

# GOVERNMENT SPENDING ON EDUCATION AND ECONOMIC GROWTH IN MOZAMBIQUE: A COINTEGRATION APPROACH

## AS DESPESAS DO GOVERNO COM A EDUCAÇÃO E O CRESCIMENTO ECONÓMICO EM MOÇAMBIQUE: UMA ABORDAGEM DE COINTEGRAÇÃO

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### Abstract

This paper focuses on the effect of government education expenditure and economic growth in Mozambique using quarterly data between 1996 and 2012. The Johansen cointegration technique were used to examine the long run relationship among the variables and the error correction was applied to evaluate the short run adjustment dynamics. The diagnostic statistics reveal a goodness of fit of the estimated model. The empirical findings revealed that the gross domestic product, government spending on education, gross capital formation and the labor force were integrated of order one. The study also found out that the government expenditure on education in Mozambique is quite low. The government spending allocated from the budget was not more than 20% in the past 15 years. This is considered below the recommended percentage set by UNESCO and NEPAD. The study suggested that a concerted effort should be made by policy makers to enhance educational investment in order to accelerate economic growth.

**Keywords:** Education, Economic Growth, Cointegration

### Resumo

O presente artigo tem como objectivo analisar o efeito dos gastos do governo com educação no crescimento económico em Moçambique usando dados trimestrais dos anos de 1996 a 2012. O teste de cointegração de Johansen e o modelo de correção de erro foram usados para testar a relação de longo prazo existente entre as variáveis e para avaliar a dinâmica de ajustamento de curto prazo. O teste diagnóstico estatístico revelou um bom ajuste do modelo estimado. Os resultados empíricos revelaram que o produto interno bruto, gastos do governo com educação, a formação bruta de capital e a força de trabalho foram integradas na primeira ordem. O estudo concluiu que os gastos do governo com educação em Moçambique são baixos. O orçamento alocado aos gastos públicos não ultrapassou os 20% nos últimos 15 anos. Esta percentagem é considerada abaixo do valor recomendado pela UNESCO e a NEPAD. O estudo sugere o esforço articulado deve ser feito pelos

fazedores de políticas para permitir o investimento na educação e desta feita acelerar o crescimento económico.

**Palavras-chave:** Educação, Cointegração, Crescimento Económico

## Introduction

The relationship between education and economic growth has been the subject of study in the economic literature, for the recognition of growth determinants, as well as estimates of its effects on overall domestic production. It constitutes an important tool to adjust the development process and improve the social welfare of the population. Therefore the impact of public spending on economic growth is one of the critical issues in the economic literature. Several models of endogenous or exogenous economic growth such as Solow (1956), Lucas (1988) and Romer (1990) highlighted the human factor, through spending on education, as being responsible for economic growth. Mozambique has experienced some macroeconomic stability registering growth rates at an average of 7% per year. However, despite the strong growth achieved in recent years, Mozambique remains with the group of the world's poorest countries. The educational context in Mozambique is a reflection of the low Human Development Index (occupying the position 184 out of 187) which of course is also reflected in the Education Development Index, in which the country stands on the 21<sup>st</sup> position out of 28 countries in sub-Saharan Africa on the present data on education (UNDP, 2000).

On the assumption that education represents a key role in economic growth and improving people's well-being, Mozambique has ratified several international documents promising to commit itself to improve the education system to efforts for education. Some of these agreements are: Jomtien Declaration, CONFINTEA, the World Declaration on Education for All (Dakar) and the World Declaration on Population and Development, the Millennium Declaration (making reference to universal primary education) (Mouzinho, 2005).

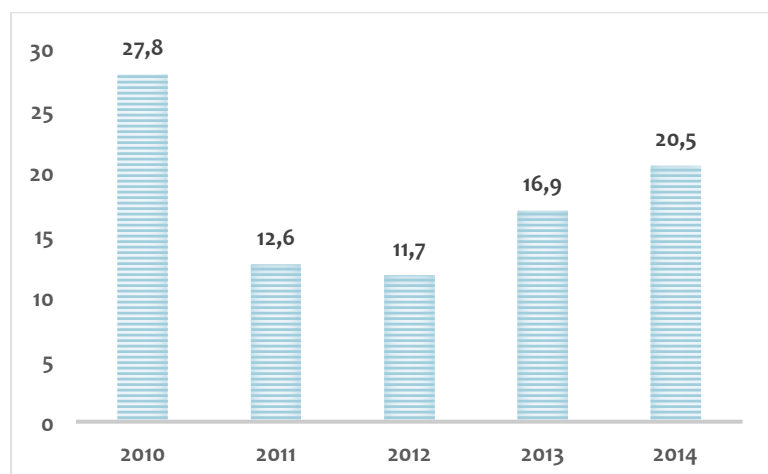
In 2004 Mozambique scraped school fees in primary education. Today the primary school is completed by 62% of children compared to 17% completed in the past, United Nations Education Scientific and Cultural Organization (UNESCO, 2012). The Action Plan for Poverty Reduction (PARPA II) which spans from 2006-2009 defined education as one of the priority areas of intervention in times of crisis.

