Human Capital Investment and Economic Growth: A Test of Endogenous Growth Theory in Two Developing Countries

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Abstract: This paper evaluates the relationship between human capital investment and economic growth in two sub-Saharan African countries (Kenya and South Africa). The paper applied a quantitative approach and secondary data were collected from the World Bank economic and education indicators from 1987 to 2016 (30 years). A cross sectional panel data arrangement gave a total of 60 observations and the fixed effect panel regression was applied using the Gretl econometrics package. The paper adds a nuance to previous methods and results by adding yearly time dummy in the model. Results show that investment in human capital is positively related to economic growth in the two sub-Saharan African countries. The paper highlights the significance results from time dummies, which shows that time is of essence in empirical analysis of this relationship and that investment in education would yield positive result on economic growth with timing considerations; this indicates that a waiting attitude is essential when investing in human capital. The paper recommends that economic policy makers should, in addition to universal primary education, commit more resources to secondary and university education to increase the stock of human capital in Africa as secondary and university education produce middle and high-level human capital. Improved policy that would fortify the colleges and universities in Africa would produce and retain quality human capital in Africa to spur economic growth. It also recommends that future research should consider the inclusion of yearly dummies when analysing the relationship between human capital investment and economic growth.

Keywords: emerging economy; economic growth; women in parliament; sustainable development

JEL Classification: E24; J24; O2; O10; O11; J16

1. Introduction

Globalization of economic systems and the attendant market integration has shifted modern economic growth thought slightly forward from the classical growth thought of Adam Smith, David Ricardo and Carl Marx. Economic development

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alternatives after the neoclassical economic thought have metamorphosed to modern economic growth thought that has ushered an increasing approach of inward search for growth. Consequently, a myriad of growth models has been proffered, amongst which is the endogenous economic growth model, which has emerged not as a replacement of classical economic growth model but as a complement (Bende-Nabende, 2018; Jones, 1995; Aghion, Howitt, Howitt, Brant-Collett & García-Peñalosa, 1998; Romer, 1994; Rivera-Batiz & Romer, 1991).

Human capital occupies the crux of endogenous economic growth approach given its ability to create assortment of innovation and education is held as the key to human capital development. Accordingly, there is a preponderance of research acclaiming that human capital stock contributes a significant boost to a country's economic growth (IIASA, 2008). Therefore, improvement in education provides a necessary pre-condition to long-term economic growth; albeit numerous findings about the role of education, IIASA (2008) highlights that education might not always prove to be a sufficient condition. Given that human capital is the hall-mark of endogenous economic growth theory, many researchers have been investigating how human capital relate to economic growth and/or development; some have concentrated on a country evidence whilst others have dwelt on a cross-country evidence (Ogundari & Awokuse, 2018; Acharya & León-González, 2018; Tyndorf & Glass, 2017; Li, Loyalka, Rozelle & Wu, 2017; Barro, 2001; Benhabib & Spiegel, 1994).

Tyndorf and Glass (2017) argue that a combined creation of stock of human capital through college and university education boosts economic growth in developing countries. Other researchers have looked at the combined contribution of human capital and health on Sub-Saharan Africa economic development and found that health is more positively related to economic development in Africa than human capital (Ogundari & Awokuse, 2018). Evidence from Li, Loyalka, Rozelle & Wu (2017) show that investment in education leads to higher income across countries, and it is well known that increased income results in higher growth. Barro (2001) found that countries with higher stock of human capital experience higher economic growth; similarly, in a cross-country analysis, Benhabib & Spiegel (1994) found a positive relationship between human capital and economic development. In their study of selected countries in Asia and Africa, Acharya and León-González (2018) concluded that there is a significant relationship between remittances and economic growth which is made possible through investment in human capital.

