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HIGHER EDUCATION EXPENDITURE AND ECONOMIC GROWTH IN KENYA

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ABSTRACT

Higher education investment has been at the centre of government policy since independence with a commitment to fight ignorance. This study aimed at analyzing the relationship between higher education expenditure and economic growth in Kenya. The study was guided by the following specific objectives; to assess the impact of government expenditure in higher education on economic growth in Kenya and to establish the causality and direction between government expenditure on higher education and economic growth in Kenya. Econometric analysis was done using Vector Error Correction Model. The data was collected from secondary sources such as World Bank, ILO and economic surveys and statistical abstracts of Kenya National Bureau of Statistics. To correctly fit the model, higher education expenditure was modeled together with labor force participation, fixed capital formation and inflation towards GDP. The results revealed that Higher education expenditure, Labor force Participation Rate and Fixed Capital Formation had long-run adjustment towards equilibrium. The short run equations showed that none of the variables caused RGDP at the lag level but jointly had significant causality towards RGDP. The results from test for joint causality indicated that although higher education expenditure had no significant individual short run effect of RGDP, its absence in the model fades the short-run joint causality of the other variables on RGDP. The long-run dynamics revealed that higher education expenditure and labor force participation rate have positive and significant long-run impact on RGDP while fixed capital formation and Inflation had a negatively significant long-run impact on RGDP. From the findings, the study recommended that the government should increase the proportion of spending on higher education to promote high quality training, research and infrastructure in order to increase its impact in the short-run and long-run.

Key Words: *Government Expenditure, Higher Education, Economic Growth*

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INTRODUCTION

There has been a strong belief among economists that educational advancement would prompt heighten growth, more riches and salary circulation, more prominent correspondence of chance, accessibility of gifted human influence, a decrease in human population, increased life expectancy, low crime rates and political security. It is this belief that has led to widespread investment in education.

Schultz (1981) noted that the future welfare of man was based on principle determinants such as population quality and enhanced learning. Explaining this further, Harbison (1973) argues that the wealth of a county relies upon its ability to build up its human resources and less on their physical assets. He goes further to say that a nation which is unable to create skill and knowledge of its people and to use them appropriately in the national economy will not be able to develop.

Education is considered as the pathway to economic success, the way to logical and innovative progression, the way to battle joblessness, the establishment of social equity, the initiate of political socialization and cultural diversity (Pscharopolos, 1988). Education is additionally observed as a tool for guiding and directing social, economic and political elements and the generational developmental imperative of societies (Ayodo and Gravenir, et al., 1999).

Education adds to the development of national income and individual income. While land was the fundamental wellspring of riches and income in agrarian social structure, capital and machinery became essential in modern social structures. In today's social orders, learning drives monetary development and improvement. Higher education is the fundamental source of that information, its generation, dispersal and its retention by any general public. Economic growth right now relies upon the ability to create knowledge-based products. However, the fate of knowledge economies depends more on their ability to create knowledge through research improvement as opposed to knowledge-based products. Therefore, knowledge economies put more prominent esteem and bestow higher need to the generation and disbursement of knowledge. Therefore, it is evident that higher education foundations are a major source for providing the human capital. (Wilkinson et, al 2013)

Higher education is paramount in building up the human capital that result in the organizations that are viewed as an essential factor of progress. Higher education has facilitated the rise of a lively middle-class society, which was not part of aristocracy which was land-tied and that drew its benefits from feudalism. The middle-class society comprises of professionals such as the bookkeepers, engineers, legal counsellors, educators and many other specialists. This was important for the advancement of modern institutions of capitalism and democracy (Crawley, 2004).

While it is obvious that there has been a considerable growth in higher education, it is not clear exactly how important this vast growth is. Researchers have not been able to get a decent hold on two basic yield estimates on how to gauge quality in higher education and how to decide the value added by higher education over and beyond the understudy's inborn capacities. It is completely conceivable that even in frameworks which are of good quality, the credentialing parts of higher education advantage the people who approach it and crowd out from work others with comparable capacities but lack formal education qualifications (Wolf, 2004). As indicated by Bloom et al (2006), Higher education may make more prominent tax income, increment of reserve funds and venture, and prompt a more innovative and urban culture. It can likewise enhance a country's wellbeing, lead to a decreased populace, enhance innovation, and strengthen governance.

The circumstances have changed as of late. Public universities no longer depend fully on the state for their funding. The asset allotment arrangements received in a few nations demonstrate that

administrations encourage pioneering exercises which create pay and a closer association among universities and beneficial sectors, particularly in innovative work. Furthermore, numerous legislatures have enabled the private sector to operate institutions of higher education, sector which is developing quickly in many nations. These have reinforced market forces in higher education, now and again crossing the limits of national frontiers (Anywanwu and Erhijakpor, 2007).

In Kenya, after the completion of Primary and Secondary education, graduates have a variety of choices. The choices are based primarily on their performance in Kenya Certificate of Secondary Education and also financial capability. Graduates who have performed well can proceed to Public Universities. Others may opt to join private universities for a number of reasons such as unavailability of the desired course in the public university or failure to qualify for the desired course in public university. For graduates who do not qualify for public university selection, they also have the option of joining private universities depending on their performance as well. The other graduates, who do not meet the university cut-off points, have the option of joining Vocational schools. Examples of the Vocational schools are; Teachers Training colleges, Technical colleges and mid-level colleges where they graduate with diploma certificates. There are also other graduates who choose to join the job market.

After Kenya's independence in the year 1963, GDP averaged at 7% that is between the years 1964 and 1976, right before the death of the first president of Kenya, Jomo Kenyatta. However, between the years 1982 and 1990 GDP growth declined, averaging 1-2%. Between the year 1997 and 2002, the economy grew at an average rate of 1% per annum. In the year 2003, after Mwai Kibaki took over as president, GDP growth quickly picked up to 2.3% in the year 2004 reaching an all-time high of 7% in the year 2007. GDP growth declined to 1% in the year 2008 due to post election violence then picked up to 2.9% in the year 2009 before averaging 5% between the years 2009 and 2013. At that time Kenya's GDP was US$55.1 Billion with a Population of 44.83 Million and a per capita of US$1,229. Between the years 2013 and 2017 GDP growth averaged 5% per annum. In the year 2018, the GDP growth averaged 5.7% in the first quarter and nearly 6.3% in the second quarter, which is much higher compared to the first quarter of the year 2017when it grew by 4.7%. In 2018, real GDP growth continueds to accelerate attaining 5.7% in the first quarter of 2018, 6.0% in the second quarter of 2018 and 6.2% in the third quarter.

