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T. ZWANE, PhD in Economics
University of Johannesburg, Republic of South Africa
524, South African Republic, Johannesburg, Gauteng, 2006, Auckland Park
E-mail: ttzwane@uj.ac.za
ORCID 0000-0003-4039-9944

THE CAUSAL EFFECT OF EDUCATION ON EARNINGS IN URBAN AND RURAL SOUTH AFRICA: A FURTHER UPDATE

Providing the nation with education is primarily an important task of the government social policy, which is fixed in section 29 of the Bill of Rights of the South African Constitution, which explicitly states that everybody has the right to a basic education as well as adult basic education. Since the establishment of the democratic rule in 1994, the South African government has made significant efforts to mitigate the education inequalities promulgated during the apartheid era. The South African government considers education as a major tool of redressing the injustices created by the institutionalised policies of apartheid, which formed a discriminatory and fragmented education system in the country. Using its institutionalised policies, the apartheid system forced the African populace into homelands and/or rural areas where they were prevented from obtaining the quality of education, which might lead them to aspire to positions they wouldn't be permitted to hold in society. Given this unfortunate condition, previous studies investigating the relationship between education and earning have not estimated separately and compared the returns to education for the full sample (South Africa) and subsamples based on urban and rural areas. This is very important, as these areas are structurally very different, with different characteristics. Thus, it is likely that the returns to education in these areas would differ, given the influence of the institutionalised policies of apartheid. Related to this point is the fact that the statistical inference of many of the earlier studies relied profoundly on cross-sectional data implementing a standard ordinary least-squares model, without controlling for endogeneity bias. The purpose of this article is to reexamine the level of earnings and education in the South African labour market using all the five waves of the newly available National Income Dynamics data set observed in biennial waves over the 2008–2017 period. Based on the available literature, this article reviews information on the aggregate indicators of the Republic of South Africa and the indicators of cities and rural areas separately. Fixed effects and two-stage least-squares estimators are applied. The fixed effects estimator is applied to mitigate against possible heterogeneity of the cross-sectional unit. The two-stage least-squares estimator

is used to address possible endogeneity bias due to reverse causation between earnings and education. After controlling for endogeneity, we found that an additional year of education increased an individual's earnings by 37.8 % in the full sample. Interestingly, the coefficient of education was found to be positive and statistically significant in both samples (urban and rural), reinforcing the results of the full sample. However, despite the coefficient of years of education being similar in direction (positively associated to earnings) across all samples, our results show that the education impact on individual earnings was higher in absolute values in urban areas. Thus, the 44.4 % increase of returns to education in the urban subsample was significantly higher than the increase of 33 % observed for the rural subsample. These results were to be expected, given the fact that South Africa is still battling the impact of the institutionalised policies of apartheid. In addition, we found that household size, head of household's age and whether the head of household was married were important factors positively influencing earnings in both territorial subsamples. The policy implications derived from our empirical results suggest that the government should invest more heavily in academic infrastructure, particularly in rural areas where the poor live, so as to improve the educational attainment in those areas.

Keywords: *endogeneity; returns to education, urban sample, rural sample, Republic of South Africa.*

Formulation of the problem. With roots in the writings of classical economists (see for instance, Smith, 1776; Marshall, 1890), analysis of the impact of education on earnings has only recently emerged. Formal modelling did not take place until much more recently (Schultz, 1960; Becker, 1964; Mincer 1974; Chiswick, 2003). The returns to education are generally important since they display the effect of education on labour market earnings (Becker, 1964). The basic idea advanced in the literature is that an increase in years of education results in an immediate increase in labour earnings (Becker, 1964; Mincer 1974; Chiswick, 2003; Mocan, 2014). Since the beginning of 1990, a large number of African countries have invested more heavily in education, in an attempt to escape the poverty curse that has characterised much of Africa since colonial times.

But in South Africa, the temptation to begin any analysis of education from a historical perspective is real, in the context of a history of past policies of disenfranchisement that championed the interests of a particular race at the expense of another. The institutionalised policies of apartheid meant that blacks in particular were given inferior education, were kept out of skilled work, and were often confined to Bantustans, which were densely populated, and had limited economic opportunities and inadequate state services (May & Norton, 1997). Years of segregation and denial of access to quality education and decent employment opportunities created an underclass of unemployed individuals who experience numerous forms of poverty (May & Norton, 1997; Zwane et al., 2016). Thus, apartheid policies led to the formation of a poor, primarily rural, African populace that was highly dependent on the sale of its cheap labour (ANC, 1994).

