

EDUCATIONAL ATTAINMENT AND EARNINGS INEQUALITY IN SOUTH AFRICA

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Abstract

This study empirically examines the impact of education on earnings in South Africa, using the five-wave panel of the National Income Dynamics Study (NIDS). An instrumental variable estimation approach using parental education was utilised. The findings of this study suggest that schooling generally has a significantly positive effect on South Africa's earnings outcomes. The evidence also suggests that returns to education are highest at the tertiary level, followed by primary and secondary education. However, the impact of education differs along gender and race lines, implying the existence of inequality. The observed higher returns at higher levels of education suggest the need for equitable access to higher education across socio-economic groups. The key policy recommendation arising from these findings is that the expansion of higher education, particularly for Africans, should be geared towards significantly contributing to the reduction or eradication of the high levels of inequality in South Africa.

Keywords: Education, human capital, inequality, South Africa.

1.0 Introduction

Poverty, unemployment, and inequality are pervasive issues in many developing countries, including South Africa. The latter is one of the most unequal countries globally, with a Gini index of 63 in 2014/15. South Africa's inequality has increased consistently since 1994 (World Bank, 2020). However, the country has made progress in reducing poverty since 1994. Between 2011 and 2015, the course of poverty reduction was reversed, threatening to undo the gains made since the end of apartheid. In 2014, approximately 55.5 percent of the population in South Africa lived below the national poverty line, meaning that about 30.3 million individuals lived on less than R992 per month. In addition, it is reported that about 25 percent of the population is experiencing poverty. These high levels of poverty are reflected in the elevated income differences in South Africa, characterised by the fact that few individuals earn high incomes, and the relatively small number of people in the middle class (World Bank, 2020).

Since 1994, the South African government has prioritised efforts to reduce poverty and income inequality in the country. To achieve this aim, the government has embarked on several initiatives aimed at creating employment and implementing economic reforms to foster investment and support sustainable job creation. However, according to the Quarterly Labour Force Survey (QLFS) for the second quarter of 2021, the official unemployment rate in South Africa reached its highest level of 34.4 percent. This implies that the South African labour market is facing extreme difficulties. Youth have the highest unemployment rate, accounting for approximately 59 percent of the total unemployed individuals (Stats SA, 2021). This means that the burden of unemployment is more concentrated among young people in South Africa.

Furthermore, Stats SA (2021) reports that young people in South Africa have become discouraged from participating in the labour market. As such, they are not building their skills through

education and training. This poses a challenge to the labour market and hinders the country's economic growth, as employers often prefer to employ those with high levels of education and work experience.

The 2019 report on Inequality Trends in South Africa indicated that the labour market is the most significant contributor to income inequality in South Africa, accounting for 74.2% (Stats SA, 2019). The South African labour market is heavily racialised and gender-biased, with female workers earning approximately 30 percent less than their male counterparts do (Stats SA, 2019). The 2019 Inequality Trends Report reveals that males are more likely to be employed and have relatively better-paying jobs than females. This may be based on the premise that the likelihood of women leaving work to focus on family responsibilities at some point in their careers is high.

The earnings distribution in the South African labour market is heavily racialised. In addition to having the worst employment outcomes, black Africans also earn the lowest wages (Stats SA, 2019). Whites, in contrast, earn substantially higher salaries than all the other population groups. In fact, the mean real earnings between 2011 and 2015, among employed black Africans, were R6,899 per month. The corresponding figures for coloureds and Indians/Asians are R9,339 and R14,235 per month, respectively. The figure for whites was R24 646 per month, more than three times as high as that of black Africans (Stats SA, 2019).

These disparities suggest discrimination in the labour market. This means that equally productive individuals are treated differently because they belong to a particular racial group. Such discrimination might be the source of the significant and persistent differences in the earnings distribution. It is worth noting that, over the years, South Africa has implemented anti-discriminatory policies and laws, such as the Employment Equity Act of 1998, in an effort to promote equity and social cohesion. Nonetheless, no practical assessment or evaluation of the effectiveness of these pieces of legislation concerning gender and ethnicity in the labour market has been undertaken.

Education plays a particularly important role in addressing poverty, unemployment, and inequality in South Africa (Branson et al., 2013). It has often been described as 'the great equaliser', due to its ability to alleviate poverty, fight income inequality, and ensure a more equitable economy. In addition, Montenegro and Patrinos (2013) have demonstrated that education enhances individuals' skills and expands their knowledge, enabling them to contribute to economic growth. For example, quality education enhances an individual's social, emotional, cognitive, and communication skills. It also supports the development of knowledge and abilities that can be utilised to earn a higher income and further develop other basic skills. Moreover, education produces several private and social benefits, including improved health, increased well-being, and reduced crime (Churchill and Mishra, 2018).

Nonetheless, education engenders some personal and social costs. These comprise the investment that an individual makes towards education through tuition fees, books and other expenses, as well as the costs covered by the society through the subsidisation of education from public funds. Education costs also include the opportunity cost, that is, the income forgone by an individual while undertaking education (Moroşan, Sava and Diaconescu, 2010). The impact of education on an individual results in improved labour-market productivity and human capital accumulation. These contributions are often measured by labour-market earnings (Churchill and Mishra, 2018). This means that the benefits of education for an individual are often revealed by their earnings, as employers tend to pay those who are better skilled and more productive higher earnings.

According to the human capital theory (Becker, 1964; Mincer, 1974), labour market earnings are determined by human capital, which is measured by educational attainment. This implies that earning differentials result from differences in productivity. Hence, individuals who invest in education gain skills that can improve their human capital, productivity, and, ultimately, their earnings. In turn, higher earnings enhance the standard of living; hence, many countries have invested in education to improve the well-being of people and alleviate poverty. However, Churchill and Mishra (2018) suggest that the impact of education on earnings varies from one country to another. This is due to differences in their respective socio-economic conditions, labour-market prospects, and educational opportunities. This variation is evident in studies that have investigated the returns to schooling in countries with different levels of development (see, for example, Schultz, 2004; Kuepie et al., 2009; Psacharopoulos and Patrinos, 2004, 2010; Ajakaiye and Kimenyi, 2011; Montenegro and Patrinos, 2013; Peet et al., 2015; Lee and Lee, 2018; Coady and Dizioli, 2018; Ahmed et al., 2020).

