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EDUCATION AND EARNINGS IN SOUTH AFRICA: AN APPLICATION OF THE MINCERIAN FUNCTION

Abstract:

The understanding of the interaction between education and income can never be exhausted, mainly because education remains the leading mechanism for upward social mobility. The argument is that people with higher levels of income are more likely to earn a higher income that those with lower level of education, that's the rule, although there maybe exceptions to the rule, the numbers for such cases are arguable small. However, there exists differences in the extent to which education influences income, earnings differentials exist by countries and social groups. This paper uses data published in 2017 by Statistics South Africa collected in the general household survey (GHS) which interviewed 72291 individuals across all the 9 provinces of the country. Using a mincerian function the paper estimates returns to education in South Africa. The results show that as expected, there is a positive relationship between education and earnings. The regression results also showed that based on the South African Household data, there is significant difference by race and gender. The results set a basis for re-examining the measurement of the variable used to capture education. The fact that a unit change in years of education is used needs to be changed so that different levels of education a weighted correctly.

Keywords:

Earnings, returns to education; Human capital

JEL Classification: A10, C50

1. Introduction

Education is arguably the most reliable mechanism for upward social mobility based on the concessions of the human capital theory (Higgs, 1904; Benjamin *et al.*, 2012; CIPD, 2017). Adam Smith in his early writing already considered education as an investment that yields a return. Adam smith articulated that:

> When any expensive machine is erected, the extraordinary work to be performed by it before it is worn out, it must be expected, will replace the capital laid out upon it, with at least the ordinary profits. A man educated at the expense of much labour and time to any of those employments which require extraordinary dexterity and skill, may be compared to one of those expensive machines. The work which he learns to perform, it must be expected, over and above the usual wages of common labour, will replace to him the whole expense of his education, with at least the ordinary profits of an equally valuable capital. It must do this, too, in a reasonable time, regard being had to the very uncertain duration of human life, in the same manner as to the more certain duration of the machine, (Smith, 1776).

Already in his early work he identified the importance of education and training as an investment in productive skills which must appropriate a profitable return. Human capital theory contends that education is a process of imparting productive skills in people which when used yields a return that is higher than the cost and time involved in the acquisition of the skills (Smith, 1776; Benjamin *et al.*, 2012; CIPD, 2017). Studies that have been published after the Wealth of nations have recognised the accuracy with which Adam Smith articulated the importance of education and training, criticisms of his equating people to machines notwithstanding. Be that as it may, the concept of education and earnings has also been driven by Jacob Mincer, where the empirical estimation of the returns of education are derived. Jacob Mincer in his Mincerian function estimated the returns to education. Studies such as those of Becker (1946) attribute the positive relationship identified between earnings and education to the years of education attained by an individual, as this could serve as a signal for skill possession to possible potential employers, which will thus make it much easier for an educated person to find employment in more lucrative jobs.

Doyle and Skinner, (2016) acknowledge that pursuing further education is commonly associated with pursuing a higher income. The real value of education in terms of obtaining a degree was given much attention in the 21st century by researchers such as Oreopoulos and Petronijevic, (2013). However, individuals, researchers, scholars and policy makers question to what extent obtaining a qualification leads to higher earnings as the relationship between educations and earnings can rather be quiet complex. As in previous years, the literature has indicated that at primary level, the returns to education are higher as compared to other higher levels of education in developing countries (Rani, 2014). Furthermore, Psacharopolous, (1994) and Card, (1994) indicate that the more educated a person is, the higher their expected earnings. Be that as it may, evidence on wage returns in developed and developing countries continues to grow, where researchers reveal that, taking into account the mean

distribution, approximately 10% is added to a person's wages with one additional year of schooling, (Psacharopoulos and Patrinos, 2004)

A number of studies, (Card, 1994; Psacharopolous, 1994; Siphambe, 2000; Psacharopoulos and Patrinos, 2004) among others, have investigated the return of education in developing countries, however the majority of the literature has focused mostly on high income economies and not on developing countries such as South Africa. Even though the supporting empirical evidence is scarce, Duflo, (2001) contends that the returns to education in developing countries are higher than in industrialised economies. This paper uses data on South Africa as one of the developing country to add to the literature on returns to education employing the Mincerian function. South Africa presents an interesting case for the analysis of the relationship between education and earnings, as South Africa is a developing country characterised by high youth unemployment, income inequality, poverty and unemployment amidst high levels of university participation.

The existence of the high level of unemployment in South Africa brings into question whether all kinds of education attainment are a profitable investment and how long it takes for an individual to start realising the return on their human capital investment. Fiaschi and Gabbriellini, (2013) asserts that, the increase in the level of education attained will lead to an increase in the estimated returns to education. Be that as it may, the estimated rate of return on education proves to be the ultimate indicator of the reward obtained in the labour market for acquiring a certain level of education (Rani, 2014) as education does not only influence a person's position in the society, its benefits are mostly channelled through ones position in the labour market, as people who are educated possess a specific skill which allows them to typically have a higher chance of getting employed, and prove to be more productive and receive higher earnings as compared to those that are not educated.