This paper contributes to the existing literature on human capital and economic growth by examining two countries in Sub-Saharan Africa, which have not received a joint study in prior literature, which is Kenya and South Africa; it should be noted that other research in this concept has dwelt on large samples neglecting

the need to pause and narrow the investigation to smaller sample, which Hamlin (2010) indicates might increase accuracy of result. Furthermore the paper makes contribution by including the yearly dummies to accommodate future effect. The paper adds a nuance to the existing literature by focusing on investment in human capital and economic growth, which has received little attention mostly in the two selected countries. Accordingly, the question that underpins this paper is whether investment in human capital is related to economic growth in two sub-Saharan African countries, hence the research objective is to analyse the relationship between human capital investment and economic growth in the two sub-Saharan African countries. From the research findings, the paper proffers some policy recommendations for economic development in Africa and provides further research agenda.

The subsequent sections of the paper has the following structure: after this introduction, the paper presents a brief overview of endogenous growth theory, thereafter a brief review of related literature follows. Thereafter, the next section presents the methodology, results from analysis and discussions and the paper closes with a conclusion

2. Endogenous Growth Theory

In economics, the endogenous growth theory argues that economic growth is facilitated from inside the system, which flows from the processes inherently existing within the system (Zhang, 2018; Aghion et al., 1998). The crux of endogenous growth theory is found the advocacy that a nation's economic growth depends to a large extent on a nation's human capital. Furthermore, the status of development in human capital of a nation can be measured with the extent of investment in education (Lin, 2017; Jorgenson & Fraumeni, 1992). Accordingly, Jorgenson and Fraumeni (1992) highlight that a greater proportion of US post-war economic growth was influenced by investment in education. This is the reason why many countries offer free education to the extent possible, hence education is seen as an investment in human capital. The endogenous theory of growth was initiated to challenge what the originators refer to as the insufficiencies in the neoclassical growth model of Solow-Swan (Akcigit, 2017; Romer, 1994). Hence, the endogenous approach is a new theorisation that highlights the long-run growth ability of an economy that is caused by endogenous variables, which is contrary to the exogenous variables ubiquitous in the neoclassical theory of growth (Grossman & Helpman, 1994).

One of the neoclassical growth model propounded by Solo-Swan holds that at the long run, output is conditioned on two factors, which are the progress in technology and population growth (Zhang, 2018). Given that the long-run

neoclassical growth model depended on exogenous factors, it virtually connotes that government policy had little or nothing to do with growth (Romer, 1994). The quality of human capital nurtures innovation and innovation is the key to novel technology for new goods and services, which in turn is acclaimed as the engine of growth (Malamud & Zucchi, 2018). Hence the more human capital is injected into the innovative sectors of any economy, the more boost in endogenous economic growth, but this can be enhanced through standards that creates incentives for innovation (Kirilenko, Neklyudova-Khairullina, Neklyudov & Tucci, 2018). Therefore, the endogenous growth theory is not a condemnation of the neo-classical growth theory, rather it is an addition meant to strengthen the neo-classical theory by introducing the inherent endogenous variables such as human capital that spins innovation and technological progress, which is pivotal to economic growth. Through the inclusion of variables embedded within the economy (endogenous), the endogenous theorists such as Arrow, Romer and Lucas brings to fore the fact that government policy could have positive or negative impact on economic growth depending on government's choice of growth approach. This has a practical implication that economic development in developing economies may not totally be abandoned to the fate of invisible hand of a perfect market. The government has a role to play to spur momentum in their pursuit for economic growth; for instance, government policy on human capital development through investment in education has been proven to be the salient strategy for the economic growth of most developed and advanced countries (Jorgenson & Fraumeni, 1992).

The growth laden implication of human capital development through education orchestrated the World Bank's conference on equity in education held in Shanghai in 2016 (World Bank, 2016). The World Bank highlighted that education is an investment for economic growth as it empowers the beneficiaries with various skills to grow new ideas for new products, services and technology, but this requires proactive government policies to improve the quality of education in all countries of the world (World Bank, 2016). It points closely to Plato's caution about the importance of education, wherein he said: "If a man neglects education, he walks lame to the end of his life." (World Bank, 2016, p. 1). The various contribution of improved education to economic growth was also given attention by World Economic Forum (2018), where it stressed that education is a distinct future of any economy as it constitutes a critical component of human capital which drives efficiency in individual worker's output and overall productive efficiency – dovetailing in economic growth of the nation (World Bank, 2016; Grant, 2017). In their analysis of the channels through which education spurs economic growth through improved productivity, the World Economic Forum details three unique avenues by which education propels growth; education raises the combined capacity of the workforce to complete tasks quicker, secondary and