In a study conducted in Italy, Odoardi et al. (2020) argue that the inequality-reducing effect of human capital is only evident in developed regions due to the presence of suitable social and economic conditions. This does not hold true for poor regions due to inequality in opportunities, suggesting that social capital may be a remedy. Similarly, in China, Campos et al. (2016) argue that income differences might be attributed to language and cultural barriers, discrimination in the labour market, and other pre-labour-market conditions such as education. A broader perspective was adopted by Arabsheibani et al. (2006). They associate Brazil's growing earnings inequality in relation to schooling returns with trade liberalisation and economic reforms, suggesting that economic and trade reforms favour the skilled over the unskilled. From another perspective, Munir and Kanwal (2020) attribute differences in returns to education to differences in educational opportunities. They argue that to eliminate the differences in skills, income levels, and professional opportunities, it is necessary to reduce educational disparities by improving educational conditions for all people. Likewise, Murakami and Nomura (2020) suggest that the diversification of schooling is essential to achieving an equitable distribution of wages.

In respect of South Africa, a developing country with high labour-market earnings inequality due to factors associated with the past injustices of the apartheid era, the study of the impact of education on earnings is critical. Previous studies (Mwabu and Schultz, 2002; Allanson and Atkin, 2005; Salisbury, 2015; Moll, 1992; Freyer and Vencatachellum, 2005) have examined the relationship between schooling and earnings, focusing on various social issues, including ethnic and racial discrimination, gender differences, and regional effects. However, the need to address the disparities in the South African labour market remains. Therefore, this study aims to contribute to the existing literature by investigating the extent to which differences in educational levels contribute to earnings disparities.

Montenegro and Patrinos (2013) argue that returns to education are highest at the tertiary level, followed by the primary and secondary levels, respectively. These scholars also suggest that the returns to education decrease as countries develop; thus, the returns to education are higher for low-income countries than for high-income countries. For a long time, it was commonly believed that returns to schooling were highest at the primary education level and decreased as educational attainments increased (Psacharopoulos and Patrinos, 2004). In contrast to this belief, Schultz (2004) reassessed the variation in earnings based on schooling in Africa and found that private returns to education were highest at the secondary and tertiary education levels. Similarly, Kuepie et al. (2009) examined the impact of schooling on wage earnings in West Africa. They

provided evidence of a convex earnings function, implying increasing returns to schooling at higher levels.

While many studies have explored the relationship between education and earnings, most have measured the returns in relation to the average years of schooling rather than the different levels of schooling. Hence, a key contribution of this study is the presentation of evidence on the effects of schooling on individuals' earnings at different levels of education, not just the average years. Disaggregating education into different levels of schooling is crucial for understanding the extent to which earnings vary in relation to educational attainment. The findings of this study can provide policymakers with significant guidance on educational priorities. Indeed, the lack of information may lead to misleading decisions on the part of individuals and society, as well as costly government choices.

This paper makes a significant contribution to the existing literature in several ways. Firstly, this paper extends the study period by utilising a recently compiled National Income Dynamics Study (NIDS) dataset, thereby improving the efficiency of the estimates. Secondly, the study allows for heterogeneity in the relationship between education and earnings inequality among individuals. Existing evidence (Mincer, 1974) shows that an individual's unobserved characteristics affect educational outcomes and earnings. Thirdly, the study also ensures heterogeneity across working age since. Indeed, according to Mincer's (1974) human capital framework, education and experience are complementary variables such that the effect of education on earnings can be expected to increase with age. Finally, this paper uses the Instrumental Variables (IVs) estimation technique to address the potential problem of endogeneity by using parental education information. Therefore, this study endeavours to analyse the relationship between education and earnings in South Africa.

The remainder of this paper is divided into the following sections: Section 2 reviews the theoretical and empirical literature on the relationship between education and earnings. Section 3 elaborates on the methodology, variables, data, and estimation technique employed in the study. Section 4 provides a discussion of the estimation results and their implications. Finally, Section 5 concludes the study by giving a summary of the findings and related policy implications.

2.0 Literature Review

Becker (1964) and Mincer (1974) introduced the conceptual framework of human capital theory, which has been primarily applied in studies examining the returns to schooling. The theory presents a framework for analysing the relationship between earnings and education. The guiding principle is that earnings in the labour market depend on human capital, measured by educational attainment (Becker, 1964; Mincer, 1974). This implies that earning differentials result from differences in productivity. As such, individuals who invest in schooling to gain skills that enhance their human capital ultimately improve their productivity and, by implication, their earnings. Furthermore, Mincer (1974) argues that education, as part of human capital, is a significant factor that determines a worker's lifetime earnings. Mincer (1974) develops an earnings function used to estimate the rates of return to education empirically.

Mincer (1974) builds upon Becker's (1964) accounting identity model and yields an earnings specification that helps determine returns to education. In Becker's (1964) seminal work, the decision to invest in education is modelled as any other factor of production. The model notes that education increases workers' future or lifetime earnings, while the costs (both direct and indirect) are borne in the present. These costs take the form of fees and foregone earnings. Hence,

an individual will choose the level of education for which the cost equates to the benefits once the education has been completed.

Research on the impact of education on earnings has become an essential part of the labour economics literature. This effect has important policy implications, especially in developing countries. Examples of impacts include the reallocation of resources to ensure higher returns to education; the implementation of policies on compulsory education, to prevent dropping out; and the endeavour to understand the underlying factors that cause a change in this relationship, to predict future changes.