Real GDP is expected to continue to improve largely because of the continuing expansions in the various sectors of the economy such as tourism, transport, construction and a recover in the agricultural sector.

The below figure is a display of the growth rate in GDP and amount invested by the central government in Higher education.

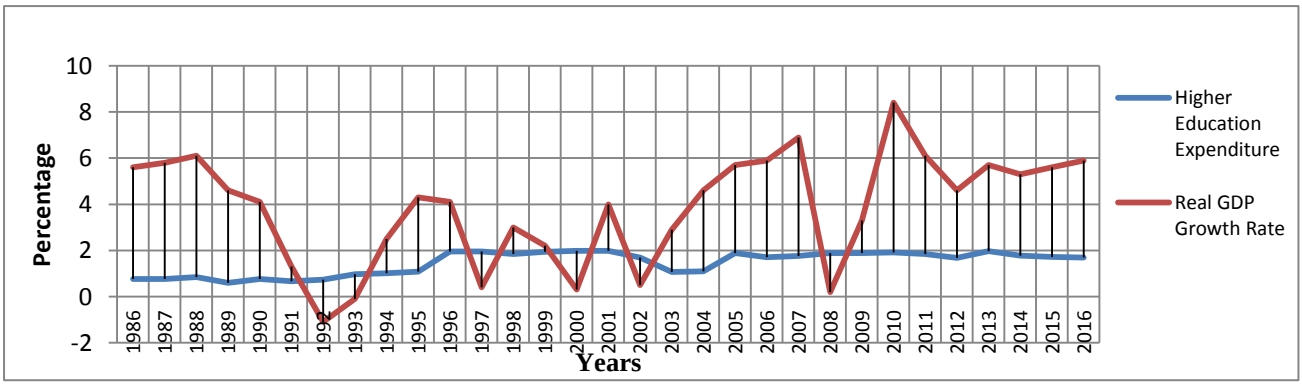

Figure 1: comparison of the trend between Expenditure in higher education and GDP

Source: Various Economic Surveys

It is observed that there is a positive correlation between investments and GDP where the higher the GDP, the higher the investment in higher education. This trend has been observed almost in all the years. However, there have been a few exceptions where higher education investment is not correlated with GDP economic growth. This can be attributed to the internal reforms within the higher education department. There can also be observed some years with great variations from the previous in both investment and GDP growth. Some of the notable years can be explained as follows. In 2009/2010 there was a spike in higher education investment. This was attributed to an expansion of capacity among the existing public universities. This expansion had to do with opening new constituent colleges and campuses. In 2011/2012 there was a drastic increase in the expenditure on higher education from the previous year. This was attributed to the increase in development expenditure because of the expected double intake by the universities later in the year.

In 2004 to 2005, an increase in GDP growth rate was observed; this was contributed by the stabilization of the Kenyan currency after the new political regime took over. There were extensive reforms coupled by the empowering of regulatory bodies like the Central Bank of Kenya, the Capital Markets Authority, the Insurance Regulatory Authority among others has given rise to a vibrant private sector and also the economy was boosted by both foreign and local investments as the climate was becoming favourable. In 2007 to 2009 there was a decrease In the GDP growth rate due to the elections and violence that followed thereafter, affecting significant development and economic growth.

Statement of the problem

Higher education investment has been at the centre of government policy since independence with a commitment to fight ignorance set as a key goal of independent Kenya. Subsequent decades saw the establishment of the first university in Kenya raising the number to 7 in three decades. By the year 2000, about 50,000 people enrolled in higher education institutions, a number that increased rapidly to 100,000 enrollments in 2010. According to the country's blueprint, *vision 2030,* Kenya aims at becoming a prosperous middle-income country centred on developing its human capital. In the last 8 years, through the implementation of first and second mid-term plans, the government has increased spending on higher education to nearly 100 billion Kenya Shillings, targeting over 200,000 beneficiaries. This has led to increased student intake through expansion of existing universities, upgrading constituent colleges to universities totaling to more than 40 fully fledged Universities in Kenya (KIPPRA, 2017).

The widespread consensus that higher education is a major driver of economic competitiveness in an increasingly knowledge-driven global economy has made quality university education the most esteemed factor of production in recent times (Ojiambo, 2009). Thus, the massive expenditure by the government on higher education is expected to have significant impacts on the economic performance. The growth of the country's economy started at -0.3 in 2001 to 7% in 2007 then looped to 1.7% in 2008 after the violence following the disputed elections. In the following 8 years, the country's economic growth has oscillated between 4.7 and 6.2%. Despite the rise in human capital development through investing in higher education, it is not clear whether huge investment in the sector by the government has a bearing on growth. Education improves the quality and efficiency of labour (Kapur and Crowley, 2008), thus the increased output of graduates from the university is expected to impact on growth either directly or through other mechanisms.

Many Studies on the phenomenon have analyzed the effect of government expenditure in the entire education system that is the relative elasticity of government expenditure in primary, secondary and tertiary level (Ojiambo, 2009; Mutiso *et al.,* 2015) and how government expenditure on a multitude of

factors in human development affect economic growth (Machuki *et al.,* 2013)

However, few studies have been carried out to measure the direct relationship of government expenditure on higher education and economic growth. Such is a study like 'The Impact of Human Capital on Economic Growth in Sri Lanka' (Rathnayaka and Athukorala, 2012), a research that studied the impact of expenditure on different levels of education on economic growth, this included higher education as a level of education.

