15-19	Illit.	7	40 - 59	50	350
15-19	Illit.	1	60 - 79	70	70
15-19	Illit.	3	100 -119	110	330
Grand total		17			850

According to the figures in the table above, the mean earnings for the illiterates of the age group of '15 - 19' is 850/17

= R50 per month.

APPENDIX D

Adjustments to Earnings Data: algebraic procedure and example.

The way this example is presented and most of the words used in it were copied from appendix B (pp.306-308) of chapter 5 of A R Donaldson' study (1987). The derivation of the adjustments procedure is reproduced in full from the same appendix of the publication.

As an example of the procedure used in generating the adjusted age earnings profiles of tables 3.21(a)2, 3.21(b)2, 3.22(a)2 and 3.22(b)2, the calculations which generate the first column of table 3.21(a)2 are presented below.

The adjustment process consists of two stages, one for correcting the mean earnings for variations in non-educational factors within education groups and the other for standardizing non-educational variables amongst the groups. The adjustments result in predicted values of earnings for the age group 35-44 which was excluded from the regression model.

The mean earnings for illiterate males is taken from table

3.18(a). For the first adjustment, average values of the relevant age variables are taken from column (1) of table 3.18(a) (reproduced in column (1) below), multiplied by the corresponding regression coefficient from table 3.21(a)1 (in column (2) below. The products are summed in column (3) and the sum is substracted from the mean earnings figure (in column (4)).

For the second adjustment, the average values of the relevant non-educational variables (in column 6 below) are subtracted from the averages for the whole sample from the last column of table 3.18(a) (in column (5)) and the differences (in column(7)) are multiplied by the corresponding regression coefficients from table 3.21(a)1 (column (8)). The sum of the products (column (9)) is then added to the adjusted mean in column (4) to give the expected earnings of illiterate persons aged 35-44 (column (10)) corrected for non-educational variables within and among education groups.

The remaining entries in column (1) of table 3.21 (a)2 are then derived by adding to this corrected figure for age 35-44, the regression coefficients for the other age groups reported in table 3.21(a)1.

Mean earnings: 2360

Age Gr.	Average value	Coefficient		
	(1)	(2)	(3)	(4)
15-19	,03	-516	-15,48	
20-24	,07	-250	-17,50	
25-34	,23	- 11	- 2,53	
45-54	,26	- 21	- 5,46	
55-64	,15	-182	-27,30	
			-68,27	2360-(-68,27) = 2428,27

	(5)	(6)		(7)	(8)	(9)	(10)
Single	,31	,20	=	,11	-322	= -35,42	
Div/wid	,02	,02		,00	-287	0,00	
Urban	,31	,14		,17	1644	279,48	
Reg. A,B,C & D	,18	,23		,05	-426	21,3	
Reg. E	,14	,11		,03	503	15,09	
Reg. H	,19	,10		,09	848	76,32	
Hostels	,395	,42		,025	2094	-52,35	
						304,42	2428,27 + 304,42 = 2733

According to Donaldson, the derivation which follow was reproduced in his publication in full from "Annex D" (pp. 181-1183) of Thias and Carnoy (1972).

DERIVATION OF PROCEDURES FOR ESTIMATION OF ABSOLUTE EARNINGS FROM REGRESSION DATA

As stated in the text of Chapter III, the model we use in performing the regression of age, socio-economic, and occupational variables on income for each schooling group is of the form:

$$Y_i = B_o + \sum_j B_j X_{ij} + \sum_k C_k Z_{ik} + U_i \qquad \begin{matrix} i = 1 \ldots n \\ j = 1 \ldots m \\ k = 1 \ldots l \end{matrix}$$

and the predictive equation may be expressed in the notation both of deviates (e.g. $X_{ij} - \bar{X}_j$) and of the original variables (X_{ij}, etc.):

Deviates

$$\hat{Y}_i = \bar{Y} + \sum_j b_j (X_{ij} - \bar{X}_j) + \sum_k c_k (Z_{ik} - \bar{Z}_k) \qquad (1)$$

Original Variables

$$\hat{Y}_i = b_o + \sum_j b_j X_{ij} + \sum_k c_k Z_{ik}$$

where $b_o = \hat{B}_o$ $\quad b_j = \hat{B}_j$ $\quad c_k = \hat{C}_k$

X_{ij} = age variables

Z_k = socio-economic, occupational variables

$\bar{Y}, \bar{X}, \bar{Z}$ = means of X, Y, and Z within a schooling group

Our objective is to find for each schooling group of African males with 11 or fewer years of schooling a monthly income figure that has been adjusted to eliminate differences in earnings due to differences (within the schooling group or between schooling groups) in parents' literacy, father's occupation, or other characteristics which influence earnings. The computational procedure is derived below simultaneously in the deviate and original variable notations. The calculations in the text are in the deviate form; the original variables form is an equivalent alternative for the computation.