In the empirical literature, the link between education and earnings has been explored across countries with different levels of development, and various findings have been reported (for example, Fryer and Vencatachellum, 2005; Gunderson and Oreopoulos, 2010; Carnarca and Sgobbi, 2011; Montenegro and Patrinos, 2013; Peet et al., 2015; Campos et al., 2016; Salisbury, 2016; Doyle and Skinner, 2016; Churchill and Mishra, 2018). Variations exist when examining the results regarding this relationship in individual developed or developing countries. In addition, previous literature (e.g., Schultz, 2004; Kuepie et al., 2009; Foldvari and van Leeuwen, 2014; Ahmend et al., 2020) highlights the relationship between education and income changes over time. They attribute these changes to variations in the skills premium, the supply-and-demand conditions of the labour market, the strong economic expansion in developing economies, the overexpansion of education, and changes in the quality of teaching over time.

In the context of developed countries, Doyle and Skinner (2016) conducted a study in the United States concerning the effect of education on earnings, using the National Longitudinal Study of Youth (NLSY) data from 2007 to 2010. They employed a Two-Stage Least Squares (2SLS) approach and utilised geographical variation as an instrument for the years of education. Their results revealed that an additional post-secondary educational year increases earnings by 9.7 percent. This demonstrates the importance of post-secondary educational attainment. This study is crucial because these scholars introduced a richer set of proximity-to-school measures as instruments. Their results emphasise the essential role of location-based institutions of higher learning in ensuring increased earnings.

Similarly, Gunderson and Oreopoulos (2010) estimate the returns to education in developed countries to understand the causal relationship between education and earnings. They address a range of methodological issues, such as measurement error in the educational variable, corrections for ability bias, omitted variables, and selection bias; as well as the possibility of heterogeneous returns and credential or sheepskin effects associated with estimating the returns to education. Using multiple data samples based on the methodological issue to be addressed, their study reveals that returns to education in developing countries range from 6% to 15%. The OLS estimates vary from 6% to 10%, whereas the IV's projections range from 10% to 15%. Furthermore, these scholars note that the returns to education tend to increase over time, despite the large increases in the supply of educated individuals. This infers a demand for educated and skilled individuals associated with the development and knowledge economy. Nevertheless, these results may not be directly comparable to the observed differences, due to differences in data sample coverage and the methodology employed. It would have been more illustrative to standardise the sample and method, to provide harmonised and comparable results.

On the contrary, Fersterer and Winter-Ebmer (2002) and Carnarca and Sgobbi (2011) find evidence of a decline in returns to education over time in Austria and Italy, respectively. Fersterer and Winter-Ebmer (2002) examine the returns to education in Austria from 1981 to 1997. Their findings reveal that the returns to education in Austria are declining over time, due to an increase

in the supply of highly educated individuals. Likewise, Carnarca and Sgobbi (2011) estimate the returns to education in Italy by controlling for employee ability. Their results indicate lower returns to higher education compared to findings in other developed countries. This indicates a variation in the returns to education, even across economies at the same level of development. This may be due to each country's unique national conditions and policies.

In the context of developing countries, Peet et al. (2015) estimate the standard Mincer equation to model the effect of education on labour market incomes across 25 developing countries, between 1985 and 2012. They employ an OLS estimation approach. The evidence indicates that, on average, an additional year of education results in a 7.6 percent increase in earnings in developing countries. Furthermore, their results suggest that an additional year of education is associated with a 7.3 percent increase in earnings for primary school, a 6.5 percent increase for secondary education, and an 8.2 percent increase for tertiary education. This study is crucial as it emphasises the importance of higher education in increasing earnings and the need for basic skills in developing countries, as depicted by the high returns on primary schooling.

Campos et al. (2016) employ the China Health and Nutrition Survey, spanning 18 years from 1993 to 2011, to investigate the impact of education on earnings inequality. Their analysis uses institutional changes as instrumental variables to account for the endogeneity of the schooling variable. The findings from their 2SLS estimation show that an extra year of education results in a 17.7 to 19.9 percent rise in earnings for all individuals and a 26.3 to 28 percent rise for ethnic minorities. Additionally, the results suggest that ethnic minorities with higher levels of education receive higher returns on their education.

Likewise, Churchill and Mishra (2018) conduct a meta-analysis of studies examining returns to education in China, aiming to address the issues of heterogeneity in the education-earnings relationship. Adopting a random effects meta-regression (MRA) analysis, they discover that the rate of return for individuals with a college education is 5.81 percent, compared to 4.72 percent for other education levels. These findings imply higher returns at higher levels of schooling and lower returns at lower levels of education.

In Africa, Schultz (2004) examines the impact of education on wage differentials in six countries: Ghana, Cote d'Ivoire, Kenya, South Africa, Nigeria, and Burkina Faso, from 1985 to 1999, adopting the Mincer wage equation. The results from their OLS estimation show that returns to education are higher at the secondary and post-secondary schooling levels and lower at the primary education level. Similarly, Kuepie et al. (2009) investigate returns to schooling in seven major West African capitals between 2001 and 2003. To control the potential issues associated with the endogeneity of the schooling variable, they use the family background as an instrument variable. Using the 2SLS estimation approach, their study reveals that education plays a crucial role in determining individuals' earnings in West Africa. Their results suggest that returns to schooling are lower at the primary school level than at the secondary and tertiary education levels. These results indicate that individuals should pursue higher education to achieve increased earnings.

In South Africa, Fryer and Vencatachellum (2005) examine the returns to schooling for women from 1989 to 1990. To account for labour market-specific factors, these scholars use a sample of black women from the township of Machibisa in KwaZulu-Natal. The 2SLS approach suggests positive returns at secondary education and no returns for lower schooling levels for the sampled women.