tertiary education pivots the knowledge transfer regarding new information, products and technology, education also bolsters creativity toward enhancing the country's ability to create its own new knowledge, products and new technologies (World Economic Forum, 2018). The overarching summary of endogenous growth theory is that countries that have improved stock of human capital and which continues to invest in research and development will continue to experience fast economic growth rate, this is not surprising therefore while many developing countries have been left behind the trajectory of economic growth (Articlelibrary, 2018). Based on the foregoing, this paper sought to test the efficacy of endogenous growth theory by focusing on relating human capital investment in two African economies South Africa and Kenya. The subsequent section presents the method, analysis and results.

3. Review of Related Literature

Human capital refers to the skills, knowledge and abilities (SKAs) that human resources within a country have acquired, mostly through education and training, as well as through experience. These SKAs are critical for performance within organisations and eventual economic development of the country. For any country to achieve sustainable economic growth, they need capable human resources. Therefore, countries need to invest in development of their human capital (Rehman, Tariq & Khan, 2018). Over time, several researchers have indicated that investing in human capital through education is one of the major drivers of economic growth and sustainability (Eigbiremolen & Anaduaka, 2014; Grant, 2017).

It has been argued that human capital is not only the means, but the end to economic development and must be a focal point in any country. In terms of factors of production, only humans constitute the active factor, human resources are crucial in acquiring, utilising and maintaining the other factors of production of innovativeness and productivity. As much as the natural resources of countries make a difference in the level of socio-economic development, it is the availability of quality and quantity human resources that makes the most difference between countries with high economic growth and those with low growth (Eigbiremolen & Anaduaka, 2014). A study that utilised time series data in Pakistan showed that human capital account for about 40% of the gross domestic product (GDP) (Nowak & Dahal, 2016).

Eigbiremolen and Anaduaka (2014, p. 26) stated that "clearly a country which is unable to develop the skills and knowledge of its people and to utilize them effectively in the national economy will be unable to develop anything else". It has been documented that a high education level of employees can lead to higher

organisational performance and consequently, higher economic growth rates. Employees with higher education levels know what is expected of them in the workplace, they tend to be more innovative, and innovation results in production of better goods and services that can give a country a competitive edge (Rehman et al, 2018). "No country has achieved a sustained period of economic growth without investing a substantial amount in their workforce" (Krasniq & Topxhiu, 2016, p. 2).

There are several reasons why countries need to invest in education of the human resources for sustainable economic growth. Such reasons include the fact that people with lack of or no skills will either be unemployed or be employed in low-paying jobs. Low levels of employment come with lower income that makes it difficult for such people to develop their own children resulting in a chain and cycle of poverty that is unbroken. Unemployment of people without skills may imply them requiring compensation from welfare grants thereby further burdening the economy of the country. In addition, crime rates tend to be higher in areas of high unemployment levels resulting in a bad image for the country, a feature that will further hurt the economic growth. Research has shown that unemployment levels unemployment, poverty, dependency on social grants and crime rates tend to be correlated with education level and a ricochet effect on the economy (Krasniq & Topxhiu, 2016; Nowak & Dahal, 2016).