Since 2007, the Education Sector Budget expanded on average 3.7 billion Meticaís (MT)<sup>1</sup> in order to accommodate an average annual growth of 198.1 thousand students, 5.8 thousand teachers and 861 schools. The nominal growth rate of government spending was considerable (Figure 1).

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<sup>1</sup>National Currency

**Figure 1: Government Spending on Education**

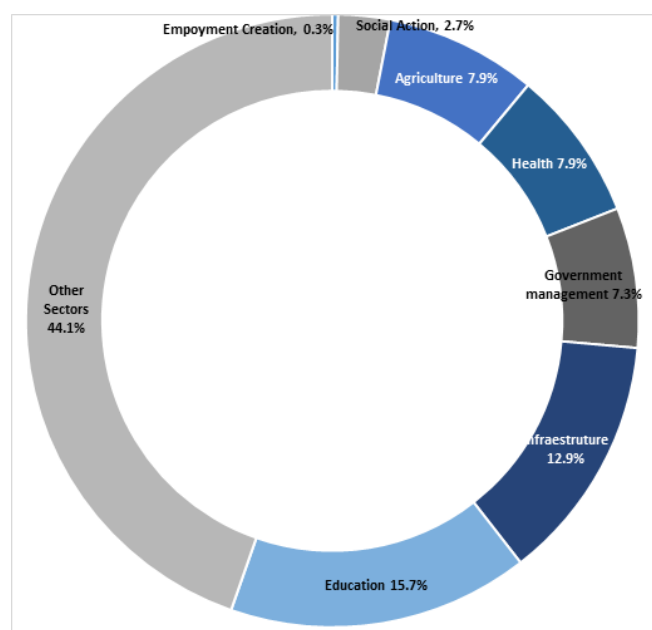


**Source: LOLE (2010-2014)**

The breakdown of public investment reveals that fact. In 2010, the education sector absorbed approximately 27.8% of the total funds allocated to priority sectors defined by the government strategic plans.

There is no doubt that the other sectors of the economy are important. But a good way to keep the economic growth supported by high growth rates is through education. Becker (1964) and Mincer (1974) highlighted that investment in education which represent investment in human capital can improve the economic activity.

**Figure 1: Government Spending on Priority Sectors**



**Source: LOLE (2010-2014)**

The Mozambican state has allocated, on average in the last years, approximately 15% of the budget for the education sector. This allocation initially reflects the Government's concern with the education sector. Mozambique has been motivated by the expressive of the increasing population.

In this context, this research aims to show the effect of Public Spending on Education and Economic Growth in Mozambique during the period 1996-2012 and to bring a new evidence for this area. The study employed several times series tests. But the main empirical evidence of the estimates was drawn using the Johansen's Cointegration and error correction approach.

## LITERATURE REVIEW

### Theoretical Literature Review

Mankiw Romer and Weil (1992) have investigated, using an endogenous model of economic growth, the link between education and economic growth. The model suggests that endogenous factors such as capital formation, technology, government policies, political stability, market distortions, human capital etc., can significantly affect overall economic performance in terms of growth. They have analyzed variations in enrolment rates for several countries. The conclusion highlighted the importance of schooling on economic growth. However, investment in educated and skilled workers will bring out efficient use of labour and capital resources for greater productivity.