Similarly, Salisbury (2016) examines the returns to education in South Africa, to determine the differences in earnings among Africans, coloureds and whites in the post-apartheid era. The author employs the standard Mincer wage equation to examine the relationship between education and wage earnings, using an OLS estimation approach. The study finds that an extra year of education leads to a 23 percent rise in returns for whites, a 19 percent increase for people of colour, and a 16 percent increase for Africans. The evidence suggests that earning inequality persists, indicating that the compensation structure in South Africa still heavily favours whites. Additionally, they report that tertiary education yields the highest returns, followed by secondary and primary education, respectively.

Based on all the studies reviewed, the findings are mixed. This suggests that the returns to education vary across the different development and educational levels. This aligns with Montenegro and Patrinos (2013), who present new and corresponding estimates of the returns to education, covering both developed and developing regions. Their analysis utilises harmonised household surveys from 131 countries and employs the standard Mincer estimation method to study the impact of education on earnings differentials across developed and developing countries. The evidence suggests that the Sub-Saharan African (SSA) region has the highest returns on education compared to other regions. Based on national income grouping, the returns are higher in lower-income and upper-middle-income countries. According to their results, returns to education are highest at the tertiary level, followed by the primary school level, and lowest at the secondary level. Their results also reveal that the average return on an extra year of education is 10.4 percent. Nevertheless, this study fails to account for possible issues of endogeneity in the educational variables.

The link between education and earnings has been investigated across countries of different levels of development, and mixed results have been reported. It is worth noting that as educational levels increase, individuals tend to report higher earnings. In the context of this study, the human capital theory is utilised to examine the private returns to education, while controlling for other observed and unobserved characteristics such as individual ability and family background. Mincer's (1974) extended function allows the addition of unobserved characteristics, which addresses the effects of these traits on the earnings outcomes associated with higher levels of education.

3.0 Methodology

The econometric procedure adopted follows the earnings function developed by Mincer (1974). This approach is an established method for modelling earnings, which has been widely used in most labour economics empirical studies (for example, Schultz, 2004; Kuepie et al., 2009; Montenegro and Patrinos, 2013; Salisbury, 2016; Depken et al., 2019). The standard Mincer earnings equation estimates the private returns to education in the form of the log earnings function of the following specification:

$$\ln(W_i) = \alpha + \beta_1 S_i + \beta_2 Age_i + \beta_3 Age_i^2 + \beta_4 X_i + \mu_i \quad (1)$$

Where $\ln(W_i)$ is the natural log of earnings (monthly earnings) for each individual; i , S_i captures a person's years of education (as a continuous variable); age is used as a proxy for the post-education and labour market experience and, therefore, Age_i captures the labour market potential experience; Age_i^2 constitutes the work-experience squared; X_i represents other control variables (race, gender, employment sector, and geography); and μ_i is the error term reflecting unobserved characteristics. β_1 can be viewed as one's private rate of return to years of education.

The main advantage of this model is that it can be extended to estimate the returns at different levels of education, by transforming the schooling variable S into a series of dummy variables D_p , D_s , and D_t (where p represents primary education, s stands for secondary education, and t is for tertiary), to capture the level of education achieved by an individual. To avoid matrix singularity, the dummy is excluded for people with no education in the equation. In this case, the equation is as follows:

$$\ln(W_i) = \alpha + \beta_p D_{p_i} + \beta_s D_{s_i} + \beta_t D_{t_i} + \beta_2 Age_i + \beta_3 Age_i^2 + \beta_4 X_i + \mu_i \quad (2)$$

Where the variables are defined as previously done in equation (1), with the use of dummies instead of the continuous education variable, this extended earnings function can help derive the private rate of return to different levels of education.

Estimation Procedure

Equation (1) will produce consistent estimates on the condition that earnings and education are not correlated with the disturbance term. The ordinary least squares (OLS) approach assumes that regressors are uncorrelated with the error term (Wooldridge, 2012). However, this assumption only holds under the premise of homogeneity, which results in consistent and unbiased estimates. Individual abilities are often heterogeneous. Therefore, the Fixed Effects (FE) and Random Effects (RE) techniques are implemented to enhance robustness, thereby eliminating heterogeneity (Wooldridge, 2012). The Hausman test is the official application model for choosing between the FE and RE, as it is a consistent and efficient estimator.

The FE/RE estimates are not consistent in the presence of an endogenous independent variable (Wooldridge, 2012). In other words, the estimates of the returns to education may be biased because the education variable is endogenous. Educational outcomes are often correlated with an individual's unobserved characteristics, such as ability, talents, motivation, family background, proximity to educational institutions, and compulsory schooling laws, which create endogeneity in the earnings-education relationship. Moreover, these components can influence one's educational decisions, resulting in omission, bias, and measurement errors. Therefore, given the plausibility of endogeneity in the schooling variable, the IV approach is employed. The IV approach is a method used in Two-Stage Least Squares estimation to estimate consistent parameters in the presence of endogenous explanatory variables. In the context of education decision-making, it allows the use of variables that affect the amount of education acquired.

Since the assumption of strict exogeneity does not hold because of the endogeneity of education, the estimation of the β_p , β_s and β_t The parameters in equation (2), together with other variables, may be biased to some degree by the presence of correlation in the unobserved effects, which impacts both education and earnings. Equation (2) is then estimated using a 2SLS estimation technique. To examine the returns to education using the instrumental variable approach, a valid instrument must be chosen. It must satisfy two main constraints: relevance and exogeneity. Relevance requires a correlation between the instrument and the endogenous explanatory variable, namely the level of education attained. Exogeneity requires that the instrument impacts the dependent variable, earnings, only through the endogenous variable, educational level (Wooldridge, 2012).