The apartheid system left legacies that are still visible today, over 20 years after independence. So deeply entrenched are the legacies of apartheid that, despite unremitting intervention to ameliorate the economic conditions of previ-

ously disadvantaged sections of our society by the post-apartheid state, poverty has continued unabated. Today, South Africa remains a country where poverty, unemployment and inequality are prominent, and seem to be worsening for the black section of society, especially those residing in rural areas (Ashley & Maxwell, 2001). Quoting from Ashley and Maxwell (2001: 395), "[p]overty is not only widespread in rural areas [where Africans live], but most poverty is rural, at least for now".

Since the inception of democratic rule in 1994, the South African government has made significant efforts to mitigate the education inequalities promulgated during the apartheid era (Letseka, 2014). The government considers education a major engine of growth and development. While there have been studies that empirically investigated the earnings — education nexus in South Africa (see for example, Bhorat, 2000; Keswell & Poswell, 2004; Ntuli, 2007; Burger & Jafta, 2006; Burger, 2011; Burger & Van der Berg, 2011; Lam et al., 2011; Branson et al., 2013; Biyase & Zwane, 2015; Salisbury, 2016), these studies have mainly focused on the differentials in the returns to education by race and gender, as well as the shape of the returns-to-education schedule.

The aim of the study and innovation character. Notwithstanding various studies conducted in South Africa on this topic, there are still serious gaps in the literature. Thus, there are no known studies that have estimated separately and compared the returns to education for the full sample (South Africa) and subsamples based on urban and rural areas. This is very important as these areas are structurally very different, with different characteristics. Thus, it is likely that the returns to education in these areas would differ, given the historical background of South Africa. Moreover, the statistical inference of many of the earlier studies relied profoundly on cross-sectional data implementing a standard ordinary least-squares (OLS) model. For many reasons, an OLS estimator of the impact of education on earnings cannot ascertain causality (for example, well-educated individuals might have higher earnings due to greater ability). If this reason holds, then education might be related to unobserved ability and this might render any causal effect between education and earnings spurious (see also Li et al., 2011). The lack of interest in accounting for endogeneity by many scholars might have been because long-running national representative panel data has only recently become available. The only known study that has employed panel data has done so only at a provincial level Lam et al. (2011), while the study by Biyase and Zwane (2015) was based on a shorter panel (only on three waves of the NIDS data set).

The purpose of this study is to revisit the association between education and earnings in South Africa using a longer panel; that is, all the five waves from the NIDS data set observed in biennial waves over the period 2008-2017. This study contributes and improves upon the existing South African literature in two-fold. Firstly,we employed various panel data estimation techniques to present

more robust results, and mitigated against possible bias resulting from problems such as unobserved individual heterogeneity and endogeneity that might have impacted earlier empirical work. Secondly, we disaggregated the panel nature of NIDS into a full sample (South Africa) and two sub-samples (urban and rural), assuming that the full sample might be concealing a lot of variation in the data set. The next section describes the data and our empirical strategy. The third section discusses a review of the literature relating to this topic. Our results are presented in section 4, and the final section provides concluding remarks.

Data and empirical methodology. The data used in this paper comes from the newly-available panel data set named the National Income Dynamics Study observed over the period 2008-2017 in biennial waves. The NIDS data set was conducted by the Southern African Labour and Development Research Unit (SALDRU), based at the University of Cape Town's School of Economics (see, for example, SALDRU, 2016). The NIDS began in 2008 with over 28 000 individuals in 7 300 households across South Africa (Finn & Leibbrandt, 2017). In wave two, conducted in 2010 / 2011, the survey successfully interviewed 6 787 households, with a total of 28 551 people successfully completing the interviews (Nwosu & Woolard, 2017). In wave three, a total of 8 040 households were successfully interviewed, with an overall total of 32 633 people successfully completing the interviews (Yu, 2012). Wave four of the NIDS data set was collected in 2014 / 2015 (SALDRU, 2016; Finn & Leibbrandt, 2017), when about 128 interviewers were deployed in the field by the NIDS from October 2014 to August 2015 (SALDRU, 2016). They successfully interviewed 37 396 individuals (SALDRU, 2016). The most recent wave of interviews, wave five of the NIDS data set, was conducted in 2017.