Organisations and companies that are most successful are the ones that effectively manage their human resources, encourage their human resources to keep developing themselves while providing them with enabling continuous learning environments (Krasniq & Topxhiu, 2016). Investment in education can be through formal education as well as informal training and development programmes that can be designed in the workplace, i.e. human capital development involves education prior to entering the workplace and that acquired during the working years. In addition, investment in education should not only focus at high school and tertiary institutions but should start from early childhood (Krasniq & Topxhiu, 2016; Nowak & Dahal, 2016). It is believed that investing in not only quantity education, but also quality education, as well as emotional and intellectual stimulation from early childhood will translate into quality human capital later in life. The investment in early emotional and intellectual stimulation in particular has been associated with emotionally intelligent human resources who can make better decisions in their personal lives and in the workplace, which improves organisational productivity and eventual better economic performance. Early education should not only be through formal education, but should be through informal learning that children acquire as they interact with other people in the society within which they operate. Social skills and emotional maturity have an effect on performance in education as well as in later performance during employment. Unfortunately a society that is plagued by social ills that include high

crime rates may not be conducive for the positive development of emotionally intelligent individuals (Krasniq & Topxhiu, 2016)

There is bourgeoning empirical research on growth and human capital. Perhaps one of the most recent in the emerging research on human capital and economic growth, especially for Africa is Ogundari and Awokuse (2018), who provides a detailed empirical analysis on the effect of human capital on the growth of thirty five countries in sub-Saharan Africa. They believe that education alone is not sufficient to represent human capital, hence they combined it with health variable. They applied the SGMM method and used a panel data of balanced genre. Their empirical analysis found that the two proxies of human capital (education and health) indicates a positive relationship with growth, but emphasized that the health variable had a larger influence than education. The findings by Ogundari and Awokuse (2018) is further reinforced by a related research, which made a projection of the effect of accumulated stock of human capital on the growth of Europe, their empirical findings from Bayesian econometric and spatial method revealed that increase in the stock human capital accumulation would boost income and economic growth of Europe in the next decade (Cuaresma, Doppelhofer, Huber & Piribauer, 2018). This finding should encourage African countries to target their economic growth model by investing more resources in education to improve their stock of human capital for expedited future growth. The futuristic element implicit in Cuaresma et al. (2018) research prompted the inclusion of yearly dummy variables in this current paper to see which future year would be significant between human capital and growth. Whilst the above two research covers regional levels, Arora and Jalilian (2018) examined this concept at the sub-national level, which is somewhat scanty in the literature; they evaluated how human capital and financial development related to economic growth in twenty three states in India.

This paper purposively drops the health variable used Ogundari and Awokuse (2018) within the African context and uses the rate of investment in education combined with the yearly dummies to check if these two would impact growth. Furthermore, although big sample is normally preferred in statistics, however, this current paper also focusses on a small sample, reason being that in big samples, the units with high performing variables tend to becloud non-performing units. Previous research indicates that in some instances small sample might increase accuracy (Hamlin, 2010).

4. Methodology

Many of the previous research on endogenous growth theory and economic growth have largely adopted a quantitative approach especially those that have focused on human capital and economic growth (Ogundari & Awokuse, 2018; Acharya & León-González, 2018; Tyndorf & Glass, 2017; Li, Loyalka, Rozelle & Wu, 2017; Barro, 2001). Therefore, this paper follows prior research method by using a quantitative approach. Secondary data were collected from the World Bank economic and education indicators covering 1987 to 2016 for South Africa and Kenya. The proxy for human capital investment is the total government expenditure on education whilst GDP per capita represents economic growth. The fixed effect panel data regression was used to analyse the data with the help of Gretl econometrics package version 1.9.8.

The regression model: $\gamma = \beta_0 + \beta_1\chi_1 + d_2Yr1988\ldots..+ d_{30}Yr2016 + \varepsilon$

Where γ represents economic growth (GDP), which is the dependent variable; β_0 is the Y intercept, β_1 is the regression coefficient, χ_1 is human capital investment, which is the independent variable and ε is the error term, which represents other independent variables not used in this research. $d_2Yr1988\ldots..+ d_{30}Yr2016$ represent the time dummies; starting with year 1988 dummy shows that first year dummy 1987 has been excluded in order to circumvent perfect collinearity. d_2 to d_{30} is the 2nd and 30th year regression coefficients of the dummies to be multiplied by the year.

4.1. Results

Table 1 and Table 2 present the regression results. Following this, Tables 3 – 5 present the validity tests namely the heteroscedasticity, common intercept, significance of time dummies, autocorrelation and normality of residuals.