Following Kuepie, et al. (2009) and Depken et al. (2019), an individual's parents' educational background is used as an instrument for endogenous schooling variables. The educational status of parents is one of the significant factors that impact a person's academic progress. Educated parents significantly impact a child's educational success, as they can provide valuable assistance. This implies that less educated parents may have a less significant effect on a child's

educational success. Thus, the difference in family background, arguably independent of ability factors, may lead to variations in individuals' earnings.

Mothers' and fathers' education are used as instrumental variables. The following equations are specified as MTHED and FTHED, to denote the educational background of one's mother and father.

$$P_i = \sigma + \delta_1 MTHED_{1i} + \delta_2 FTHED_{2i} + \delta_3 X_i + \varepsilon_i \quad (3)$$

$$S_i = \sigma + \delta_1 MTHED_{1i} + \delta_2 FTHED_{2i} + \delta_3 X_i + \varepsilon_i \quad (4)$$

$$T_i = \sigma + \delta_1 MTHED_{1i} + \delta_2 FTHED_{2i} + \delta_4 X_i + \varepsilon_i \quad (5)$$

Stage 2 of the estimation is based on equation (2), as indicated earlier. While it is often challenging to genuinely attain exogenous instruments, the exogeneity conditions and the statistical validity of the instruments are officiated with the Sargan-Hansen exogeneity test and Stock-Yogo's weak IV test.

An alternative instrument variable for an individual's educational attainment is used to examine the robustness of the IV estimates of the returns to education. The robustness test examines an individual's quarter of birth as a potential concern that may impact their level of education. Thus, a person's level of educational attainment at the quarter of birth is also used as an instrument. Furthermore, the validity of the estimates based on the IV technique is investigated.

The 1996 South African Schools Act stipulates that children must start school at the age of seven and complete the general education phase, Grade 9, by the age of 15 (South African Schools Act of 1996). As a result of this schooling requirement, an individual born later in the year reaches a minimum school-leaving age at a lower grade than those born earlier in the year. Thus, an individual born later in the year (July-December) may have slightly less schooling than those born earlier (January-June), based on a January to November schooling schedule. This discrepancy in education may lead to variations in individual earnings.

In line with related studies, this research employs Mincer's (1974) human capital earnings function to estimate the returns to schooling. It starts with an estimation equation based on the simple OLS model. It then moves to a more complex schooling equation, the 2SLS model, in which education is considered endogenous. The IV method is used because educational outcomes are often correlated with an individual's unobserved characteristics, which can influence their schooling decisions. The model is refined to minimise measurement error in the schooling variable, correct for ability bias, and mitigate the possibility of inconsistent estimates. A robustness test is then performed to validate the estimates obtained from the Two-Stage Least Squares method.

Data and Variable Description

In estimating the returns to education in South Africa, this study uses the five waves of the National Income Dynamics Studies (NIDS) longitudinal dataset. The NIDS is a nationally representative household survey that was first conducted in 2008. Since then, this survey has been conducted biannually in 2010, 2012, 2014, and 2016. The NIDS was implemented by the Southern Africa Labour and Development Research Unit (SALDRU). It collects information from approximately 28,000 people in about 7,300 households. The initial interviewees are tracked over the years and re-interviewed.

The sample is restricted to the working-age population, people aged 15 to 65. A total of 13,349 individuals reported their monthly labour wages from their primary occupation and indicated their highest level of education. This represents only a small percentage of the total adults in the

data. However, this is to be expected due to South Africa's high unemployment rate of 32.5 percent and a low labour participation rate of 56.6 percent (Stats SA, 2020). In addition, the fact that a large share of all workers is self-employed, working for family businesses, or not earning substantial wages, minimises the possible number of survey interviewees who report labour market earnings.

The NIDS datasets contain completed and non-responsive interviews. This means that some potential respondents declined the interview. Therefore, the scope of the study is limited to the completed interviews. The target population for the NIDS does not cover other collective living quarters such as student hostels, nursing homes, hospitals, prisons, and military barracks. Therefore, it is only representative of non-institutionalised and non-military persons in South Africa (SALDRU, 2016).

In line with the existing literature (for example, Schultz, 2004; Kuepie et al., 2009; Montenegro and Patrinos, 2013; Peet et al., 2015; Salisbury, 2016; Depken et al., 2019) and Mincer's (1974) proposition, the dependent variable in the current study is the natural logarithm of monthly earnings. The primary dependent variable used is educational attainment, defined as a categorical variable within the South African education system. The educational categories are (i) no education, (ii) primary schooling, (iii) secondary schooling, and (iv) tertiary education. These categories help to capture the effects of education. This study controls for various demographic factors, including work experience, race, gender, industry (employment sector), and region (geography).

4.0 Empirical results

Descriptive statistics

Table 1 provides a summary of the statistics pertaining to several variables used in the study's regression model. From panel A, the average log income is 8.037, and the variation in the responses is approximately 1.103, away from the mean. The average educational attainment of the sample is as follows: 21.6 percent without education, 35.4 percent with primary schooling, 35.7 percent with secondary schooling, and 7.3 percent with tertiary education. Panel B illustrates the income profile by education and the average earnings of individuals at each level of education. On average, the log income for individuals with no education is 7.132, 7.374 for those with primary schooling, 7.903 for those with secondary schooling, and 8.909 for those with tertiary education. These statistics indicate that South Africa's monthly labour market earnings increase with educational attainment.