While some of these studies may suffer from methodological weaknesses (Thuku and Maingi*et al*, 2013), they also fail to measure the causality and direction of causality thus yielding varied inconclusive results. In order to bridge this gap and yield results that can lead to more targeted policy recommendations on higher education expenditure, this study aimed at assessing how government expenditure in higher education affects the performance of the economy and causal relationship between the two variables.

Objectives of the study

The main objective of the study was to determine the relationship of government expenditure on higher education and economic growth in Kenya. The specific objectives were:-

- To assess the impact of government expenditure in higher education on economic growth in Kenya.
- To establish the causality and direction between government expenditure on higher education and economic growth in Kenya

LITERATURE REVIEW

Theoretical Literature

Education

Education is an essential tool that will lead a country to dynamic advancement and sustainability of human capital. An economist Gary Becker, a Nobel Laurent once emphasized the role of education as the key to development of the human capital. In this day and age, knowledge and skills are paramount for progress.

Mincer (1981) hypothesized that similarly as collection in individual human capital produces individual financial development (salary), the equivalent applies for social benefits. Human capital is a factor of production which works hand in hand with physical capital. Human capital is acquired through several ways, such as informal and formal education and on the job training through training, work experience mobility of labour not forgetting knowledge and vocational training. Researchers and other economists have conducted a statistical study on the cost of education and its returns. The study concluded that employers tend to pay educated employees higher wages as opposed to their less-educated workers, this is because of their ability to produce knowledge-based goods and services.

Human Capital expenditure by Schultz (1961)

This is the hypothesis of human capital investment as proposed by Schultz (1961) who contends that both knowledge and skill are a type of capital and that this capital is a result of "intentional investment." Schultz speaks of how Western nations have increased their national yield as a result of investment in human capital. He additionally makes a connection between an increase in human capital and the general increment in labourers income.

O-Ring theory

Kremer (1993) hypothesized the O-ring hypothesis of economic improvement, a model of economic advancement. The hypothesis suggests that in order for work to be of high and significant quality, tasks must be executed proficiently together. The key component of this model is positive assortative coordinating, whereby individuals with comparative expertise levels work together. The name originates from the 1986 Challenger carry fiasco, a calamity caused by the disappointment of a solitary O-ring. Kremer believes that the O-ring hypothesis clarifies why rich nations create more entangled items, have bigger firms and significantly higher labourer profitability than poor nations.

Empirical Literature

Empirical studies have been undertaken in order to support this theoretical premise. Most of these studies focus on education and economic growth. Very few research studies have specifically looked into the relationship between higher education and economic growth. We looked at the empirical literature available for education and economic growth and higher education and economic growth.

Machuki *et, al* (2013) researched on the relationship between human capital (as proxied by capital expenditures on education and health) and economic growth in Kenya (1981-2011). He used the Ordinary Least Square multiple regression analytical method to examine the relationship between capital expenditures on education, healthcare and economic growth. The results showed a positive relationship between health expenditures and economic growth; while showing a significant but negative relationship between education expenditures and economic growth. The results can be influenced by the estimation method used in this case (OLS), that is its advantages and disadvantages when compared to other estimation methods and the selected years of study. This study however covered expenditure on entire education system and not expenditure on higher education only, hence the research gap addressed in this research study.

Rathnayaka and Athukorala (2012) took up a research study to identify the impact of human Capital on economic growth in Sri Lanka. The study also examined how different skill levels in human capital that is Primary, Secondary and higher education affect economic growth. For the econometric estimation, Vector Error Correction Model (VECM) was employed.

The results of the VECM showed that the short-run impact of both government expenditure on university education and general education are significant, however, the magnitude of the coefficient of general education is greater than the university education. The difference between this research and the research in question is the country of origin, hence the specific data used. Therefore this necessitates a research study to be undertaken for the case of Kenya.

The causality between government expenditure on education and economic growth in Malaysian economy was studied by Hussin, Muhammad and Razak (2012) using time series data from 1970 to 2010 and applying Vector Auto Regression (VAR) technique. The results showed that education expenditure had Granger-Causality with GDP. They also found out that economic growth cointegrated with fixed capital formation, labour, labour force participation and government expenditure on education and would to a greater extent influence long-run economic growth. Apart from the varying data due to the country of origin and time frame selected, this study used entire education expenditure as opposed to higher education expenditure which is used in this research study, which leaves a gap to be filled by the results of this research study.

Sianesi and Van Reenen (2003) undertook a survey on the relationship between human capital and growth. The research data samples were from OECD and developing countries. The model of choice was the Solow model and growth accounting. The results indicated that human capital increases productivity, suggesting that education is productivity enhancing, and not merely a device used by individuals to signal their ability to potential employers. The survey results suggest that a one year increase in average education raises the level of output per capita by between three and six percent, or raise the rate of potential growth by just over one percentage annually depending on the model adopted. The study focused on education as a whole and variable of choice to represent human capital in the production function was number of years in schooling as opposed to capital injected in higher education.

Lau, Jamison, and Louat (1990) estimated an aggregate production function relating real GDP to

capital stock, labour force, land and average education of the labour force based on data for 58 developing countries. They found positive and statistically significant estimates for the elasticities of output with respect to average education. In their study, sub-Saharan Africa had the lowest elasticity - of 0.03 – followed by the Middle East and North Africa. Barro and Sala-i-Martin (1995). This study majored on the average education of a particular labour force in various developing countries as opposed to this study which looks at expenditure geared into developing human capital in Kenya.

METHODOLOGY

This research sought to unravel the relationship between higher education expenditure and economic growth in Kenya. The research study was a non-experimental causal time series study. The research used data study recorded between the years 1986 and 2016. The collected data was analysed using Vector Error Correction Method (VECM) after undergoing time series diagnostic tests. Time series analysis was adopted in this study because of the sample size selected. VECM was used in analysis because it allows for analysis and interpretation of short and long run relationships and also allows for causality tests.