The principal aim of the NIDS is to gain a deeper understanding of individuals who are getting ahead and those who are falling behind in South Africa (Yu, 2012). The NIDS data set contains a wide-ranging set of variables (for example, education, household earnings, age, household size, race dummies, province dummies and so forth). Table 1 presents a list of the variables used in this study.

Directed by empirical literature in this field (see for example, Mincer, 1974; Psacharopoulos, 1994; Psacharopoulos & Patrinos, 2018), we employed the Mincerian earnings function. The method was based on the human capital theory, which put forward the notion that investment in schooling improves employees' skills, leading to increased productivity and, hence, higher earnings (Mincer, 1974). In the literature, a number of studies have estimated the causal association between earnings and education, using a standard OLS to data of a cross-sectional nature (Li, 2003; Keswell & Poswell, 2004; Asadullah, 2006; Li et al., 2011; Gunawan, 2012; Wang & Wu, 2018). However, empirical works in education economics suggest that the standard OLS estimates of the return to education can be biased due to endogeneity of education and heterogeneity of cross-sectional unit (Asadullah, 2006; Pietro & Pedace, 2008). Endogeneity may arise due to an

individual's optimal schooling choices, measurement error and omitted variables (Pietro & Pedace, 2008).

To mitigate against the well-known limitations of cross-sectional data and the standard OLS model, we used panel data and panel data models (fixed effects and random effects). The random effects model is used if individual specific effects are assumed to be uncorrelated with the error term (Baltagi et al., 2003). The fixed effects model eases this assumption and permits individual specific effects and the error term to be correlated (Angrist & Pischke, 2009). We performed the Hausman test to choose the most appropriate model, fixed effects or random effects, consistent with the literature (Angrist & Pischke, 2009). The results of the test presented in table 2 favours the fixed-effects model. We specified the fixed effect estimator as follows:

$$\text{Inwage}_{it} = \beta_0 + \beta_1 \text{education}_{it} + \beta_2 \text{age}_{it} + \beta_3 \text{age squared}_{it} + \beta_4 X_{it} + X\,\varphi_{it} + \varepsilon_{it}. \quad (1)$$

To account for endogeneity bias, we then used the lagged value of education in a 2SLS framework as follows:

$$\text{Inwage}_{it} = \beta_0 + \beta_1 \text{education}_{it-1} + \beta_2 \text{age}_{it} + \beta_3 \text{age squared}_{it} + \beta_4 X_{it} + \varepsilon_{it}. \quad (2)$$

Where Inwage_{it} denotes the natural logarithm of earnings of individual *i* at period *t*, while ε_{it} is the white noise error term. According to Mincer (1974), earnings are explained by the amount of human capital, which is largely captured by education and experience. So education_{it} represents years of schooling. We followed Polachek (2007) and used age_{it} and age squared_{it} to proxy for post-education and labour market experience. The subscript X_{it} represents the vector of observed individual characteristics (see Table 1). In model 1, we also captured φ_{it} individual specific time-invariant unobservable to account for heterogeneity.

However, the fixed effects esimator is regrettably not without some limitations. Perhaps a major limitation of the fixed effects estimator for this study is that it does not address the joint endogeneity of earnings and education (i.e., earnings might determine education attainment). So, to prove conclusively that the estimated relationship between education and wages is causal, we utilised an instrumental variables regression approach in the context of a 2SLS (IV-2SLS). In order to use this approach, we needed at least one valid instrument (for example, a variable that is related to education, but does not have an effect on earnings). Though it is often challenging to get truly exogenous instruments, we follow many prominent scholars in this field (De Gregorio & Lee, 2002; Leyaro et al., 2010; Biyase & Zwane, 2015), and used the lagged value of education as an instrument in a 2SLS framework (see model 2).

Analysis of recent studies and publications. The relationship between earnings and education attainment in developed countries has attracted considerable interest in the literature (see for example, Sapelli, 2003; Ashenfelter & Krueger, 1994; Becker 1964; Card & Krueger, 1992; Duflo, 2001; Psacharopoulos

& Patrinos, 2004; Oreopoulos, 2006; Schultz, 1961). However, fewer studies have been conducted in developing countries (see for instance, Case & Yogo, 1999; Schultz, 2004; Keswell & Poswell, 2004; Kuepie et al., 2009; Casale & Posel, 2011; Salisbury, 2016). The majority of these studies presented aggregate findings without completely allowing for country-specific effects that might affect the influence of education (Biyase & Zwane, 2015).