Other benefits of education not related to the labour market include improved public health, reduction of crime and a better approach to parenthood, which could as asserted by Moses, (2011) enhance the financial aspects related to the labour market participation. Furthermore, it is observed in South Africa that, students who leave school early or drop out of school are more prone to sustained periods of unemployment, which further impacts their future earnings capacity, taking into consideration other external factors such the individual's age, race and gender. The literature on earnings and education is identified to be one of the most extensive in economics, as a great deal of attention is received from policy makers and researchers all over the world. The study by Biyase and Zwane (2015) indicated the existence of a gap in the literature by investigating the notion between education and earnings in South Africa, taking into account the disparity in earnings across race, gender and family dynamics, as investigating this relationship is not as straightforward due to the fact that there exists several socio economic factors that are correlated with earnings and education, (Biyase and Zwane, 2015).

The literature on education and earnings also postulates that, even though it's possible for the poor to invest in education which will thus lead to upward social mobility, it is however found that children with educated parents are more likely to reap prominent

benefits of education (Moses, 2011). Investment in parental human capital also proves to be a beneficial factor for one's future income, as parental education has positive effects on their children's earnings, as the study of Van der Berg (2002) asserts that in South Africa, a matriculate student who has at least one parent who has matriculated, is likely to earn twice as much as compared to a matriculate who's parent does not have a matric qualification. The current education system in South Africa seems to be feeding into the earnings inequality patterns through the rising patterns of poverty, inequality and unemployment. Completing secondary and tertiary school in South Africa provides individuals with and advantage in the labour market, which thus improves access to employment opportunities as well as obtaining higher earnings (Branson and Leibbrandt, 2013). Be that as it may, a tertiary qualification is highly valued in the South African labour market, with the exception of a matric qualification. This further widens the gap between education and earnings especially for those who have tertiary qualifications. The link between the distribution of schooling and the distribution of the labour market income in South Africa proves to be an essential issue.

In light of the brief introduction, the primary objectives of this study is to investigate the relationship between earnings and education in South Africa. Given this background, the rest of the paper will be organised in the following manner. Section 2 presents the literature on earnings and education. Section 3 explains the methodology of estimating the rates of return to education making use of the Mincer earning function. Section 4 discusses the results and discussion, and lastly Section 5 provides the conclusion and policy recommendations and implication.

2. Literature review

Over the last 30 years, the link between education and earnings is well established in the literature and has been an important aspect of labour economics (Doyale et al., 2016). The conclusion amongst researchers is that higher education is characterised by increased future earnings, whist a hand full of researchers indicate that, certain external aspects such as race, gender and family dynamics also play a vital role in future earnings, whilst other researchers prove that education does not guarantee higher earnings. It is for this ambiguous nature in the findings of researchers, that the study looks into the growing body of literature.

The study of Burger and Van Der Berg (2011) made use of a simulation model that uses matric results and the level of education attainment to generate estimates of education quality, which were further based on the wage differences across different race groups. The study further incorporated the use modelling cognitive skills, the ability and school quality in order to explain labour market earnings differentials in South Africa. Their results reveal that the wage gap is a key contributor to the differences observed in the quality of education. Furthermore, Branson et al (2013) investigated the changes in education, employment and earnings in South Africa. Their findings reveal that, the reward for secondary and tertiary education completion remains positive, and has shown to increase for tertiary educated individuals who are born since 1960. Biyase and Zwane (2015) made use of the national income dynamic dataset to investigate the impact of education levels on wages in South Africa from

2008-2012. Their study concludes that; a positive impact is identified when an individual participates in education.

Be that as it may, Doyle and Skinner (2016) estimates the education earnings equation using geographic variation with data from the National Longitudinal Study of Youth, 1997, making use of a variety of 6 instruments based on geographic variation. The six instruments incorporated include: the distance weight tuitions, the presence of a colleague existing in the country for two years or for 4 years, distance weight enrolment in colleagues existing for two years within the state, the inverse log distance to colleague's existing for two years within the state and the inverse log of the distance to all the colleges. Their findings reveal that an additional year of postsecondary schooling leads to a 9.7% increase in earnings. Furthermore, the study also found the impact of postsecondary education attainment in women to have a larger impact, whilst no measurable postsecondary education attainment was observed from men.