On theoretical framework, the study adopted the human-capital augmented Solow model as postulated by Mankiw, Romer and Weil (1992). They presented Solow's (1956) model of economic growth augmented to include human capital investment as a separate input into a standard Cobb-Douglas production function. Both linear and non-linear specifications of the functional relationship in the equation were estimated using time series data for the period 1986-2016. Unit root test was the first diagnostic procedure done on the properties of the data and aimed at testing for stationarity. The test was important and helped in avoiding spurious regression problem as most standard econometric procedures require time series tests to be stationary. This study required some order of stationarity for the time series data, as this was a prerequisite in cointegration analysis and Granger causality version VECM. After testing for stationarity, the next step was to test for cointegration to assess the long- run linkages among study variables.

To achieve the objectives of the study, annual time series were used. The data used in this study was collected from various secondary sources. The secondary sources included; the *Kenya National Bureau of Statistics (*statistical abstracts and economic surveys*),* World Bank Africa database 2018 and ILO *datastat*. Secondary data was utilized for the purpose of this study. The data collected covered the period 1986 to 2016. The brevity of the sample period was dictated by the availability of consistent data, which are compiled on an annual basis. The collected data was for the following variables; economic growth and government investment in higher education, labor force participation rate, fixed capital formation and inflation rates.

EMPIRICAL FINDINGS

The analysis aimed at measuring the relationship between higher education expenditure and GDP growth rate through labor force participation rate in Kenya from 1986-2016. However, GDP is also affected by other productivity parameters such as inflation rate, which also was considered for modeling to avoid under specification. From the Cobb Douglas production function, output (GDP) is affected by both capital formation and labor force productivity. On the other hand, research (Feldstein, 2002, Bulman and Simon, 2003) has shown that inflation affects return on capital negatively, slows down capital formation, and triggers labor force efficiency losses resulting from unproductive activities for coping with rising prices. Thus, to properly fit the model on relationship between Higher Education Expenditure and GDP, Inflation (INF) was included in the model. The figure below presented the trend and distribution of the variables across the study period.

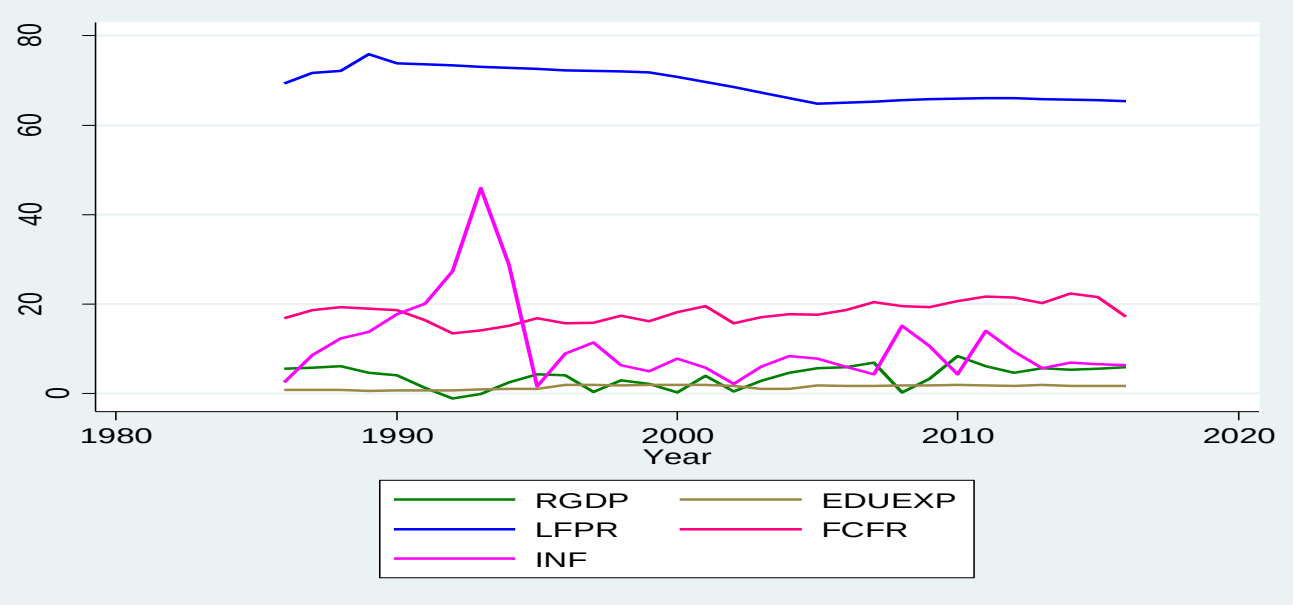

Figure 2: Trends in GDP Growth, Education Expenditure, Labor Force Participation, Fixed Capital Formation and Inflation Rates 1986-2016

From figure 2, all the variables with an exception of LFPR were fairly constant and on a more so similar level within the specified time of the study. For the case of INF, we observed the highest level of inflation in the years 1992 and 1993 due to the devaluation of the Kenyan shilling coupled with excess money supply in the years 1992 and early 1993. In the year 2011, there was an increase in inflation which was as a result of drought, rising global oil prices and depreciation of the Kenyan shilling. For RGDP, there was a notable decrease in the year 2008 this was attributed to the post election in the period after the disputed election of December 2007.

Descriptive Analysis

The analysis explored data characteristics through getting a summary computation where the measure of central tendency (mean) and dispersion (standard deviation) for the variables was obtained. Normality of the variables was also tested using Skewness, Kurtosis, Jarque-Bera and Shapiro Wilk*W* test. The results were as presented in table 1 below;

Table 1: Descriptive Analysis

	EDUEXP	LFPR	RGDP	FCFR	INF
Mean	1.515	69.2245	3.82903	6.2226	10.89032
Std. Dev	3.4457	3.4883	2.3914	2.2844	9.2397
Min	11.19	64.84	-1.1	3.5	1.6
Max	28.57	75.9	8.4	8.4	46
Skewness	0.0000	0.6790	0.2708	0.9433	0.0000
Kurtosis	0.0004	0.0000	0.3996	0.4396	0.0006
Jarque-Bera Test	21.37 (0.0000)	14.37 (0.0008)	2.08 (0.3532)	0.63 (0.7306)	21.10 (0.0000)
Shapiro Wilk'*W*' Test	0.84184 (0.00135)	0.86941 (0.00001)	0.75455 (0.11037)	0.84330 (0.10178)	0.94329 (0.00034)
Observations	31	31	31	31	31