Moreover, the statistical inferences of many of these studies relied on a cross-sectional data set, which has some major drawbacks (such as a failure to mitigate against the possible heterogeneity of cross-sectional unit and endogeneity bias) compared to panel data. The theoretical basis of studies in this field is largely rooted within the framework of the human capital theory advanced in his seminal work by Mincer (1974). Within this framework, education is understood as a measure of human capital accumulation (Becker, 1964). The human capital theory expressed the notion that individuals acquire skills and knowledge to in-

Table 1. **Description of variables used in the empirical analysis**

Explanatory variables and description	
WC	Province: Western Cape dummy variable (1 = yes, 0 = no)
EC	Province: Eastern Cape dummy variable (1 = yes, 0 = no)
NC	Province: Northern Cape dummy variable (1 = yes, 0 = no)
FS	Province: Free State dummy variable (1 = yes, 0 = no)
KZN	Province: Kwazulu-Natal dummy variable (1 = yes, 0 = no)
NW	Province: North West dummy variable (1 = yes, 0 = no)
GAU	Province: Gauteng dummy variable (1 = yes, 0 = no)
MPU	Province: Mpumalanga dummy variable (1 = yes, 0 = no)
LIM	Province: Limpopo dummy variable (1 = yes, 0 = no)
Urban	Area type: urban dummy variable (1 = yes, 0 = no)
Rural	Area type: rural dummy variable (1 = yes, 0 = no)
Wages	Earnings of individual householeld
Married	Marital status of the head of household (married =yes 1, 0 = no)
Gender	Gender: female dummy variable (1 = yes, 0 = no)
Age	Age in years of head of household
Age squ.	Age in years of household squared
Education	Education of the head of household (years of education)
Primary	Education: primary education dummy variable (1 = yes, 0 = no)
Secondary	Education: secondary education dummy variable (1 = yes, 0 = no)
Matric	Education: matric dummy variable (1 = yes, 0 = no)
Tertiary	Education: tertiary dummy variable (1 = yes, 0 = no)
Mar status	Married or living with a partner: (1 = yes, 0 = otherwise)
Fam. size	Total number of individuals in the household

Source: author's computation.

crease their value in labour market (Becker, 1964). The theory postulated that income from labour is a function of training, education and experience (Djomo & Sikod, 2012). According to this theory, education increases productivity and the higher the productivity, the higher the wages (Becker, 1964; Mincer, 1974). The theory views education as an investment, like any other financial investment, and whether people invest in human capital depends on whether the investment is profitable, which in turn depends on cost and expected returns (Djomo & Sikod, 2012; Gillies, 2017).

Following studies that have been conducted in developed countries, Shields and Shields (2009) estimated external returns to education in the United States of America using an explicit production function of the form suggested by Lucas. Shields and Shields (2009) merged individual USA data with aggregate data by state for the USA. The results strongly suggested that the level of education has a positive external benefit on production (Shields & Shields, 2009).

Arrazola and Hevia (2006) investigated the differences in returns to education between men and women in Spain. After controlling for the biases appearing in the least squares estimation of the basic Mincerian equation, Arrazola and Hevia (2006) showed that the returns for women were greater than those for men in Spain. The results further showed that the gender differential increased when accounting for the endogeneity of the education and the selection bias, and appears to be especially important for vocational and university studies (Arrazola & Hevia 2006). Angrist and Krueger (1991) used the quarter year of birth (ie, quarter 2 of 1998) as an instrument for education and adopted the framework of the human capital theory. The results showed that, on average, one additional year of education increased the wages of individuals by 7.5% (Angrist & Krueger, 1991). Taking advantage of a change in the legal school-leaving age in the United Kingdom, Oreopoulos (2006) compared his estimates of the returns to education to the average local treatment effect obtained from Canada and the United States of America. Oreopoulos (2006) reported an increase in returns of 10-14% per year. The author concluded that his findings were in line with the results observed in previous studies.

When applying twins as instrument, Ashenfeiter and Rouse (1998) reported that an additional year of education showed a 9 % increase in wages for those twins. In a related study, Bonjour et al. (2003) examined a set of identical twins from the United Kingdom. The empirical finding showed that the returns to education for women was 7.7 % per year of schooling (Ashenfeiter & Rouse, 1998). These authors failed to provide concrete reasons why one twin achieved more education than the other, while coming from the same genetics and upbringing (Ashenfeiter & Rouse, 1998). Pietro and Pedace (2008) examined the returns to education in Argentina from 1995 to 2003. They used various estimation models in an effort to address sample selection bias emanating from endogenous labour force participation and to control for the endogeneity of education. As in

several other studies, Pietro and Pedace (2008) reported that the IV estimates of the rate of return to education were significantly higher than the corresponding OLS estimates. In their concluding remarks, Pietro and Pedace (2008) argued that, while the estimates associated with these techniques revealed some different intertemporal pattern, returns to education decreased between 1996 and 1999, and increased between 1999 and 2002.