Table 1. Regression Result on the link between Education Expenditure and GDP Growth

Model 1. Fixed-effects, with 60 observations With 2 cross-sectional units Time-series total = 30 Dependent-variable: GDP_Pcapt				
	Coefficient	*Std. Error*	*t-ratio*	*p-value*
const	-617.749	1247.32	-0.4953	0.62428
Edu_Exp	151.119	186.533	0.8101	0.42469
dt2.	71.7741	301.471	0.2381	0.81355
dt3.	-4.83962	287.157	-0.0169	0.98667
dt4.	-39.1356	305.501	-0.1281	0.89898
dt5.	101.894	309.369	0.3294	0.74433
dt6.	185.725	309.369	0.6003	0.55311

dt7.	236.327	377.864	0.6254	0.53676	
dt8.	156.829	329.68	0.4757	0.63798	
dt9.	61.2576	282.586	0.2168	0.82996	
dt10.	139.191	303.293	0.4589	0.64983	
dt11.	430.387	294.632	1.4608	0.15521	
dt12.	612.583	288.758	2.1214	0.04287	**
dt13.	868.708	357.907	2.4272	0.02190	**
dt14.	1092.01	366.835	2.9769	0.00595	***
dt15.	1229.89	375.816	3.2726	0.00283	***
dt16.	2997.09	381.294	7.8603	<0.00001	***
dt17.	3156.23	412.468	7.6521	<0.00001	***
dt18.	3072.14	325.131	9.4489	<0.00001	***
dt19.	3095.91	315.581	9.8102	<0.00001	***
dt20.	3325.02	329.506	10.0909	<0.00001	***
dt21.	3075.19	341.066	9.0164	<0.00001	***
dt22.	2769.66	332.571	8.3280	<0.00001	***
dt23.	2386.55	395.971	6.0271	<0.00001	***
dt24.	4078.75	415.508	9.8163	<0.00001	***
dt25.	5243.96	401.894	13.0481	<0.00001	***
dt26.	5718.86	421.953	13.5533	<0.00001	***
dt27.	6342.08	350.81	18.0784	<0.00001	***
dt28.	7413.11	293.8	25.2318	<0.00001	***
dt29.	6334.7	301.83	20.9877	<0.00001	***
dt30.	5225.14	304.21	17.1761	<0.00001	***

Table 2. Summary Statistics

Mean of dependent variable	2568.318	S.D.of dependent var	2267.707
Sum of squared residual	2233957	S.E. of the regression	282.4609
The-R-squared	0.992637	The-Adjusted R-squared	0.984485
The-F(31, 28)	121.7693	The-P-value(F)	6.97e-23
The-Log-likelihood	-400.8845	The-Akaike criterion	865.7690
The-Schwarz criterion	932.7881	The-Hannan-Quinn	891.9839
rho	-0.187039	The-Durbin-Watson	2.299126

Validity Tests

Table 3. Test of Common Intercept, Significance of Time Dummies and Autocorrelation

Test for differing-group-intercepts -
H_0: There is a common intercept among the groups
Test-statistic: F(1, 28) = 0.325444
With a p-value = P(F(1, 28) > 0.325444) = 0.572904
Wald-test: Testing for joint significance of time-dummies
Null hypothesis: none of the time dummies have effect on GDP
Asymp. t-statistic: Chi-square(29) = 3352.27
with p-value = 0
Autocorrelation Test:
Durbin-Watson Test
From table 2, it can be seen that Durbin-Watson value is not far away from the value of 2, hence there is no autocorrelation.