Source: Author's Computation (2019) *P-value in parenthesis*

The results showed that Labor force participation rate had the highest mean (M=69.22%, SD=3.49) followed by inflation (M=10.89%, SD=9.24), Fixed Capital Formation Rate (M=6.22%, SD=2.28), Real GDP (M=3.83%, SD=2.39) while education expenditure had the lowest average (M=1.52%, SD=3.45). For the Standard deviation, variables with highest SD indicated that the data points were spread out over a wide range of values, while low SD indicated that data points tend to be close to the mean of the set, also called the expected value. From the tabulated data, EDUEXP had the highest coefficient of variation (CV=SD/Mean), of CV=> 1, meaning that the variables data points were spread out over a large number of values. While the other variables all had a CV<1 indicating data points are close to the mean. The normality hypothesis was tested using Jarque-Bera statistic distributed as Chi square with 2 degrees of freedom (for skewness and Kurtosis). The p-value for Jarque-Bera statistic showed that apart from real GDP and FCFR, the null of normal distribution was rejected for EDUEXP, LFPR and INF. Shapiro Wilk*W* test was used to test normality for smaller sample size and was used to countercheck the outcome of Jarque-Bera test. The *W* test equally indicated that the null hypothesis is rejected for EDUEXP, LFPR and INF.

Stationarity Analysis

In this analysis, stationarity was tested using Augmented Dickey Fuller unit root tests and Philip-Perron statistic. The null hypothesis was that the variables had unit root and it is rejected when the test statistics is larger (in absolute terms) than the critical values. The results were presented in table 2 below.

Table 2: Unit Root Test

Variable	Augmented DF Test		Philip-Perron Test	
	Test Statistic	Stationarity	Test Statistic	Stationarity
EDUEXP	-3.436	Non Stationary @ 0.1 level	-3.518	Non Stationary @ 0.1 level
LFPR	-0.451	Non Stationary	-0.699	Non Stationary
RGDP	-3.164	Non Stationary @ 0.1 level	-3.123	Non Stationary
FCFR	-2.129	Non Stationary	-2.174	Non Stationary
INF	-2.669	Non Stationary	-2.686	Non Stationary @ 0.1 level

Source: Author's Computation (2019)

The results of both Dickey Fuller and Philip-Perron tests showed that none of the variables were stationary as the test statistics had absolute values less than at least one of the critical tests levels. Transforming the variables from non-stationary to stationary was done through differencing. In this study, first difference were obtained and tested for stationarity. As shown in table 3, below all the differenced variables became stationary after taking the first difference.

Table 3: Unit Root Tests Taking First Difference

Variable	Augmented DF Test		Philip-Perron Test	
	Test Statistic	Stationarity	Test Statistic	Stationarity
EDUEXP	-8.753	Stationary	-9.247	Stationary
LFPR	-5.521	Stationary	-5.514	Stationary
RGDP	-6.547	Stationary	-7.222	Stationary
FCFR	-4.896	Stationary	-4.783	Stationary
INF	-5.196	Stationary	-5.371	Stationary

Source: Author's Computation (2019)

Model Estimation

The unit root tests showed that the series is I (1) whose implication is that, before estimating the model, the series must be tested for cointegration in order to determine whether to use VAR in differences or VECM. If VAR is fitted in cointegrated series, the model is deemed as mis-specified, sub optimal and spurious. The suitability of fitting a VECM for cointegrated series is due to the fact that

it adjusts to both short-run shocks in variables and resulting long run deviations from equilibrium.

Lag Order Selection

Lag order was estimated for cointegration testing and for fitting the ideal model. Optimal lags to be included in the model were estimated using various criterions. As shown in table 4, Final Prediction Error (FPE), Akaike Information Criteria (AIC), Hannan Quinn Information Criteria (HQIC) and Schwarz's Bayesian information criterion (SBIC) yielded an optimal lag order of 4.

Table 4: Selection Order Criteria

Sample: 1991-2016								
Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-290.479				5115.3	22.7292	22.7989	22.9711
1	-263.474	54.011	25	0.001	4572.75	22.5749	22.993	24.0266
2	-222.796	81.356	25	0.000	1742.55	21.3689	22.1353	24.0303
3	-165.036	115.52	25	0.000	293.279	18.8489	19.9637	22.72
4	-90.4097	149.25*	25	0.000	52.9185*	15.0315*	16.4946*	20.1123*

Source: Author's Computation (2019)

Cointegration

Johansen Maximum Likelihood test for cointegration was estimated using 4 lags obtained from selection criteria. The results table 5 showed that the null hypothesis for at most one cointegrating equation among the variables cannot be rejected 5% level.

Table 5: Johansen Tests for Cointegration

Trend:	Constant				Number of obs = 27
Sample:	1990 - 2016				Lags = 4
Maximum rank	parms	LL	Eigen value	Trace statistics	5% Critical value
0	80	-7.1567695	.		.
1	89	65.132109	0.99527	3.1179	3.76*
2	96	96.042955	0.89870	19.0467	15.41
3	101	114.60286	0.74711	56.1665	29.68
4	104	122.56727	0.44565	117.9882	47.21
5	105	124.12622	0.10906	262.5660	68.52

Source: Author's Computation (2019)

Vector Error Correction Model (VECM)

The study main hypothesis was to assess whether expenditure on higher education had an impact on economic growth either directly or indirectly. The 4 lag VECM coefficients give the short run causality from one variable to the target variable. The principle for short run causality is having positive and significant coefficients of first difference of the VECM. Taking GDP as the target variable, table 6 showed the short run effects of each variable towards RGDP.