Among the studies that investigate the effect of education on earnings in developing countries, is that of Salisbury (2016), who estimated both private and social returns to schooling in the post-apartheid South Africa. The aim was to establish whether the returns for black and coloured South Africans have improved since the initial 1990s post-apartheid era. Salisbury (2016) found a significant improvement in the returns to education for both groups compared to the apartheid era. The author's findings suggest that the white section of the population still has higher returns to education when compared to black and coloured South Africans.

Fryer and Vencatachellum (2005) examined the returns to education for black South African women in the Machibisa township of KwaZulu-Natal. The authors controlled for labour-specific factors and found that primary education was not a reliable predictor of employment status, that the returns to education were 0.30 % for the first two years of secondary school education, and that secondary school graduates were more likely to find employment in the government sector than in any other sector (Fryer & Vencatachellum, 2005).

A study by Keswell and Poswell (2004) applied three data sets to estimate returns to education in South Africa, namely the Project for Statistics Living Standards and Development 1993, the 1995 and 1997 October Household Surveys, and the September 2000 Labour Force Survey data. The authors reported that there was a strong convex association between education and wages in South Africa, conflicting with the conventional human capital theory. Their results suggested that the returns to education in South Africa increased with an increase in the level of education. Biyase and Zwane (2015) estimated the returns to education in South Africa using three waves of NIDS data. Using the 2SLS estimator, the authors found that the lagged value of education used as an instrument presented an unambiguously positive effect on the wages of an individual from participation in education.

Empirical analysis. Table 2 presents the preliminary quantitative results of analysing the returns to education using the fixed-effects estimator. As before, our analyses were conducted first for the full sample (South Africa) and then separately for the urban and rural areas. The results for the full sample, presented in column 2, are as expected. For example, education enters with an unambiguously positive coefficient and indicates statistically significant effects on earnings in South Africa. These estimates indicate that, as the years of education of the heads of households increase, earnings increase in the same direction, sup-

porting the study's theoretical expectation. This confirms the human capital theory that investment in education improves employees' skills, resulting in increased productivity and, hence, higher earnings (Mincer, 1974). Similar results were observed in this century by Asadullah (2006), Hongbin et al. (2012), Biyase and Zwane (2015) and Wang and Wu (2018).

The earnings–age nexus will now be briefly explained. The results show a positive correlation between these variables, which is significant at a 1 % level of significance. The empirical results imply that, as the age of the head of the household increases by one year, earnings increases in the same direction. Conversely, the results of age squared are negative and statistically significant at a 1 % level of significance. Similar results were observed for China by Hongbin et al. (2012). Marital status is another important variable in the earnings function. The results indicate that being married positively affects earning in South Africa. Likewise, household size enters with a positive and statistically significant

Table 2. **Fixed effects estimates of earnings functions, 2008-2017**

Parameter	Full sample		Urban sample		Rural sample	
	Coeff.	Std Errors	Coeff.	Std Errors	Coeff.	Std Errors
Years of education	0.0375***	(0.0069)	0.0258*	(0.0109)	0.0485***	(0.0102)
Age	0.1164***	(0.0023)	0.1127***	(0.0036)	0.1225***	(0.0031)
Age squared	–0.0002***	(0.0000)	–0.0002	(0.0004)	–0.0001***	(0.0000)
Married	0.1020***	(0.0130)	0.1274***	(0.0199)	0.0914***	(0.0196)
Household size	0.1013***	(0.0014)	0.1163***	(0.0026)	0.0917***	(0.0018)
Health status	–0.0199**	(0.0061)	–0.0245*	(0.0097)	–0.0145	(0.0089)
Urban	–0.299***	(0.0788)				
Farms	–0.2075	(0.0282)				
Eastern Cape	0.1842**	(0.0626)	0.2683*	(0.1074)	0.2748**	(0.0835)
Northern Cape	–0.0101	(0.0513)	–0.0795	(0.1032)	–0.0237	(0.0626)
Free State	0.0930	(0.0724)	0.1139	(0.1073)	0.2709*	(0.1268)
KwaZulu-Natal	0.0267	(0.0636)	–0.0655	(0.0946)	0.3859***	(0.1157)
North West	0.0619	(0.0476)	0.1124	(0.1072)	0.1064	(0.0547)
Gauteng	0.2086***	(0.0562)	0.2218*	(0.0987)	0.2714***	(0.0753)
Mpumalanga	0.1712***	(0.0370)	0.2609***	(0.0757)	0.3039***	(0.0398)
Limpopo	0.1453**	(0.0499)	0.3813***	(0.0946)	0.1406*	(0.0612)
Pool abilty test		(0.000)		(0.000)		(0.000)
Hausman test		(0.000)		(0.000)		(0.000)
Number of obs		88,293		33.040		37.738