Table 1:

Descriptive statistics

Panel A: Summary of the statistics of the variables

Variable	Mean	Std. Dev.
Log Income	8.037	1.103
Education	.	.
No Schooling	0.216	0.412
Primary	0.354	0.478
Secondary	0.357	0.479
Tertiary	0.073	0.26
Age	26.393	21.058
Agesquared	1140.043	1573.597
Gender	.	.
Male	0.449	0.497

Female	0.551	0.497
Race	.	.
African	0.838	0.37
Coloured	0.124	0.33
Asian/Indian	0.011	0.11
White	0.026	0.16
Employment sector	.	.
Agriculture	0.135	0.341
Private Households	0.108	0.31
Mining and Quarrying	0.034	0.182
Manufacturing	0.115	0.318
Construction	0.058	0.235
Wholesale and Retail trade	0.163	0.369
Transport	0.041	0.199
Financial Intermediation	0.077	0.266
Community	0.269	0.443
Geography	.	.
Traditional	0.483	0.5
Urban	0.453	0.498
Farm	0.064	0.245

Panel B: Income by education

Education	Log Income (mean)
No Schooling	7.132
Primary	7.374
Secondary	7.903
Tertiary	8.909

Panel C: Education by race

Race	Education				
	No Schooling	Primary	Secondary	Tertiary	Total (percent)
African	22.71	36.00	35.11	6.18	100.00
Coloured	18.20	38.13	36.88	6.78	100.00
Asian/Indian	13.34	22.51	46.99	17.16	100.00
White	6.91	9.74	43.12	40.23	100.00
Total	21.63	35.42	35.67	7.28	100.00

Source: Author's use of the five waves of the NIDS dataset

Table 1 (panel C) highlights significant racial disparities in educational categories that disproportionately affect Black individuals. This racial distinction is evident from the considerably higher percentage of blacks (about 22.71 percent) in the data for people without education, compared to white individuals (about 6.91 percent). Tertiary education is also highest among whites, followed by Asian/Indians, and lowest among blacks. This difference could be attributed to the inequality in the education systems during apartheid South Africa.

Standard deviations reflect the variation in individual responses from the mean, whether the responses are widely dispersed or concentrated around the mean. For example, the standard deviations of no schooling, primary education, and secondary education indicate that, on average, individual responses were more than 40 percent away from the mean. The reactions of individuals with tertiary education were approximately 26% away from the mean.

Estimation results

Using the OLS regression of Mincer's earnings model to estimate the returns to education, Table 4 presents the estimates based on equation (2), which was specified and discussed in the previous chapter. The log of monthly income is estimated based on different educational categories. The results from the Hausman test, which is the official test used to specify whether individual effects are fixed or random, indicated a p-value of 0.000. This is less than 0.05 and thus rejects the null hypothesis that the individual effects are random. Therefore, the results from the FE model should be selected.

However, the fixed-effects approach does not generate estimates for race variables, because they are time-invariant. This approach also omits some of the results for educational and gender variables. Furthermore, under the Hausman test hypothesis, the fixed-effects approach is consistent when all variables are uncorrelated, thereby eliminating individual effects. According to Greene (2008), the most crucial difference between fixed and random effects is whether the individual's unobserved characteristics have elements that are correlated with the regressors in the model. This implies that if individual differences influence the dependent variable, random effects should be used. In this study, education is considered endogenous, since educational outcomes are often correlated with an individual's unobserved characteristics. Therefore, the estimates selected and reported in this study are from the RE model.

In Table 2, column 1 displays the Pooled OLS equation results, while column 2 represents the RE estimation results. The educational variables have the expected signs in both models, both theoretically and statistically, and exhibit significant parameters. The coefficient estimates outlined in column 1 indicate that an individual's earnings increase by 20 percent for each additional year of primary education. For each subsequent year of secondary education, earnings increase by 67.6 percent. An extra year of tertiary education yields an increase in earnings about seven times higher than that engendered by an additional year of primary.

Table 2: OLS Regression Results on the Returns to Education

VARIABLES	(1) POLS	(2) RE
Primary	0.200*** (0.037)	0.291*** (0.048)
Secondary	0.676*** (0.036)	0.914*** (0.047)
Tertiary	1.465*** (0.039)	1.517*** (0.049)
Age	0.049*** (0.004)	0.068*** (0.005)
Agesquared	-0.0004*** (5.06e-05)	-0.0006*** (5.70e-05)
Female	-0.337*** (0.016)	-0.342*** (0.021)
Coloured	0.001 (0.019)	0.015 (0.027)
Asian/Indian	0.535*** (0.062)	0.566*** (0.078)
White	0.903***	1.003***

	(0.038)	(0.047)
Private Households	-0.366***	-0.356***
	(0.033)	(0.033)
Mining and Quarrying	0.933***	0.791***
	(0.045)	(0.049)
Manufacturing	0.285***	0.215***
	(0.032)	(0.030)
Construction	0.116***	0.141***
	(0.038)	(0.037)
Wholesale and Retail Trade	0.148***	0.105***
	(0.030)	(0.029)
Transport	0.427***	0.271***
	(0.043)	(0.043)
Financial Intermediation	0.340***	0.291***
	(0.036)	(0.036)
Community	0.340***	0.188***
	(0.029)	(0.029)
Urban	0.364***	0.333***
	(0.018)	(0.022)
Farm	0.132***	0.124***
	(0.029)	(0.034)
Constant	5.760***	5.177***
	(0.087)	(0.100)
R-squared	0.438	
Observations	13,349	13,349

Standard errors in parentheses. ***, ** and * indicate significant p -value at 1percent, 5 percent and 10 percent levels respectively. POLS, Pooled ordinary least squares; RE, Random effect.

Once the heterogeneity is accounted for, the coefficients reported in column 2 increase significantly. The results show a 29.1 percent increase in earnings for an additional year in primary education, a 91.4 percent increase for secondary schooling, and a 151.7 percent increase for tertiary education. All these increases are related to the income of individuals with no education. A significant, positive relationship exists between age and earnings, suggesting that income increases with experience. However, a non-linear effect of age is present, meaning that an individual's earnings tend to reduce at higher age values, in the later years of one's career. Thus, the positive impact of experience may eventually decrease. These results are consistent with Mincer's (1974) human capital theory, which posits that labour-market earnings tend to increase rapidly in the early years of employment, then flatten over time, and decrease slightly in the later years.