The theoretical framework adopted by Mankiw Romer and Weil (1992) consider a standard neoclassical production function which begins from a premise that changes in quantities of factors of production account for growth. The neoclassical model is based on the Cobb-Douglas function and is given as:

$$Y = F(A, K, L) \quad (1)$$

Where Y, K, L are aggregate real output, capital and labour respectively, and A denotes technical progress or total factor productivity (TFP). Then by differentiating the equation with respect to time, we can reach the following equation:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \frac{A \delta F}{\delta K} \cdot \frac{K}{Y} + \frac{A \delta F}{\delta L} \cdot \frac{L}{Y} \quad (2)$$

Assuming that the neoclassical production function of Cobb-Douglas exhibits constant returns to scale, the share of physical capital, labour and the technical change sum up to one. Thus if  $\alpha$  is the capital share,  $\beta$  is the labor share, then the share of the educational capital is given as:

$$\gamma = 1 - \alpha - \beta$$

(3)

Finally we could get the augmented Solow's fundamental equation (4) by combining equation (2) and (3):

$$\frac{\Delta Y}{Y} = \alpha \frac{\Delta K}{K} + \beta \frac{\Delta L}{L} + \gamma \frac{\Delta A}{A}$$

(4)

Where  $\frac{\Delta Y}{Y}$  represents the growth rate of output,  $\frac{\Delta K}{K}$  represents the growth rate of physical capital,  $\frac{\Delta L}{L}$  represents the growth rate of labor and  $\frac{\Delta A}{A}$  represents the growth rate of TFP.

According to Ayara (2003) the growth rate of total factor productivity is caused by changes in capital formation and improvement in human capital due to education. From the model, it is expected that the more the number of labourers, physical capital and educational capital which is employed, the higher the level of national productivity.

Using natural logarithm on the equation (4) the equation becomes:

$$\ln Y = \ln C + \alpha \ln K + \beta \ln L + \gamma \ln A$$

(5)

This specification can also be expressed in rates of growth with this extended model from Solow it can be easily used to carry out simple regression-based estimates of the impact of educational capital on economic growth.

### Empirical Literature Review

Teixeira and Fortuna (2003) have applied the Pack (1994) argument to empirically assess the importance of human capital as a direct or indirect (through innovation) cause for Portuguese economic growth from 1960-2001.

The study results were achieved using Johansen Cointegration technique and a Vector Error Correction Model (VECM) with two lags. The long run structural relations between TFP, human capital and innovation capacity (knowledge stock). These structural relations are based on a log-linear specification of the joint evolution of total factor productivity (proxy of technological progress), internal knowledge stock (accumulated expenses in Research and Development) (R&D) and human capital stock (average number of years of schooling). They have used the average number of years of schooling as a proxy of human capital, the accumulated expenses in R&D as a proxy of internal stock of knowledge or internal innovation capability. The main conclusion that Teixeira and Fortuna (2003) have drawn is similar to that one concluded by Barro (1991). They have stated that a greater aggregated

economic activity will be caused by a higher endowment in human capital and/or a greater innovation capability (these two factors being interrelated, as more human capital tends to stimulate innovation capability of an economy).

Babatunde and Adefabi (2005) empirically assesses the direct effect of education on economic growth in Nigeria during the period of 1970-2003. The general objective of the study was to investigate the long run relationship between education and economic growth in Nigeria between 1970-2003. The methodology used in the study was Johansen Cointegration technique and Vector Error Correction Methodology followed by Leoning (2002). Babatunde and Adefabi (2005) consider two different situations in their model: firstly, they considered human capital as an independent factor of production. And secondly they assumed that the level of human capital instead of growth. They state that the economic growth rates perform a basic role in the determination of the growth of output per worker whereby human capital affects the productivity parameter. The Johansen Cointegration result establishes a long run relationship between education and economic growth. They have stated that a well-educated labour force appears to significantly influence economic growth both as a factor in the production function and through total factor productivity.

In the same context, Dauda (2005) analysed the Investment in Education and Economic Growth in Nigeria using a cointegration Approach. She conducted the study under the assumption of education as being a component of human capital formation and being an important factor for increasing the productive capacity of people. She adopted a theoretical framework similar to Teixeira and Fortuna (2003) and Babatunde and Adefabi (2005). It relied on the theory explored by MankiewRomer and Weil (1992). She applied the Johansen Cointegration technique and Vector Error Correction to test empirically the impact of investment on education on economic growth performance. The variables used for the study were: Real gross domestic product, Total expenditure on education, Physical capital formation proxied by gross capital formation and the Labour force. The study provided an empirical evidence on the impact of investment on education on economic growth in Nigeria.