Source: author's calculation based on NIDS 2008-2017.
Notes: *** significant at 1 %; ** significant at 5 %; *significant at 10 %.

coefficient. Interestingly, health status of the head of household is negative and significant at a 5 % level of significance. A possible interpretation of the negative coefficient of health status is that poor health might lead to poor work performance (for example, lower productivity or higher absenteeism) and ultimately lower wages.

But, the above findings should be interpreted with caution given the fact that the full sample might be concealing a lot of differences in the data set. Perhaps what is more interesting is a comparison of urban and rural samples (columns 5 and 8 of table 2). But the estimates presented here are remarkably different to each other (rural and urban) and to those reported in column 2 of table 2 (full sample). The rate of returns to education in urban areas is 2.5 %, which is remarkably smaller than the rate of 4.8% observed for the rural sample. These results are interesting in that they challenge a long standing view that seem to suggest that rural population is poor, given the historical past discussed in the introductory section of this study. These results are undeniably puzzling as they contradict those of Wodon (1999), who found that higher education had a greater effect in the urban areas of Bangladesh. Our results are also not in line with those observed by Wang and Wu (2018), who found that the returns to education in rural China was 3.7 % compared to 25.6 % in urban areas. Variables such as age, age squared, household size and whether the household head is married echo the pattern and structure of those presented in the full sample, although the impact of some of these variables differs in magnitude. Our findings are by and large similar to the work of Asadulah (2006) for Bangladesh and Wang and Wu (2018) for China.

In an attempt to ensure that our results reported in table 2 are not biased due to endogeneity problem, we estimated equation 2 pursuing a 2SLS estimator, with the lagged value of education as an instrument variable. We further executed several specification tests to establish whether the instrument pursued was indeed relevant. A test of Cragg Donald minimum eigenvalue statistic, developed by Cragg and Donald (1993), was implemented to check the weakness of the lagged value of education. The test value was compared to the critical values provided by Stock and Yogo (2005). The results of the Cragg-Donald F-test reported at the bottom of table 3 are fairly higher comparative to the Stock-Yogo test critical values. We therefore reject the concern of weak instrument. We also performed an endogeneity test to check whether to use the 2SLS estimator or whether the results of the fixed effects model would be sufficient. The results show that the 2SLS estimator was in fact the technique we needed to pursue. As before, we conducted our analysis first for the full sample (South Africa) and then separately for the urban and rural areas. Column 2 of table 3 mitigates against possible endogeneity bias.

There are some noticeable differences between the estimates from the fixed effects specification and those derived from the 2SLS estimator. The differences

are in the levels of magnitude and significance of the explanatory variables on earnings. This is to be expected, given the fact that the number of years of education is endogenously related to earnings. Therefore, the results of the 2SLS model are likely to be less prone to misspecification than the fixed effects model (Belzil, 2007; Keane, 2010). For example, the estimated results of the 2SLS estimator presented in table 3 (column 2) indicate that an additional year of education increases an individual's earnings by 37.8 %. In both the urban and the rural samples, education enters with a positive coefficient and statistical significance at 1 %. The conclusion advanced earlier also applies in this part.