Table 6: Vector Error Correction Model

		Coef.	Std.Err.	z	p>|z|	[95% Conf. Interval]	
D_RGDP							
	_ce1						
	L1.	-0.1140968	0.0451797	-2.53	0.012	-0.2026475	-0.0255462
	RGDP						
	LD.	-0.0032769	0.2753444	-0.01	0.991	-0.5429400	0.5363883

	L2D.	-0.0960559	0.2734910	-0.35	0.725	-0.6320884	0.4399767
	L3D.	-0.1478108	0.2578736	-0.57	0.567	-0.6532337	0.3576121
	EDUEXP						
	LD.	-0.0196068	0.0482000	-0.41	0.684	-0.1140772	0.7486350
	L2D.	-0.0066242	0.0430940	0.15	0.878	-0.0778386	0.0910870
	L3D.	-0.0252212	0.0466098	0.54	0.588	-0.1165748	0.0661324
	LFPR						
	LD.	-0.1552492	0.2859991	-0.54	0.587	-0.7157972	0.4052987
	L2D.	-0.1373924	0.2874938	-0.48	0.633	-0.7008699	0.4260851
	L3D.	-0.0796409	0.2859067	-0.28	0.781	-0.6400078	0.4807260
	FCFR						
	LD.	-0.7533963	0.3321512	-2.27	0.023	-1.4044010	-0.1023919
	L2D.	-0.3485879	0.2968097	-1.17	0.24	-0.9303243	0.2331484
	L3D.	-0.4004317	0.3075036	-1.3	0.193	-1.0031280	0.2022643
	INF						
	LD.	-0.0313524	0.0169746	-1.85	0.065	-0.0646219	0.0019171
	L2D.	-0.0135304	0.0163059	-0.83	0.407	-0.0454893	0.0184285
	L3D.	-0.0084278	0.0166307	-0.51	0.612	-0.0410234	0.0241678
	_cons	-0.0617529	0.0541571	-1.14	0.254	-0.1678989	0.0443930

Source: Author's Computation (2019)

The results across the LD, L2 and L3 showed that there was no short-run causality from each variable towards GDP, including EDUEXP.

Testing Short-Run causalities of the model Variables

Table 7: Testing joint (for all lags) short run causality of EDUEXP towards RGDP by setting the null that joint short run causality is zero at p≤0.05, yields the following results.

D_RGDP] LD.EDUEXP	0
D_RGDP] L2D.EDUEXP	0
D_RGDP] L3D.EDUEXP	0
Chi2 (9)	0.88
Prob>chi2	0.8309

Table 8: Testing Joint short run causality of model variables including EDUEXP (p≤0.05)

[D_RGDP] L. _ce1	0
[D_RGDP] LD.RGDP	0
D_RGDP] L2D.RGDP	0
[D_RGDP] L3D.RGDP	0
[D_RGDP] LD.EDUEXP	0
D_RGDP] L2D.EDUEXP	0
D_RGDP] L3D.EDUEXP	0
[D_RGDP] LD.LFPR	0
[D_RGDP] L2D.LFPR	0
[D_RGDP] L3D.LFPR	0
[D_RGDP] LD.FCFR	0
[D_RGDP] L2D.FCFR	0

[D_RGDP] L3D.FCFR	0
[D_RGDP] LD.INF	0
[D_RGDP] L2D.INF	0
[D_RGDP] L3D.INF	0
Chi2 (9)	26.71
Prob>chi2	0.0448

Table 9: Testing Joint short run causality of model variables without EDUEXP (p≤0.05)

[D_RGDP] LD.LFPR	0
D_RGDP] L2D.LFPR	0
[D_RGDP] L3D.LFPR	0
[D_RGDP] LD.FCFR	0
[D_RGDP] L2D.FCFR	0
[D_RGDP] L3D.FCFR	0
[D_RGDP] LD.INF	0
[D_RGDP] L2D.INF	0
[D_RGDP] L3D.INF	0
Chi2 (9)	9.57
Prob>chi2	0.3863

The joint linear hypothesis showed that there was no sufficient evidence presented in the data to reject the null (@p≤0.05). Thus, education expenditure has no joint short run causality on RGDP. However, testing the total joint short run causality for all the variables, the null, of zero short run effect of all the variables towards GDP is rejected as the Chi square results (Test 1 below) yield a p-value 0.0446 which was less than 5%. Under test 2, joint short run causality of the model variable is done excluding EDUEXP lags and the results (p-value=0.3863) showed that we couldn't reject the null of zero joint short run causality of the variables. Thus, EDUEXP causes RGDP in the short run as part of other production parameters while short run effects of the other variables in the model are not statistically significant to cause RGDP in the short run.

Error Correction Model

The cointegration test revealed there was at least one linear combination that yields long-run association ship among the variables. Error Correction Term (ECT) or the cointegration equation (ce) shows the speed of the model adjustment, from the short term shocks, towards the long-run equilibrium implying that rapid short run change by one or more model variable(s) that deviates the association ship from equilibrium fades off in the long-run to return the series to equilibrium. In the VECM output, this was reported from the coefficients of cointegration terms, which were summarized in table 10 below.

Table 10: Long run Error Correction Terms

Variable	Speed of Adjustment (Lagged Error Correction term)	p-value
D RGDP	-0.1141	0.012
DEDUEXP	0.4056	0.011
DLFPR	-0.1118	0.002
DFCFR	-0.1013	0.036
DINF	-0.3274	0.676

Source: Author's Computation (2019)

The results showed that the error correction terms for RGDP, LFPR and FCFR were negative and significant at 5% level implying that they had long-run causality towards these variables in the model. Precisely, the results suggested that previous period errors or deviation from the long-run equilibrium were corrected for within the current period at a convergence speed of 11.4% for GDP, 11.2% for

LFPR and 10.1% for FCFR. The other variables, i.e. EDUEXP and INF did not have significant long-run correction. From the results, the long-run model was summarized as follows;

$$\Delta RGDP = -0.062 + \begin{pmatrix} -0.196\ LD \\ 0.0066\ L2 \\ -0.0252\ L3 \end{pmatrix} \Delta EDUEXP_{t-1} - 0.1141 ECT_{t-1}$$

The Johansen normalization restriction imposed presents the long-run dynamics of the model, where the error term is generated. RGDP was taken as the target variable thus the restrictions were imposed on it.

$$\Delta RGDP = -0.062 + Shortrun\ shocks - 0.1141 ECT_{t-1}$$

Including the EDUEXP short-run coefficients;

Table 11: Johansen Normalization Restriction Imposed

beta		coef.	Std. Err	z	P>|z|	[95% Conf. Interval]	
_ ce1	RGDP	1		.	.	.	.
	EDUEXP	-0.09351	0.027139	-3.45	0.001	-0.146702	-0.04032
	LFPR	-4.78387	0.151574	-31.56	0.000	-5.080951	-4.48679
	FCFR	1.570619	0.134872	11.65	0.000	1.306276	1.834962
	INF	0.625629	0.02546	24.57	0.000	0.575728	0.67553
	_cons	-31.8374	.	.	.	.	.