Odit et al. (2012) conducted a research impact of investment in education on economic growth in Mauritius. The main objective of the study was to bring new evidence on the relationship between education and economic growth and also investigated whether formal models shed any light on the claim that education plays a central role in growth. They have applied an adapted a Cobb-Douglas production function which exhibits constant returns to scale from Leoning (2002) where the human capital was treated as an independent factor of production in the human capital augmented growth model to examine the effect of education on economic growth using the human capital augmented production function and the Error Correction Model. The variables of the study were the real gross domestic product, the capital stock, Human capital stock and labour. In this case Oditet.all. (2012) used the human capital defined as the average years of schooling of the total population aged 15 and above. They have concluded that human capital was considered as an important role in economic growth mainly as an engine for improvement of the output level. This conclusion

is in line with the findings of Bils and Klenow (2000). They have concluded that countries experiencing high rate of enrollment in schools made faster growth in per capita income.

Zivengwa (2012) investigated the causal relationship between education and economic growth in Zimbabwe during the period 1980-2008. The study explores the idea of Education as a way of contributing to economic growth. He distinguished two ways. Firstly, education directly affecting economic growth via capable workers. Secondly, education indirectly affecting economic growth by leading to the creation of knowledge, ideas and technological innovation. The starting point is that growth and human capital development can be mutually reinforcing. The conclusion is in line with Jaoul (2004) ideas when he said growth promotes human capital development, and human development promotes growth.

The methodology used by Zivengwa (2012) is straightforward. He empirically evaluated the results using Pairwise Granger Causality and Vector Autoregression (VAR). The model he applied is an extension to the one applied by Leoning (2002). The variables of the study were the gross domestic product, the investment on education as a proxy of human capital and Physical capital (investment) referred to an increase in capital stock in the economy and is one of the traditional determinants of economic growth. Gross Fixed Capital Formation is used as a proxy for physical capital investment. The conclusion confirms the assertion made by the growth theories. Investing more resources in human capital development is vital for labour productivity and growth of the economy. This in turn will lead to poverty reduction. Furthermore, the results also confirm that education can lead to economic growth through its impact on physical investment. Investing in human capital will lead to improvement in physical capital productivity which in turn leads to economic growth.

In conclusion, all the revised studies have applied the MankiewRomer and Weil (1992) model to build their endogenous growth model. The conclusions from the literature support the notion that education is important for economic growth for a country.

## METHODOLOGY

The estimation of how government expenditure on education affects the economic growth was applied using the augment theory of growth explored by Mankiew Romer and Weil (1992). The study was conducted in Mozambique and used quarterly time series data for the period 1996-2012 to estimate the effects of the components of the augmented production function on economic growth.

### Variables of the Study

The data we used were taken from the Mozambique National Institute of Statistics (INE) online at ([www.ine.gov.mz](http://www.ine.gov.mz)) and the World Bank (WB) data base, World Development Index (WDI) online at (<http://data.worldbank.org/country/mozambique>). The variables used are the Gross Domestic Product (GDP), Gross Capital Formation (GCF), Government Spending on Education (GEDU) and the Labor Force (LBF).

- **Gross Domestic product (GDP)** is the total amount of final goods and services produced by a country in certain period of time, normally one year. The GDP (Y) is taken as a proxy for economic growth performance. This is the commonly used measure of economic growth as also used by Romer (1990), Rebelo (1991) and Tamang (2011). Economic growth is expected to relate positively and significantly with education and physical capital investment.
- **Government Expenditure on Education (GEEDU)** represents the portion of nation government spending with education. The functional areas supported by the government budget are higher education, secondary education, primary education, institutional development and others. The variable here is used as a *proxy* of Human Capital (H) as Tamang (2011) did. Human capital (H) refers to the stock of qualified hand labor to produce technically.
- **Gross Capital Formation (GCF)** represents an increase in capital stock (K) in the economy and is one of the classical determinants of economic growth. Gross Fixed Capital Formation, is a macroeconomic concept used as measure of the net investment in an economy, is used as a proxy for physical capital investment. The Gross Capital Formation is used as a *proxy* of Physical Capital Investment. This is the commonly used measure of economic capital stock as also used by Romer Tamang (2011) and Zivengwa (2012).
- **Labor Force (LBF):** Total labor force comprises of people of ages 15 and older who meet the International Labour Organization definition of the economically active population: all people who supply labor for the production of goods and services during a specified period. It includes both the employed and the unemployed (<http://data.worldbank.org/indicator/SL.TLF.TOTL.IN>).

### Empirical Model

The variables used in the study exhibits a strong trends, that is, they are nonstationary. This study uses Augmented Dickey-Fuller (ADF) unit root tests in order to check and make sure that the dependent variable are stationary at  $I(0)$  or  $I(1)$ .