Table 2 also shows a significant earnings gap between whites, Asians/Indians, and coloured, with Africans as the reference group. The results show that being white has a positive effect of 90.3 percent on earnings, compared to being African American. A 53.5 percent and a 0.143 percent positive effect on earnings were noted for Asians/Indians and coloured individuals, respectively, compared to Africans. This race gap increases once heterogeneity is accounted for in the random effect estimation (column 2). This racial gap implies that the South African labour market still has a sizeable discrimination component across all races, to the disadvantage of blacks and coloureds who tend to earn less. The gender gap is less pronounced when accounting for

heterogeneity; nevertheless, being a female has a negative impact on earnings relative to being male. The results show that working in a private household has a negative impact on individual earnings.

Table 3:
Hypothesis Testing For Instrumental Variables

	Education
Endogeneity test of endogenous regressors:	271.207
Chi-square(3) P-val =	0.0000
Regressors tested: 1.education 2.education 3.education	
Under-identification test (LM statistic):	13.158
Chi-square(6) P-val =	0.0219
Weak identification test (F statistic):	1.870
Stock-Yogo weak ID test critical values:	
5percent maximal IV relative bias	13.95
10percent maximal IV relative bias	8.50
20percent maximal IV relative bias	5.56
30percent maximal IV relative bias	4.44
Sargan statistic (overidentification test):	12.186
Chi-square(5) P-val =	0.0160
Instrumented: 1.education 2.education 3.education	
Included instruments: age agesquared 2.gender 2.employmentsector 3.employmentsector 4.employmentsector	
5.employmentsector 6.employmentsector 7.employmentsector 8.employmentsector 9.employmentsector	
Excluded instruments: mother'seducation father'seducation 2.race 3.race 4.race 2.geography 3.geography	

Source: Author's Computation, 2025.

Table 3 reports the results of the endogeneity test. The p-value is 0.000, rejecting the null hypothesis of exogeneity. This means that the education variables are exogenous; hence, an individual's level of education can be instrumentalised based on parental education. The under-identification Lagrange multiplier (LM) test indicates that the regressors are not under-identified; the p-value is 0.0219, which is less than 0.05. Hence, the null hypothesis of a weak instrument is rejected, indicating that the instruments are robust.

After controlling key variables, IV 2SLS estimation results are reported. As shown in Table 4, the RE model performed better. The coefficient related to each education level is explained as an increase in earnings between individuals with no education and those with the education levels considered in this study. Primary, secondary, and tertiary education variables have a significant, positive effect on earnings. An additional year of tertiary education yields greater returns, followed by primary and secondary schooling, respectively. A clear difference in the average monthly earnings exists across education levels. Individuals with tertiary education earn, on average, 573 percent more for each additional year of study than those without tertiary education. An average of 218.2 percent applies to individuals with primary education, against a 211.9 percent for those with secondary education.

High returns to tertiary education imply a scarce supply of and an increasing demand for higher skills in South Africa. If the increase in the supply of better-educated individuals is slower than the related demand, returns to tertiary education are likely to be higher. Consequently, a high return in primary education implies a continued need for basic skills. Low returns for secondary schooling indicate an increasing demand for skills, prompting students with secondary education to pursue further tertiary education. In terms of other control variables, being a female has a significant negative effect on earnings. The results suggest that females earn 65.8 percent less, relative to males. This distinction could be because of the labour-market discrimination against

women, on the premise that they would not last long in the labour force due to family responsibilities. Thus, the labour market might be biased in favour of men, even if women are as committed to their careers as men are. As expected, age has a positive effect on earnings. Indeed, a non-linear effect of age on earnings is evident, although insignificant. The employment industry has no significant impact on earnings, except for being employed in the community, which has a significant negative effect at 10percent.

Table 4:
IV 2SLS Regression Results (Mother's And Father's Education)

VARIABLES	(1) POLS	(2) RE
Primary	2.138* (1.124)	2.182* (1.208)
Secondary	2.507*** (0.798)	2.119** (0.876)
Tertiary	5.656*** (0.753)	5.730*** (0.810)
Age	0.062** (0.026)	0.053* (0.028)
Agesquared	-0.000 (0.000.)	-0.000 (0.000)
Female	-0.643*** (0.089)	-0.658*** (0.096)
Private Households	-0.204 (0.171)	-0.125 (0.189)
Mining and Quarrying	0.339 (0.281)	0.387 (0.305)
Manufacturing	-0.106 (0.235)	0.063 (0.265)
Construction	-0.384 (0.248)	-0.306 (0.271)
Wholesale and Retail Trade	-0.142 (0.246)	-0.009 (0.272)
Transport	-0.170 (0.351)	0.0762 (0.385)
Financial Intermediation	-0.229 (0.270)	-0.352 (0.279)
Community	-0.504** (0.254)	-0.455* (0.275)
Constant	3.532*** (0.801)	3.856*** (0.885)
R-squared	0.167	
Observations	1,198	1,198

Standard errors in parentheses. ***, ** and * indicate significant *p*-value at 1percent, 5percent and 10percent levels respectively. POLS, Pooled ordinary least squares; RE, Random effect.

The results of the IV estimates imply that treating education levels as endogenous increases the estimated returns. This increase may reflect the attenuation bias caused by measurement errors in the estimates, which treated educational variables as exogenous. Card (1999) suggests another explanation according to which the returns to education are heterogeneously distributed across the population. Therefore, IV estimates may capture the marginal responses for those whose family background changes have a substantial impact on their academic performance. This means that an IV estimator using parental education as an exogenous instrument may yield estimates that exceed the corresponding OLS estimates.

Observing higher returns to primary education is contrary to Psacharopoulos and Patrinos's (2004) expectation of decreasing returns to education in developing countries. In line with the study by Montenegro and Patrinos (2013), the evidence from the present research indicates that returns are highest for tertiary education. The results also support the findings of Schultz (2004) and Kuepie et al. (2009), which suggest that returns are elevated at high levels of education.