Source: Author's Computation (2019)

The Johansen normalization coefficient signs are reversed in the long-run. The results showed that EDUEXP and LFPR had a significantly positive long-run effect on RGDP while FCFR and INF significantly affected RGDP negatively in the long run.

Post Estimation Tests

In order to determine the robustness of the model, the VECM was subjected to post estimation tests. The tests included; normality of distribution disturbances, autocorrelation and model stability. This section presents the results.

Normality of Residuals

Jarque-Bera test was used to test for normality of distributed disturbances. The null hypothesis for the test is; H_0: The disturbances of the differenced equations are normally distributed. The results were as shown below;

Table 12: Jarque-Bera Test for Normality of Distributed Disturbances

Equation	chi2	df	Prob>chi2
D_RGDP	0.678	2	0.71257
D_EDUEXP	1.427	2	0.49004
D_LFPR	1.149	2	0.56288
D_FCFR	0.538	2	0.76399
D_INF	4.214	2	0.12159
ALL	8.006	10	0.62822

Source: Author's Computation (2019)

The results showed that, for all the variables under the model, the Chi square distributed statistics had large probability which implied that no sufficient evidence to reject the normality hypothesis. Thus the disturbances were normally distributed.

Lag Order Autocorrelation

The 'no autocorrelation at lag order' is the key assumption underlying the robustness of VECM. A Chi Square distributed Langrage multiplier was applied on the VECM to test for autocorrelation. The results in table 13 indicated that the significance level of the chi square tests was above 5% level at lag 2 but not in lag one.

Table 13: Langrage Multiplier test for Autocorrelation at Lag Order

Lag	chi2	df	Prob>chi2
1	48.4837	25	0.00326
2	34.6633	25	0.09447

Source: Author's Computation (2019) Ho: no autocorrelation at lag order

Model Stability

The stability of the VECM model was measured using modulus of Eigen value for the matrix with 5-1 (variables *minus* co-integrating relationships). A stable model has the moduli of the remaining Eigen values strictly less than unity. As shown in table 14, the Eigen values meet stability condition thus the model was stable.

Table 14: Eigen value Stability Condition

Eigen value	Modulus
1	1
1	1
1	1
1	1
-0.6422342+.2704835i	696869
-0.6422342-.2704835i	696869
-0.207113+.5526693i	590203
-0.207113-.5526693i	590203
-0.3636416 +.111741i	380422
-0.3636416-.111741i	380422

Source: Author's Computation (2019) The VECM specification Impose 4 unit moduli

Roots of the Companion Matrix

The roots' of the companion matrix is a visual representation of the eigen values within a X-Y plane, where; X axis presented real components while Y axis presented the complex components. From the figure below, all the Eigen values lied inside the unit circle thus the model satisfied stability condition.

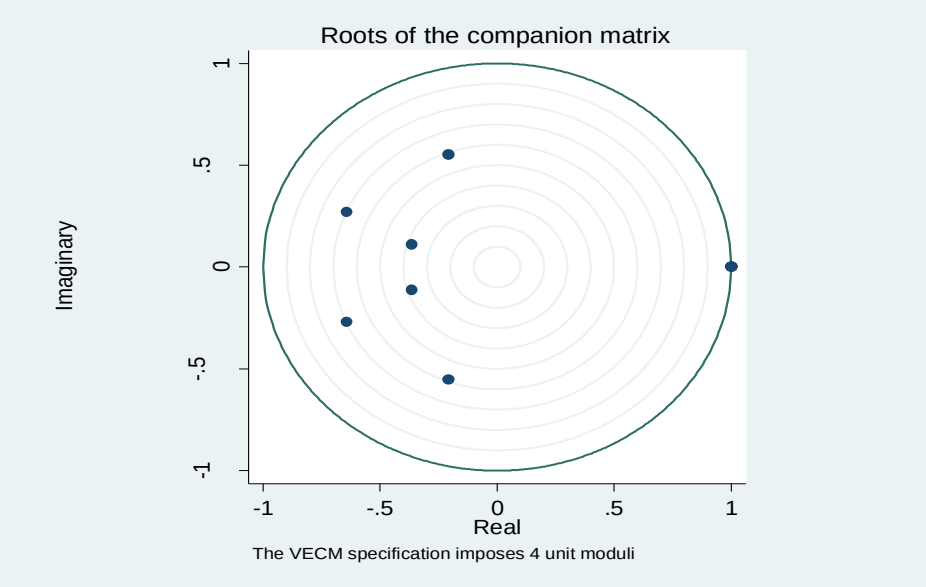

Figure 3: Roots of the Companion Matrix

DISCUSSION

The study aimed at analyzing the relationship of higher education expenditure and economic growth in Kenya. It also sought to establish causality and its direction through other economic parameters.

On impact of government expenditure in higher education on economic growth, the analysis revealed that in the short-run, higher education expenditure alone does not cause RGDP but causes RGDP in the short-run through a joint effect that include FCFR, LFPR and Inflation. Likewise, RGDP does not cause higher education expenditure in the short-run which implies that changes in higher education expenditure is not attributable to changes in RGDP. The long run dynamics revealed that higher education expenditure (and labor force participation rate) has positive and significant long-run impact on RGDP. This empirically verified the postulations of Shultz (1961) human capital expenditure theory' where he argued that education enhances labor productivity in the long-run increasing economic output and growth.