Table 4. Normality of Residual

Testing for residual normality
H_0: error is distributed normally
T-statistic: Chi-sq.(2) = 31.7197
p-val. = 0.000..

interval	midpt	frequency	rel.	cum.
< -554.62	-665.54	1	1.67%	1.67%
-554.62 - -332.77	-443.69	1	1.67%	3.33%
-332.77 - -110.92	-221.85	8	13.33%	16.67% ****
-110.92 - 110.92	-1.2790e-013	40	66.67%	66.67%
110.92 - 332.77	221.85	8	13.33%	96.67% ****
332.77 - 554.62	443.69	1	1.67%	98.33%
>= 554.62	665.54	1	1.67%	100.00%

Table 5. Heteroskedasticity Test

Wald-test for heteroskedasticity -
H_0: there is a common error variance in the units
Asymp. t-statistic: Chi-square(2) = 2.18042e-029
p-val = 1
Pooled error variance = 37232.6
unit variance
1 37232.6 (T = 30)
2 37232.6 (T = 30)

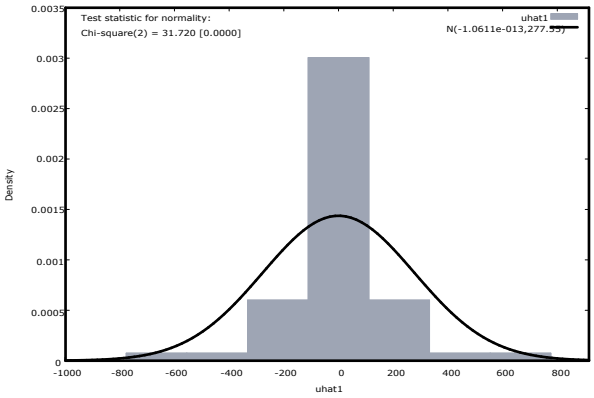

Figure 1. Distribution of Residuals Graph

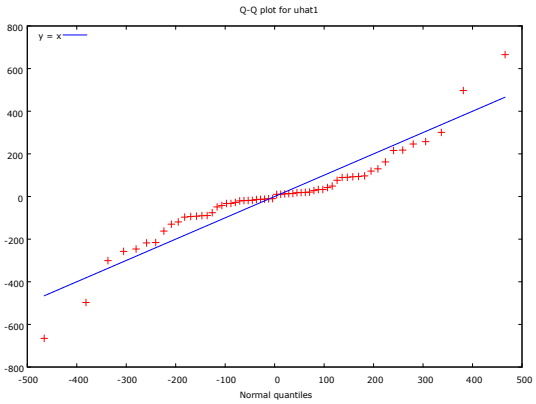

Figure 2. Quantile-Quantile (Q-Q) Plot

4.3. Discussion

Table 1 shows that investment in education has a positive relationship with economic growth in the two sub-Saharan African countries. The overall R-squared of the output in Table 2 proved to be a high level positive correlation between a combined investment in education, time dummy and economic growth with 0.99 and 0.98 R-squared and adjusted R-squared respectively. Furthermore, overall model P-value in Table 2 showed that the combined influence of investment in education and yearly dummy on economic growth is highly significant at a P-value of less than 0.0001. This finding in two sub-Saharan African countries corroborate the earlier positive findings from prior literature such as (Ogundari & Awokuse, 2018; Acharya & León-González, 2018; Tyndorf & Glass, 2017; Li, Loyalka, Rozelle & Wu, 2017; Barro, 2001; Benhabib & Spiegel, 1994). Given the inclusion of yearly dummies in this paper, this research method and findings differ from

earlier methods and results by adding a nuance through the time dummy. The importance of time dummy is to factor in the fact that investment in education may yield expected significant outcome on economic growth depending not only on how much was invested but also depending on the time and also the need to wait after investing to see the benefit accruing not instantly but in later years. It can be seen from Table 1 that yearly dummies started yielding significant influence on economic growth from the 12^{th} year of investment up to the 30^{th} year of investment.

Although Ogundari and Awokuse (2018) pointed out that a possible reason for low correlation of education with economic growth could be attributed to low quality of education; in addition to their sentiment, this paper speculates (subject to future research confirmation) that the low level relationship between investment in education and economic growth could be due to possible effect of corruption along the channels of grant allocation and actual implementation, hence this paper suggests that further research should introduce corruption into the model. The paper also agrees with Ogundari and Awokuse (2018) that education alone may not be a stand-alone single proxy for human capital – more proxy variables of human capital should be introduced by future research. It is noteworthy though to highlight that the introduction of time dummy to this research adds a nuance to existing body of literature on human capital and economic growth. Time is important on investment in education, when to invest and the patience to wait for the significance influence on growth is crucial.