Liu et al (2000) investigated family background and return to schooling in Taiwan, where the study found that the inclusion of family background variables in the wage function results in sensitive estimated returns. The results indicate a significant relationship between a worker's wage and the effects of family background in the private sector and not in the public sector. Furthermore, the study also revealed that the effect of a mother's schooling with respect to the wage function is however lower than that of a fathers schooling, even though an even larger effect of the wife schooling is observed, suggesting that estimates that excludes a family background may be biased. Making use of a household income and expenditure survey, Siphambe (2000) investigates the rates of return to education in Botswana. His findings suggest that the rates of return to education increase with the increase in the level of education obtained. The study also indicates the robustness of human capital models and further indicates that education is not income equalising. The study further found that despite the fact that women are in most cased highly educated than men, woman on average are paid far less than men.

The study of Peet, Fink and Fawzi, (2015) further investigated the returns to education in developing countries, making use of household surveys from 25 developing countries from 1985 to 2012. Their findings indicate no evidence of excess returns in developing countries, and they further estimate the average return to schooling to be 7.6%. Furthermore, their results revealed higher returns for females than males, and lower returns in rural areas and higher returns in some regions of Africa and Latin America as compared to Asia and Eastern Europe. Angrist and Krueger (1991) conducted a cross country and individual country analysis. With respect to an individual country analysis, their results revealed that on average, an additional year of education lead to a 7.5% increase in wages. Making use of large cross section sample set in India utilising the mincerian function, Rani (2014) investigated the disparities in earnings and education. The study concludes that taking into account the location, English language ability as well as religion, the study reveals that the rate of returns to education increases with the level of education obtained. The study further indicates that, across different groups, the rates of return to education are lower which could be attributed to the lower quality in the basic education system in India, as the

rate of return amongst rural workers is 4.9% & and 38.2% amongst fluent English ability groups.

3. Methods and data

The paper uses data that was collected by Statistics South Africa. Statistics South Africa (STATSSA) is a government department that is responsible for the collection of important data used by government and also made available to the public for the assessment of the important government objectives. STATSSA has the capacity to collect large data sets that are representative of the county's population. The paper uses data that were collected by STATSSA in 2016 -2017 in the General Household Survey (GHS). The data was sources from the STATSSA website. The data has 72291 individuals, these included all the persons found in the 21601 households that were interviewed across all the nine provinces of the country. The distribution of the sample by province is presented in Table 1.

Table 1: distribution of the sample by Province

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Western Cape	6943	9.6	9.6	9.6
	Eastern Cape	9953	13.8	13.8	23.4
	Northern Cape	3314	4.6	4.6	28.0
	Free State	4293	5.9	5.9	33.9
	KwaZulu-Natal	12862	17.8	17.8	51.7
	North West	4548	6.3	6.3	58.0
	Gauteng	15936	22.0	22.0	80.0
	Mpumalanga	6149	8.5	8.5	88.5
	Limpopo	8293	11.5	11.5	100.0
	Total	72291	100.0	100.0	

The data was also fairy distributed between female headed households and male headed households, so that the differences in the earnings premium by gender can be isolated without any sample biases. Table 2 presents the frequency distribution of the sample by gender.

Table 2: Sample distribution by gender of head of household

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	34255	47.4	47.4	47.4
	Female	38036	52.6	52.6	100.0
	Total	72291	100.0	100.0	

The paper uses race as one of the dependent variables which was entered in as dummy variables for the four racial groups that were included in the sample. Table 3 gives the frequency by race of the sample distribution. The majority of the respondents

were African blacks, which was expected as it captures the representation of race I South Africa.

Table 3

		Frequency	Percent	Valid Percent	Cumulative Percent
		Population group			
Valid	African/Black	60276	83.4	83.4	83.4
	Coloured	6736	9.3	9.3	92.7
	Indian/Asian	1259	1.7	1.7	94.4
	White	4020	5.6	5.6	100.0
	Total	72291	100.0	100.0	

3.1 Model Specification

The studies on education and earnings have benefitted from works of Jacob Mincer who is considered to be the father of modern labour Economics (Polachek, 2007; Fiaschi and Gabbriellini, 2013; Biyase and Zwane, 2015; Doyle and Skinner, 2016) Mincer is known for his earnings function which considers earnings as a function of education and years of experience.

The theoretical basis in most studies of earning and schooling is based on the foundation set by the 20th century fathers of human capital theory such as Theodore Schultz -1961, Gary Becker- 1964 and Jacob Mincer 1958, and improved in 1974 (Schults, 1961; Becker, 1962; Fiaschi and Gabbriellini, 2013). The original model for the empirical estimation of the returns to education or the association of education and earnings as proposed by the human capital formulation is the well-known Mincerian function of 1974. As Fiaschi and Gabbriellini, (2013) explain in their paper that 'This model focuses on the life-cycle dynamics of earnings and on the relationship between observed earnings, potential earnings and human capital investment, both in terms of formal schooling and on-the-job investment.'