On causality and direction of causality between government expenditure on higher education and economic growth, the results of the VECM across the all short-run lags of education expenditure towards RGDP revealed that education expenditure did not cause RGDP in the short run. Similarly, education expenditure does not have a composite (include all lags) short run effects on education. Further, although education expenditure did not adjust RGDP in the long-run, the cointegration equations revealed that RGDP, LFPR and FCFR adjusted to equilibrium in the long-run. The short run equations showed that all the variables in the model did not cause GDP at the lag level but had a jointly and significantly cause RGDP in the short run. This implies that education expenditure cause RGDP in the short-run as part of broader economic context.

This outcome deviated from Rathnayaka and Athukorala (2012) findings where their VECM model yielded significant short-run impacts on education expenditure to RGDP in Sri Lanka which is attributable to different economic structure between Kenya and Sri Lanka. The results from test for joint causality indicated that although higher education expenditure had no significant individual short-run effect of RGDP, its absence in the model fades the short-run joint causality of the other variables on RGDP. The results of this study differed with Machuki *et al* (2013) who established significant negative impacts of education expenditure on economic growth in Kenya. The variation in findings can be attributed to period covered in the time series data, variables included in the model, levels of education considered, that is all education levels as opposed to this study only considering higher education, as well as modeling method.

On the other hand, fixed capital formation and Inflation had a negatively significant long-run impact on RGDP. According to Solow's Model of economic growth, capital formation needs to accumulate at a higher rate than depreciation to positively impact economic growth in the long-run, otherwise capital output will decline therefore converging the economic growth to a steady state (Karl, 2005). Thus, higher rate of capital depreciation explains the long-run negative capital impact on economic growth in the model. Finally, the negative effects of inflation on GDP in the long-run resonates well with Feldstein, (2002) and Bulman and Simon, (2003) argument that Inflation affects return on capital negatively, slows down capital formation, and triggers losses in labor force efficiency resulting from unproductive activities for coping with rising prices.

CONCLUSION

The proportion of higher education expenditure is still small in Kenya to have significant short-run effects on GDP. The labor force participation resulting from investment in higher education does not cause GDP in the short-run. Thus as an expenditure, higher education spending does not have significant increase in GDP growth, although

as part of overall productive equation, higher education expenditure contributes significantly to long-run change in GDP growth rate.

Notably, higher education expenditure together with labor force participation rate have long- run positive effects on economic growth owing to graduates joining the labor force and effects of research output from universities which have long term effect on development.

The rate of depreciation of assets and productive equipment lowers the long-run effects of capital formation on economic growth. The level of inflation eats into the effectiveness and efficiency yielded from higher education spending by increasing labor costs and discouraging investments thus slowing the economic growth in the long-run.

RECOMMENDATIONS

From the findings of this study, the following policy recommendations were proposed;

- The government should increase the proportion of spending on higher education to promote high quality training, research and infrastructure in order to encourage broad based impacts in the short and long-run as well as shorten the payback periods.
- Implement stringent policy and legal guidelines relating to depreciation to ensure capital equipment imported into the country have long lifespan as depreciation affects economic growth negatively in the long-run.
- Design and implement responsive monetary policies to control inflation that reduces the long-run impact of higher education spending on economic growth.

Suggestions for Further Research

This study focused on analyzing the relationship of higher education expenditure and economic growth in Kenya using time series data of 1986-2016 where higher education expenditure was modeled together with three other variables. To extend the relevance of the finding of this study, future research should also explore the following;

First, study relationship of higher education spending and economic growth using a broader period time series, factoring more variables.

Secondly, an extended research to assess the graduates output, quality of workforce and how they affect economic performance in Kenya.

Thirdly, comparative relationship of government spending on higher education in comparison to secondary and primary education on economic performance to paint a holistic picture on the entire education system.

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APPENDIX

Time Series Data

Year	Higher Education spending as a percentage of GDP (EDUEXP)	Labor force Participation Rate (LFPR)	Real GDP Growth Rate (RGDP)	Fixed Capital Formation Rate (FCFR)	Inflation Rate (INF)
1986	0.77	69.3	5.6	16.8	2.5
1987	0.77	71.7	5.8	18.7	8.6
1988	0.85	72.1	6.1	19.3	12.3
1989	0.6	75.9	4.6	19	13.8
1990	0.76	73.8	4.1	18.7	17.8
1991	0.66	73.6	1.3	16.4	20.1
1992	0.74	73.4	-1.1	13.5	27.3
1993	0.97	73.1	-0.1	14.1	46
1994	1.02	72.8	2.5	15.1	28.8
1995	1.08	72.6	4.3	16.8	1.6
1996	1.95	72.3	4.1	15.7	8.9
1997	1.96	72.1	0.4	15.8	11.4
1998	1.84	72.0	3	17.4	6.3
1999	1.94	71.8	2.2	16.2	5
2000	1.98	70.8	0.3	18.2	7.8
2001	1.99	69.7	4	19.5	5.8
2002	1.69	68.5	0.5	15.7	2.2
2003	1.07	67.3	2.9	17.1	6
2004	1.1	66.1	4.6	17.7	8.4
2005	1.89	64.8	5.7	17.6	7.8
2006	1.71	65.0	5.9	18.6	6
2007	1.76	65.3	6.9	20.5	4.3
2008	1.89	65.6	0.2	19.6	15.1
2009	1.89	65.8	3.3	19.3	10.6
2010	1.91	65.9	8.4	20.7	4.3
2011	1.85	66.0	6.1	21.7	14
2012	1.68	66.0	4.6	21.5	9.4
2013	1.97	65.8	5.7	20.2	5.7
2014	1.77	65.7	5.3	22.4	6.9
2015	1.72	65.6	5.6	21.6	6.6
2016	1.69	65.4	5.9	17.2	6.3

Sources: KNBS economic Surveys (Various), World Bank Datastat, International Labor Organization (ILO), Central Bank of Kenya