Additional test in Table 3 to Table 5 presents the validity tests of heteroscedasticity, test of common intercept, significance of time dummies, autocorrelation, normality of residuals. All the validity tests proved valid except for normality of residuals. The heteroscedasticity test shows that the units have a common error variance; the Durbin-Watson test indicates absence of autocorrelation with a value of 2, the group of variables have a common intercept and the Wald test for significance of time dummies show that time dummies should be in the model given that the null hypothesis of time dummies is rejected at the P-value of 0.0 (in Table 2). Although, in the case of normality of residual, the outcome indicates non-normality of residual, experts highlight that the analysis could proceed (Williams, Grajales & Kurkiewicz, 2013). Furthermore, Oğuz Kırman, a software scientist highlight that fixed effect panel regression overcomes non-normality of residual and that it might be surprising when some panel regression has normal distribution (Quora, 2018a). In addition, Baltagi (2005) highlights that F-test is robust to normality test, also in Quora (2018b), John Frain explains in detail that non-normality of residual might not completely invalidate the results. Again, the analysis proceeded as the paper does not intend to prove any hypothesis, which might require a necessary condition of residual normality (in some cases). Furthermore, a visualization of the Q-Q plot in Figure 2 indicates that

the deviation of the residuals from normality is very minimal. This is also compensated by the heteroskedasticity test which shows that units have a common error variance. However, the paper notes the non-normality of residuals as a major limitation of this paper for future authors to correct by increasing the sample size. It is important that when data has been drawn from two samples, the assumption of common distribution should be checked by means of Quantile-Quantile (Q-Q) plot as in Figure 2. It is evident from Figure 2 chart that the two variables cluster together along the line which indicates that the variables are from a population with common distribution with minimal deviations (National Institute of Standards and Technology (NIST, 2013).

5. Conclusion

This paper set out to analyse whether human capital investment relates with economic growth in two sub-Saharan African countries (South Africa and Kenya). Prior literature reviewed holds divergent conclusions about this relationship in other countries previously studied but with majority in favour that human capital influences economic growth. The paper used secondary data from the World Bank economic and education indicators for 1987 to 2016 and applying a panel data approach produced 60 observations. After a fixed effect panel regression, which was conducted using the Gretl econometric package, results indicate a positive relationship between human capital investment and economic growth. This paper adds new approach to existing research by adding the yearly dummies into the model specification, which hence showed that a combined investment in human capital and yearly dummies proved to be significantly related to economic growth. It adds new knowledge to the literature, which is that time is of essence with regards to when investment in human capital could influence growth.

The policy implication from this research is important for economic growth of emerging and/or developing nations but importantly for African countries. Amongst others, the striking policy implication of this paper portrays investment in human capital (through investment in education) as a vital key for fueling the much needed economic growth of African countries. African countries should in addition to investing in universal primary education also prioritise more resources to secondary education because primary education alone would not produce the desirable skill for economic development, rather, policies for advancing secondary education would contribute to boosting economic growth and reduction in poverty since medium level skills are acquired from secondary education. In addition, improved input and output for tertiary education should receive government attention from African countries as this will provide advanced human capital skill, which will not only feed the industries and public sector but will also enhance entrepreneurship, create more jobs and lift greater population out of poverty.

Accordingly, governments in Africa need to invest more resources in education and commit to monitoring effective and efficient usage of such resources. The significance results from the time dummies included in this research attests to the importance of timely investment in education as this would improve economic growth in the near future. Improved policy that would fortify the colleges and universities in Africa would produce and retain quality human capital in Africa to spur economic growth. The paper suggets that future research should include time dummies and rate of corruption when analysing the relationship between investment in human capital and economic growth.

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