The model used is the famous human capital augmented growth model in which human capital enters as an independent factor of production in the production function. Relying on previous studies such as Tamang (2011), Dauda (2009), Mankiw, Romer, and Weil (1992). The following model was employed to determine empirically the impact of investment in education on economic growth performance in Mozambique. All the variables, were expressed in logarithms to smoothen the data which displayed a high trend.

### The VAR Methodology

After testing for unit roots, the long run relationship explained by the Johansen Co-Integration test was applied. If all variables are integrated of the same order,  $I(1)$  for example, the next step involves the application of the Vector Error Correction Model (VECM) in which all variables enter the above model in their first differences. The VECM combines the long-run dynamics with short run dynamics.



### Error Correction Model

Three tests statistics are suggested to determine the number of cointegration vectors: the first is Johansen's "trace" statistic method, the second is his "maximum eigen value" statistic method, and the third method chooses  $r$  to minimize an information criterion.

## EMPIRICAL ANALYSIS

### Trend of the Series

The variables of the study were collected from two main data sources:

- National Institute of Statistics from Mozambique ([www.ine.gov.mz](http://www.ine.gov.mz))
- World Bank (<http://data.worldbank.org/country/mozambique>).

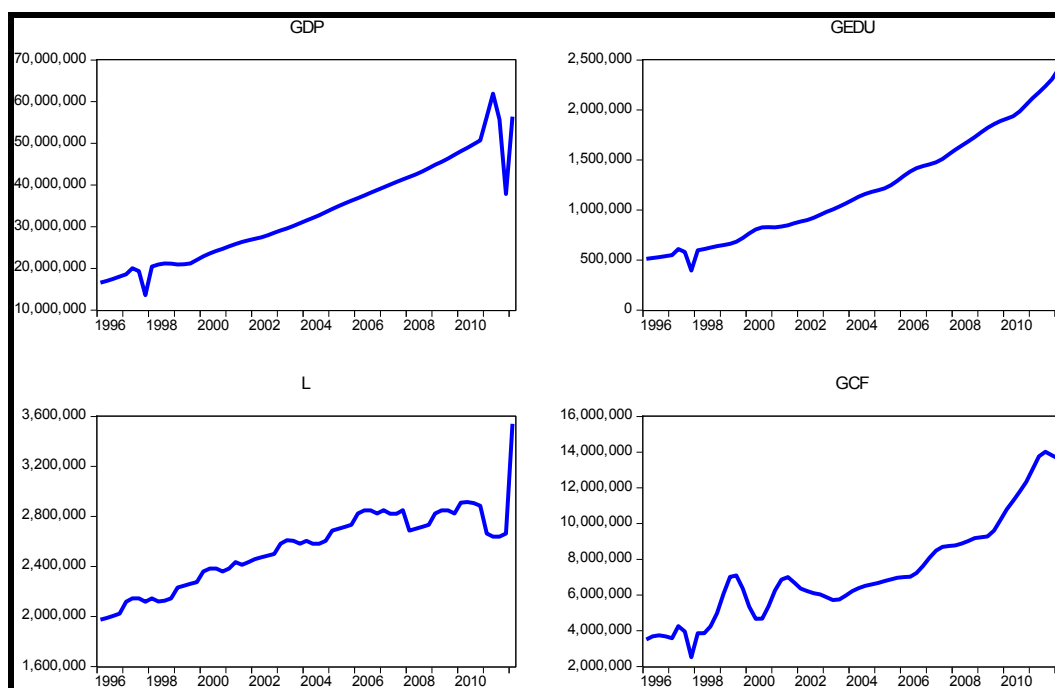
The trend for the series is presented in Figure 3.

The GDP of Mozambique has grown in recent years. The graph clearly shows this evolution, with some falling records of the national production. It should be noted that the annual growth rate has been one of the largest worldwide.

The GCF showed the same behaviour. Therefore, the value of purchases of durable goods increased in 1996-2012 period. Included in this variable the purchase of machinery, equipment, transportation, repairs due to capital works in construction, growing crops, import capital goods and other investments. Since 1999 and 2000 there have been a reduction in investment. This reduction is associated with the floods that affected the country and some reduction in national economic activity.

Public spending on education has also shown an increasing trend. On average, in recent years, the budget of the resource associated with public spending averaged at 15% annually.