According to Fiaschi and Gabbriellini, (2013) if we let E_t to be the potential earnings at time t. Investments in training can be expressed as a function of potential earnings invested, meaning that $C_t = K_t E_t$ where k_t is the fraction or amount that was invested at time t. and allowing the mincerian function can be summarised as follows ρ_t to be the return to training invested, and with several steps of calculation Fiaschi and Gabbriellini (2013) arrive at the following as the standard Mincer earnings function.

$$lnw(s,x) \approx \ln E_{x+s} - K\left(1 - \frac{x}{T}\right) = [lnE_0 - K\rho_0 - K] + \rho_s s + \left(\rho_0 k + \frac{\rho_0 K}{2T} + \frac{K}{T}\right)x - \frac{\rho_0 k}{2T}x^2 = \alpha + \rho_s s + \beta_0 x + \beta_1 x^2 \qquad (1)$$

In the follow up paper we argue that there is need to relook at the years of schooling which is usually used as a proxy for education and training. In the current paper education is proxied by the years of schooling as reported in the survey.

Thus a simplified version is estimated as follows

$$w = \alpha_1 + \alpha_2 Education_i + \alpha_3 Exp^2{}_i + \alpha_4 Gender_i + \sum_{i=1}^{n} D_i + \varepsilon \quad (2)$$

With wages expressed in log terms the equation will be as follows;

$$lnw = \alpha_1 + \alpha_2 Education_i + \alpha_3 Exp^2{}_i + \alpha_4 Gender_i + \sum_{i=1}^{n} D_i + \varepsilon \dots (3)$$

Where w is the wages or salaries to proxy earnings, education is the years of schooling, Exp^2 is experienced squared, gender is the gender of the respondent, entering the regression as a dummy variable coded as 1 for males and 0 for females. And D_i represent dummy variables for race. Race had four categories namely, black, coloured, Indian and white as presented in tables 3 above. Three categories for gendered were entered in the regression model with the fourth one (Black) being left out to be used as the reference category.

4. Results and discussion

The results in Table 4 are based on the regression equation 2. All the variables are significant at 1% significance level. And as expected the coefficients have a positive relationship with earnings. Table 5 shows the results according to equation 3 with log on income as a dependent variable.

Table 4

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-8943.470	300.774		-29.735	.000
	Highest education level	944.499	16.200	.410	58.302	.000
	Gender	2474.129	174.472	.095	14.181	.000
	white	9810.347	336.285	.206	29.173	.000
	Indian	5792.595	596.800	.065	9.706	.000
	coloured	1470.603	284.997	.035	5.160	.000
	Exp2	1.672	.093	.122	18.043	.000

Coefficients

a. Dependent Variable: Monthly Salary

With log income the results are not that different from those in table 4 except for the size of the coefficient, and that is expected as it is indicating a percentage change in income due to a unit change in the variable

Table 5

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	6.076	.039		154.626	.000
	Highest education level	.120	.002	.452	54.046	.000
	Gender	.353	.022	.129	16.070	.000
	white	.966	.053	.150	18.107	.000
	India	.652	.104	.050	6.255	.000
	coloured	.110	.038	.024	2.937	.003
	Exp2	.000	.000	.084	10.256	.000

a. Dependent Variable: log income

Based on the results in Table 4, a unit change in years of schooling leads to on average a R944.499 change in monthly wages. The p-value is 0.000 indicating that it is significant at 1% significance level. This would imply that any year of schooling at any level will be associated with that increase. We argue in this paper that it is not correct to assume equal premium for any year of education at any level. This argument will be extended in the subsequent paper. For purposes of this paper it is merely pointed out that although this is in agreement with expectation in terms of the sign of the coefficient, an index that assign a weight to a year of schooling based on the level would be more accurate.

The results also present interesting findings on races and gender. As expected, there is a gender gap in the wages regardless of education level. Males in the sample earn R2,474,13 more than females. This is in agreement with the literature that point to the existence of a gender gap in wages in the labour market (Rubery and Koukiadaki, 2016; Brynin, 2017). The p-value for gender (0.000) is also significant at the 1% significance level.

Race was also significant with a p-Value of 0.000 for all the three dummy variables. Black was used as the reference category. The coefficient for white was the highest with R9810 as the difference between the average monthly wages between white and black respondents in the sample. Indians also earned R5792 more than black Africans, and coloureds also earned R1470 more than blacks in the sample.

5. Conclusion

The results of the mincerian function agrees with literature in the sense that there was a significant positive relationship between years of schooling and earnings. The study however will produce in a series of papers a follow up paper that attempts to use a weighted index to measure education attainment. Also of interest in the results were

the big racial and gender differences that indicated the existence of a gap between all races with the African/Blacks earning the lowest on average compared to whites who were the highest and the Indians who were second. The coloured group also were earning more than the blacks. We will include these categories in the subsequent paper as well to see if the gap will persist even with an improved measure of education

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