However, despite the coefficient of years of education being positive across all samples, column 5 shows that the education impact on individual earnings is higher in absolute value in urban areas. Thus, the rate of returns to education in the urban subsample is 44.4 %, which is relatively higher than the rate of 33 %

Table 3. **Two stage least square estimates of earnings functions, 2008-2017**

Parameter	Full sample		Urban sample		Rural sample	
	Coeff.	Std Errors	Coeff.	Std Errors	Coeff.	Std Errors
Years of education	0.3785***	(0.0054)	0.4447***	(0.0094)	0.3304***	(0.0075)
Age	0.0002**	(0.0001)	0.0003***	(0.0000)	0.0001***	(0.0000)
Age squared	–0.0072	(0.0012)	–0.0161***	(0.0022)	0.0013	(0.0016)
Married	0.2448***	(0.0104)	0.3096***	(0.0169)	0.1698***	(0.0153)
Household size	0.0836***	(0.0012)	0.0939***	(0.0024)	0.0769***	(0.0015)
Health status	–0.0229	(0.0069)	–0.0292**	(0.0111)	–0.0209	(0.0098)
Urban	0.0456**	(0.0174)				
Farms	–0.7287	(0.0876)				
Eastern Cape	0.1862***	(0.0216)	0.0723	(0.0543)	0.4147***	(0.0325)
Northern Cape	–0.1453***	(0.0197)	–0.2273***	(0.0569)	–0.1543***	(0.0233)
Free State	0.0642**	(0.0233)	–0.0577	(0.0563)	0.1809***	(0.0365)
KwaZulu-Natal	–0.0907	(0.0248)	–0.2440	(0.0563)	0.1804***	(0.0541)
North West	–0.0754***	(0.0169)	–0.1863**	(0.0572)	–0.0197	(0.0184)
Gauteng	–0.0155	(0.0228)	–0.1736	(0.0614)	0.0302	(0.0269)
Mpumalanga	0.0750***	(0.0208)	–0.0079	(0.0538)	0.2527***	(0.0272)
Limpopo	0.0541*	(0.0221)	0.0106	(0.0584)	0.0613*	(0.0271)
Cragg-Donald Wald F stat		958.339		476.319		466.329
Number of obs		61.500		24.620		29.188

Source: author's calculation based on NIDS 2008-2017.
Notes: *** significant at 1 %; ** significant at 5 %; *significant at 10 %.

observed for the rural subsample, disputing the results of the fixed effect model. These results are to be expected, given the fact that South Africa is still battling the impact of the institutionalised policies of apartheid. In their recent work, Biyase and Zwane (2018: 126) observed that majority of South African rural schools (or traditional areas) areas, "struggle with serious challenges, including the lack of classrooms, lack of qualified teachers, poor access to basic services such as water and electricity, no landline telephones and hence no internet, very few public or school libraries and so on". As a result, a large number of rural populace continue to be under-educated as these localities suffer access to a well-established academic infrastructure. Emerging strands of South African literature (Gardiner, 2008; Biyase & Zwane, 2018) argues that such problems are embedded in the socio-economic indicators (i.e. poverty and unemployment), and they also have a firm impact on the quality of education that is available to pupils. These results reinforce those of Wodon (1999) for Bangladesh and Wang and Wu (2018) for the rural and urban China.

As regards the impact of some explanatory variables on earnings, the 2SLS results seem to be comparable to the findings from the fixed effects model. Specifically, coefficients for household size and whether the head of household is married are an important factor influencing earnings — enters positively and significantly in both samples. The results of the 2SLS indicate that, while age squared has the predicted sign in both samples, the effect is statistically insignificant in the the full and rural samples respective, a finding that was not observed in the fixed effects model. Another puzzling result that has turned insignificant in the full and rural samples is the health status of the household, suggesting that health status does not matter in these samples. There was improvement in the level of significance for some provincial dummies.

Conclusions. In the literature on the relationship between earnings and education, the dominant conjecture is that education improves employees' skills, thus increasing their productivity and, in turn, their earnings (Mincer, 1974). The aim of this paper was to contribute to the existing literature and adding important value to this field by estimating returns to education in South Africa employing panel data models and a representative NIDS data set (for the period 2008-2017). The returns to education were estimated separately for the full sample and sub-samples based on the rural and urban areas.

The results of the 2SLS estimator, which mitigate against possible endogeneity bias, presented in table 3 (column 2) showed that an additional year of education increases an individual's earnings by 37.8 %. Interestingly, the coefficient of education was found to be positive and statistically significant in both samples (urban and rural), reinforcing the results of the full sample. However, despite the coefficient of years of education being positive across all samples, column 5 showed that the education impact on individual earnings, is higher in absolute values in urban areas. Thus, the 44.4 % rate of returns to education in the urban

subsample was significantly higher than the rate of 33 % observed for the rural subsample. The coefficients of age and age squared were positive and negative respectively, supporting our expectations.