First, (1) is evaluated when $Z_{ik} = \bar{Z}_k$ for all i, that is, when the Z_{ik} are set equal to their mean values.

(2)

Since the X_{ij} are zero-one variables, $X_j = 1$ for age j and zero otherwise. Restating (2) for the case $X = X_j$, we obtain:[1]

$$\hat{Y}_i \Big|_{\substack{Z_{ik} = \bar{Z}_k \\ X = X_j}} = \bar{Y} + b_j - \sum_j b_j \bar{X}_j \quad \Big| \quad \hat{Y}_i \Big|_{\substack{Z_{ik} = \bar{Z}_k \\ X = X_j}} = b_o + b_j + \sum_k c_k \bar{Z}_k \quad (3)$$

We now wish to adjust the Y_i to reflect the extent to which the particular schooling group varies from the whole sample (African males with 11 or fewer years of schooling) with respect to the distribution of socio-economic and other variables. We designate $\bar{Z}_k^*$ as the means for the whole sample of the socio-economic and occupational variables. Recalling that the $\bar{Z}_k$ are the means of these variables for the individual schooling groups, we add the adjustment D:

$$D = \sum_k c_k (\bar{Z}_k^* - \bar{Z}_k)$$

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[1] A look at (3) shows in a particularly clear way the relationship between the schooling group means in the deviate form (Y) and their relevant intercept terms in the original variables form (b_o). By setting equal the right hand terms of the two equations, we find:

$$b_o = \bar{Y} - \left(\sum_j b_j \bar{X}_j + \sum_k c_k \bar{Z}_k\right)$$

which may be recognized as the usual formula for the least squares intercept or, regrouping:

$$\bar{Y} = b_o + \sum_j b_j \bar{X}_j + \sum_k c_k \bar{Z}_k$$

and this gives:

$$\hat{Y}_i + D = \bar{Y} + b_j - \sum_j b_j \bar{X}_j + \sum_k c_k (\bar{Z}_k^* - \bar{Z}_k) \quad \Big| \quad \hat{Y}_i + D = b_o + b_j + \sum_k c_k \bar{Z}_k + \sum_k c_k (\bar{Z}_k^* - \bar{Z}_k)$$

$$= \left[\bar{Y} - \sum_j b_j \bar{X}_j + \sum_k c_k \cdot (\bar{Z}_k^* - \bar{Z}_k)\right] + b_j \quad \Big| \quad = \left[b_o + \sum_k c_k \bar{Z}_k^*\right] + b_j \quad (4)$$

The adjusted incomes are thus equivalent to those measured by the given regression equation where the Z variables are assumed to take on the sample mean values for all regressions. The expression (4) in deviate notation describes algebraically the computational procedure carried out in the Example in Chapter III, when the Z are the socio-economic variables only. It describes the procedures used to obtain the Table 3.7, when the Z are the socio-economic and occupational variables, but when only significant values of c_k are used.

APPENDIX E

Calculation of overall rates of return to education

The formula used to calculate the overall rates of return to education was suggested by Psacharopoulos. The overall rate of return to education is a cost weighted average of the social rates at different educational levels

The following tables E.1 and E.2 give the calculations involved. The first column shows the education levels, the second one, rates, the third, the numbers of the pupils enrolled for that particular education level in the year 1985, the fourth, the unit costs of education, the fifth, the weight and finally the sixth gives the calculation of column number two times column number five. Then the overall rate is computed by dividing the total of column number six by the total of column number five.

Table E.1: Overall rate of return to education for males

Educational leval	(2) Rates %	(3) Numbers	(4) Unit Cost(R)	(5) Cost weight (3)x(4)	(6) (2)x(5)
4	20,0	1375581	302	415425000	8308500000
5	4,5	130574	302	39433348	177450066
6-7	4,5	160897	774	124534278	560404251
8-9	14,0	92874	774	71884476	1006382664
10	15,0	17710	774	13707540	205613100
			TOTAL	664985104	10258350080

Therefore the 'overall social rate is 15,43

Table E.2: Overall rate of return to education for females

(1) Educational leval	(2) Rates %	(3) Numbers	(4) Unit Cost	(5) Cost Weight (3)x(4)	(6) (2)x(5)
4	9,0	1346785	302	406729000	3660561000
5	3,5	141455	302	42719410	149517935
6-7	3,5	192100	774	148685400	520398900
8-9	13,0	100483	774	77773842	1011059946
10	16,0	13361	774	10341414	165462624
			TOTAL	686249066	5507000405

Therefore the 'Overall' Social rate is 8,02

SOURCE: Tables 3,21 (a) and (b) and the 1986 South African Statistics book for numbers.

* For primary education (i.e.up to standard 4), an 'average rate' of return to education ,which measures the rate applying on average to six years of schooling taken together is used.

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