The population as well as human capital has been growing. The Council of Ministers (2006) pointed out that productivity growth mainly depended on investment in education and health. This human capital is increasing and has taken challenges such as the inability of the economy to generate jobs, low educational provision which does not allow in short-term to be more productive, reducing the State's presence as an employee, because of changing the role of the economy and the precarious health problem that it faces.

**Figure 3: Times Series Plot**

**Source: Authors' Representation**

### Unit Root Tests using ADF

The time series used in this study shows an increasing trend. It is expected that most time-series variables are non-stationary in their levels and that several of these variables are therefore, represented in their first difference. Then the time-series are therefore said to be integrated of order one and are denoted by  $I(1)$ . This implies that these selected series become stationary when they are differenced once.

Initially, the stationarity of the variables GDP, GEEDU, GCF and LBF is verified. The stationarity of the data set was performed using Augmented Dickey-Fuller (ADF) (1981). We test for the presence of unit roots and identify the order of integration for each variable in levels and first differences. The variables were specified including intercept. The results of the ADF test are presented in Table 1.

**Table 1: Results from Unit Root Tests**

Variables	ADF Statistic	Test critical values	Order of Integration
LnGDP	-9.689975*	-2.909206	$I(1)$
LnGEEDU	-2.914517*	-2.172122	$I(1)$
LnLBF	-4.769722*	-2.91086	$I(1)$
LnGCF	-5.380338*	-2.909206	$I(1)$

\*Significant at 5% level.

**Source: Authors' Computation**

The ADF unit root test for GDP, GEEDU, GCF and LBF confirmed that variables have unit root or integrated of order one in their level and become stationary in their first differences, at least at the 5% level of significance.

### Johansen Cointegration Test

Since all variables are integrated of the same order  $I(1)$  the next step involved the application of the Johansen cointegration test. Johansen (1988) and Johansen and Juselius (1990) stated that the method should give asymptotically optimal estimates since it incorporates a parametric correction for serial correlation. The nature of the estimator means that the estimates are robust to simultaneously bias, and it is robust to depart from normality. Johansen method detected a number of cointegrating vectors in non-stationary time series. It allowed for hypothesis testing regarding the elements of co integrating vectors and loading matrix. The cointegration test results are reported in Table 2:

**Table 2: Unrestricted Cointegration Rank Test (Trace)**

Hypothesis Null	$\hat{\lambda}$ Eigenvalue	$\lambda$ Trace	Critical Value 5%	Prob.
None *	0.545468	66.67357	47.85613	0.0003
At most 1	0.196209	19.36435	29.79707	0.4670
At most 2	0.090268	6.259413	15.49471	0.6649
At most 3	0.009671	0.583094	3.841466	0.4451

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level

**Source: Authors' Computation**

The cointegration test results for Public Spending on Education and on Economic Growth rejected the null hypothesis of no cointegration by showing the existence of at most one cointegrating equation at 5% level. This means that GEED, GCF and LBF affects the GDP in long run in Mozambique.

### Error Correction Mechanism

Having verified that the variables are cointegrated of the same order, the vector error-correction models (VECM thereafter) can be applied. The ECM displays the short-run adjustment dynamics. In other words, the ECM indicates the speed of adjustment towards the long run equilibrium after a short run shock. In this case, best fitting or parsimonious ECM was selected. The results are presented in Table 3:

**Table 3: Vector Error Correction Model**

Variables	Coefficients	t-Statistic	Probability
ECM (-1)	-0.385457	-2.406636	0.0479
D(LnGEEDU(-3),1)	3.015494	2.80669	0.0062
D(LnGCF (-2),1)	1.617546	2.025316	0.0459
D(LnLBF(-2),1)	0.345085	1.434371	0.1550
C	0.059374	2.334374	0.0219
R-squared	0.972077		
Adjusted R-squared	0.930193		
F-statistic	23.20877		
Prob(F-statistic)	0.000000		
Durbin-Watson stat	1.896048		

**Source: Authors' Computation**

The empirical results show that estimated lagged error correction term is negative and statistically significant t, suggesting that error correction is happening in the model. The coefficient of feedback is -0.385457, therefore the ECM is able to correct any deviations in the relationship between GDP and the explanatory variables. The coefficient suggests that approximately 38.55% of disequilibrium in previous quarter is corrected in the current quarter.