Returns to education is an effective gauge for scholars and policy makers to understand the changing role of education. So, understanding the returns to education between urban and rural areas provides policy makers with some ideas on where they should focus in terms of education policy. Given that the returns to education are higher in urban areas than in rural areas, the state should to create more opportunities for individuals residing in rural areas to access better quality education. A quote from Nelson Mandela Foundation, (2005:139) cited in Gardiner (2008) clearly sums up the policy implications derived from our results. "A powerful rationale for rural education and a robust political constituency to argue for it are now required. Such a rationale can be provided: it is one that sees education as being able to play a role in rural development alongside and integrated with other social policies aimed at addressing inequality and poverty".

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Т. Званє, PhD (Econ.)
Університет Йоханнесбурга, Південно-Африканська Республіка
524, Південно-Африканська Республіка, Йоханнесбург, Гаутенг, 2006, Окленд Парк
E-mail: ttzwane@uj.ac.za
ORCID 0000-0003-4039-9944

ВПЛИВ ОСВІТИ НА ЗАРОБІТКИ У МІСТАХ І СІЛЬСЬКИХ РАЙОНАХ ПІВДЕННОЇ АФРИКИ: ПОДАЛЬШЕ ОНОВЛЕННЯ

Забезпечення нації освітою є важливим завданням урядової соціальної політики, яка закріплена у розділі 29 Білля про права у Конституції Південно-Африканської Республіки, де прямо зазначено, що кожен має право на базову освіту, а також на базову освіту для дорослих. З моменту встановлення демократичного правління в 1994 році уряд ПАР доклав значних зусиль для зменшення нерівностей в освіті, що існували за часів апартеїду. Уряд ПАР розглядає освіту як головний інструмент усунення несправедливості, створеної інституціоналізованою політикою апартеїду, яка сформувала дискримінаційну та фрагментарну систему освіти в країні. Система апартеїду змусила африканське населення переселитися в сільські райони, де практично неможливо здобути якісну освіту. Попередні дослідження взаємозв'язку між освітою та заробітком не оцінювали його окремо у міській та сільській місцевості. Це важливо, оскільки ці області мають істотно відмінні структурні характеристики. Імовірно, що і вплив освіти у містах і сільській місцевості буде різним. З цим пов'язаний той факт, що статистичні висновки багатьох попередніх досліджень ґрунтувалися на даних поперечного перерізу, реалізуючи стандартну звичайну модель найменших квадратів і не контролюючи зміщення ендогенності. Метою цієї статті є перегляд рівня заробітку та освіти на ринку праці у ПАР з урахуванням усіх п'яти хвиль нещодавно доступного набору даних про національну динаміку доходів, визначену за дворічними періодами протягом 2008—2017 років. На підставі огляду наявної літератури у цій статті проаналізовано сукупні показники ПАР і показники міст та сільської місцевості окремо. Застосовано оцінювання фіксованих ефектів та двоступеневий метод оцінювання за принципом найменших квадратів. Оцінювання фіксованих ефектів використано для згладжування можливої неоднорідності поперечного перерізу. Двоступеневе оцінювання за принципом найменших квадратів — для виявлення можливих зміщень ендогенності через зворотну причину між заробітком та освітою. Дослідивши ендогенність ми з'ясували, що додатковий рік навчання збільшив заробіток особи на 37,8 % у повній вибірці. Цікаво, що коефіцієнт освіти виявився позитивним і статистично значущим в обох вибірках (міській та сільській), підсилюючи результати повної вибірки. Однак, незважаючи на те, що коефіцієнт років освіти позитивно пов'язаний із заробітком у всіх вибірках, наші результати показали, що вплив освіти на індивідуальний заробіток був більшим за абсолютні значення у міських районах. Таким чином, 44,4 % прибутку до освіти у містах були значно вищими за 33 %, визначені для сільської місцевості. Ці результати є очікуваними, враховуючи той факт, що ПАР все ще бореться з впливом інституціоналізованої політики апартеїду. Крім того, ми з'ясували, що розмір домогосподарств, вік голови домогосподарства та чи був голова домогосподарства одружений є важливими факторами, що впливають на прибуток у обох територіальних вибірках. Отримані емпіричні результати вказують, що уряд повинен більше інвестувати в академічну інфраструктуру, особливо в сільській місцевості, де живуть бідні, щоб покращити рівень освіти в цих районах.

Ключові слова: ендогенність, повернення до освіти, міська вибірка, сільська вибірка, Південно-Африканська Республіка.