Robustness Test

The following analysis is conducted to examine further the robustness of the IV estimates of the returns to education. Table 5 presents the results of the estimates using the quarter of birth as an instrumental variable. It is revealed that the effects of the main estimates correspond with those based on mothers' and fathers' education as the primary instruments. However, no evidence of the significant effect of primary schooling on earnings was found. Moreover, the estimates of education from the quarter-of-birth IV are higher. Contrary to the previous IV results, these findings indicate that secondary education has the greatest impact on earnings. These results also contradict Montenegro and Patrinos's (2013) conclusion, which estimated that secondary education produces the lowest returns to education.

The differences in these estimates may be because the quarter of birth may be correlated with unobserved ability variations, suggesting that seasonal differences may not be attributed to differences in individuals' earnings. Therefore, the quarter-of-birth IV estimates may be biased.

Table 5:
Robustness check (Quarter-of-birth)

VARIABLES	(1) POLS	(2) RE
Primary	7.426*** (1.423)	2.324 (2.161)
Secondary	4.914*** (0.768)	6.206*** (1.524)
Tertiary	9.800*** (1.026)	6.143*** (1.452)
Age	-0.063*** (0.020)	0.140*** (0.043)
Agesquared	0.0010*** (0.0002)	-0.0006** (0.0003)
Female	-0.449*** (0.045)	-0.434*** (0.057)

Private Households	-0.232*	-0.303***
	(0.122)	(0.053)
Mining and Quarrying	0.286*	0.316***
	(0.155)	(0.089)
Manufacturing	0.041	-0.048
	(0.149)	(0.056)
Construction	-0.157	-0.072
	(0.125)	(0.053)
Wholesale and Retail Trade	-0.064	-0.106
	(0.151)	(0.071)
Transport	0.133	-0.084
	(0.174)	(0.069)
Financial Intermediation	-0.640***	-0.063
	(0.149)	(0.057)
Community	-0.914***	-0.197***
	(0.140)	(0.055)
Constant	3.080***	-1.084
	(0.702)	(1.778)
R-squared	-3.287	
Observations	13,349	13,349

Standard errors in parentheses. ***, ** and * indicate significant p -value at 1percent, 5percent and 10percent levels respectively. POLS, Pooled ordinary least squares; RE, Random effect.

In short, the empirical analysis based on the 2SLS method reveals that tertiary education has the highest effect on the earnings outcome, followed by primary and secondary education, respectively. These results are consistent with those of Montenegro and Patrinos (2013), who found that tertiary education yields the highest returns to education, while secondary schooling generates the lowest returns in developing countries. Salisbury (2016) also found that, in South Africa, tertiary education produces the highest returns. Females earn less in relation to their male counterparts. Furthermore, a significant difference in earnings exists among the racial groups, with Africans earning the least in relation to the other racial groups.

5.0 Conclusion

This study has investigated the impact of education on earnings. The focus was on measuring the impact of returns to different levels of education on individuals' earnings in the South African labour market. To achieve this, the educational variables were disaggregated into primary, secondary, and tertiary education. This helped estimate the returns to each level of education, thereby accounting for and assessing the quality of each group. This study utilised the panel data constructed from the five waves of the NIDS. The endogeneity of the educational variables was controlled by using parental education. The main finding of this study is consistent with the existing literature's indication that returns are higher at higher levels of education.

The findings of the current study suggest that, generally, education has a significantly positive impact on the earnings of South African labour. The results show that, on average, individuals with tertiary education earn 573 percent more for each additional year of education than those without education. The respective percentages for individuals with primary education and those with secondary education are 218.2 and 211.9. The findings also suggest an upward estimate of educational returns, once the endogeneity of schooling variables is considered. Furthermore, the evidence suggests that returns to education are the highest at the tertiary level, followed by

primary and secondary levels, respectively. When considering gender, the effect of South African females on possible earnings outcomes in the labour market is less significant than that of males.

A key contribution of this study is its provision of evidence on the significant effects of education on individuals' earnings at various levels of educational attainment. Measuring the returns to education by level, rather than just average years, is essential to enhancing the quality of each level of educational attainment. Moreover, the observed higher returns to tertiary education contradict the hypothesis of the concave return function. This hypothesis stipulates that, returns are decreasing across all developing countries, and that they are highest at primary level and lowest at tertiary level. This implies that policymakers must redirect educational funds and reassess primary concerns to improve future prospects.

The policy implications of this study are the imperative to achieve more equitable access to higher education across all socio-economic groups and to improve the observed differences in earnings. Inequality in education is likely to lead to earnings inequality. Education policies can help enrol individuals in higher education, especially for the African racial group, until sufficiently high returns are achieved. This would encourage these individuals to continue to invest in furthering their education. Such policies could aid in poverty reduction and the subsequent elimination of persistent inequality in South Africa.

Regarding data availability, the limitation of this study is that the focus was exclusively on formal education and formal employment. The experimental setup could not account for potential variations in the quality of education between urban and rural areas, and across regions. Therefore, future research might extend this study by analysing the extent to which the existence of multi-level characteristics influences the education-earnings relationship.

Theoretical and Policy Implications

The findings reinforce human capital theory by confirming that higher educational attainment yields substantially greater earnings, with tertiary education producing the highest returns. This supports models emphasising productivity-enhancing effects of advanced skills and the heterogeneous nature of returns across demographic groups. The pronounced gender and racial disparities highlight persistent structural inequalities not fully explained by human capital alone. Policy-wise, the results call for expanding equitable access to tertiary education, especially for disadvantaged groups, while strengthening basic education to improve progression rates. Targeted funding, anti-discrimination enforcement, and labour market reforms are essential to reducing wage inequality and ensuring education translates into inclusive economic mobility.

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