The adjusted  $R^2$  remained 93%, which shows the validity of fit. By implication, this shows that over 93 percent of the variations GDP is explained by GEEDU, GCF and LBF taken together. The F-statistics of 23.21 demonstrates that the explanatory variables of the model are important determinants of the GDP in Mozambique. All in all, these statistics and also the Durbin-Watson reveal a goodness of fit of the regression results.

The estimated coefficients were positive and significant except the LBF which was not significant (Table 3). There are in accordance with a prior expectation of the theory. A positive variation of the explanatory variables leads to an improvement of economic growth. These results corroborate with the findings from Babatunde and Adefabi (2005) and Dauda (2005) which indicated a positive relationship between investment in education and long run economic growth for Nigeria.

## Structural Analysis

The impulse response functions (IRFs) and variance decomposition (VD) are often used to explain the dynamic effects of the shocks on the endogenous variables since estimated coefficients from VAR models often appear to be lacking in statistical significance due to the inaccuracy of the technique in estimating standard errors. The VD separates the variation in an endogenous variable into the component shocks to the VAR. It can be used to estimate the importance of various structural shocks. An IRF traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. While IRFs

trace the effects of a shock to one endogenous variable on to the other variables in the VAR, variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR.

Nonetheless, the IRF has been criticized on the basis of being sensitive to variables ordering. Hence we adopt the use of the generalized impulse response function (GIRF) which is insensitive to variable ordering to analyze the interactive responses between oil price and stock markets and obtain the contribution of oil price shocks to the variability in stock returns. Also, in contrast with IRFs for structural models, generalized impulse responses do not require that we identify any structural shocks. Pesaran and Shin (1998) proposed a more general alternative to the Choleski decomposition which is unaffected by the ordering of the variables and which does not require the orthogonalisation of the reduced form innovations. The resulting responses are unique and fully take account of the historical patterns of correlations observed amongst the different shocks.

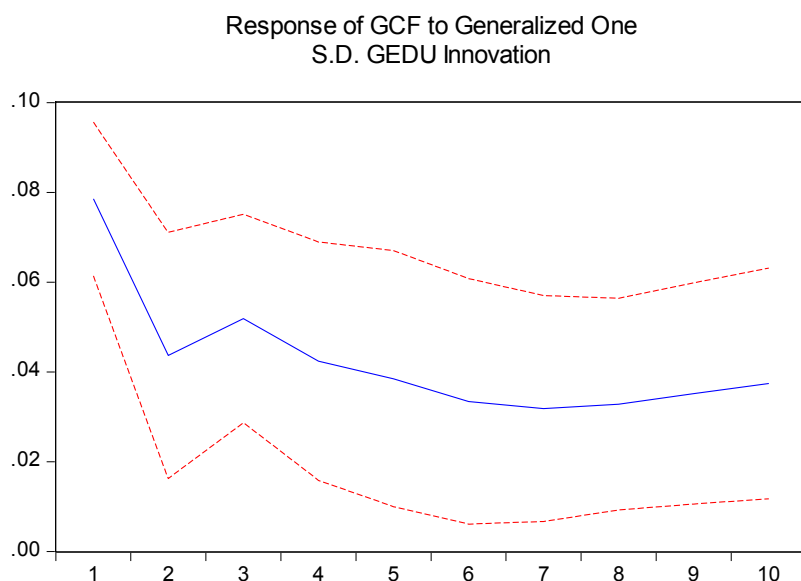
The representation in Figures 4, 5 and 6 presents the generalized impulse response analysis for government spending on education in Mozambique. The GIRF revealed that gross domestic product (GDP), gross capital formation (GCF) and the labour force respond positively to government expenditure on education. This confirmed the error correction analysis that government expenditure on education contribute to the economic growth of Mozambique. Although there are fluctuations in the response, it was positive through the estimation period. Overall, government expenditure on education tends to improve the gross domestic product, gross capital formation and the labour force.

**Figure 1: Generalized Impulse Response of Gross Domestic Product to Government Expenditure on Education**



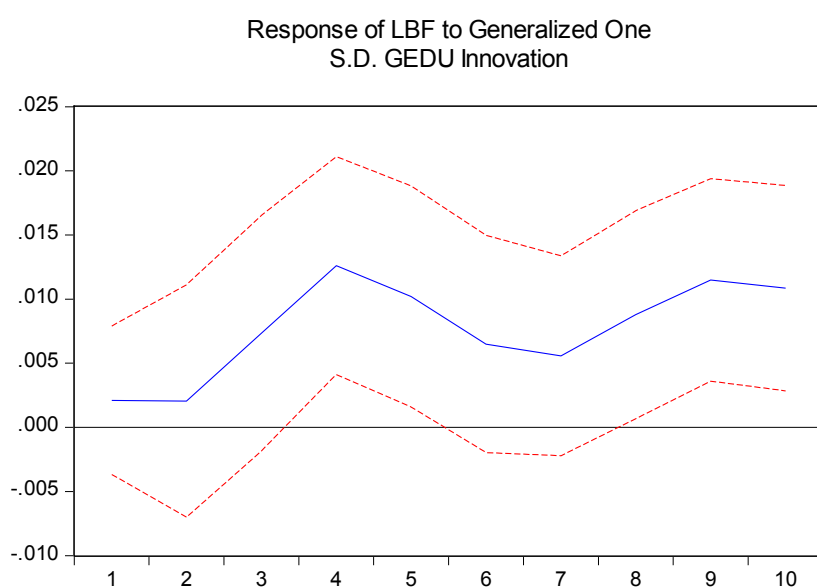
**Source: Authors' Representation**

**Figure 2: Generalized Impulse Response of Gross Capital Formation to Government Expenditure on Education**



Source: Authors' Representation

**Figure 3: Generalized Impulse Response of Labour Force to Government Expenditure on Education**



Source: Authors' Representation

We decompose the variables to know their relative importance in future prediction. The Table below shows the results of the variance decomposition of the variables within a 20 month period horizon. The VD reveals that 16.0%, 20.5% and 22.1% of future changes in economic growth is due to changes in the government expenditure on education in the 5<sup>th</sup>, 10<sup>th</sup> and 20<sup>th</sup> period. This implies that government expenditure on education have a significant future impact on economic growth in Mozambique. A close examination of the

table reveals that the effect of government expenditure on economic growth is increasing in time compared to the labour force which effect is decreasing in economic growth.

**Table 4: Variance Decomposition Error**

Cholesky Ordering: GDP GEDU GCF LBF

Period	S.E.	GDP	GEDU	GCF	LBF
1	0.079886	8.617795	5.505863	4.197136	81.67921
2	0.085141	12.95838	26.98629	2.749958	57.30537
3	0.093661	10.04585	20.83380	5.251763	63.86858
4	0.104000	20.86979	16.92287	5.806444	56.40090
5	0.113837	28.83933	15.80464	5.386599	49.96943
6	0.123469	29.19239	16.04965	5.279901	49.47805
7	0.128993	27.25735	19.11544	4.966254	48.66095
8	0.133748	25.95818	20.62949	4.837060	48.57527
9	0.139423	29.13199	19.53491	4.681991	46.65110
10	0.145233	32.92903	18.46951	4.431079	44.17038
11	0.151130	33.82397	18.50576	4.356986	43.31328
12	0.155484	33.12898	20.02356	4.245590	42.60186
13	0.158981	32.58276	21.25460	4.147511	42.01513
14	0.162843	33.79752	21.10434	4.078684	41.01945
15	0.166970	35.72920	20.56434	3.967039	39.73942
16	0.171166	36.56141	20.56951	3.890103	38.97898
17	0.174796	36.41409	21.36081	3.820795	38.40430
18	0.177957	36.20828	22.17851	3.750435	37.86278
19	0.181215	36.80218	22.32012	3.682978	37.19472
20	0.184623	37.91053	22.10345	3.601564	36.38446

**Source: Authors' Computation**

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another times series. The result of the pairwise granger causality tests reveals that there is a unidirectional relationship between government expenditure on education, gross domestic product, gross capital formation and labour force. It shows that government expenditure on education granger causes gross domestic product, labour force and the gross capital formation at the 1 per cent level of significance. The variables however do no granger causes the government expenditure on education. This confirms the earlier findings of the importance of government expenditure on education in Mozambique.

**Table 5: Pairwise Granger Causality Tests**

NullHypothesis:	Obs	F-Statistic	Prob.
GEDU does not Granger Cause GDP	63	12.4354	0.0000
GDP does not Granger Cause GEDU		0.15879	0.8535
GCF does not Granger Cause GDP	63	0.02034	0.9799
GDP does not Granger Cause GCF		8.09321	0.0008
LBF does not Granger Cause GDP	63	4.11078	0.0214
GDP does not Granger Cause LBF		15.3441	0.0000
GCF does not Granger Cause GEDU	63	0.72413	0.4891
GEDU does not Granger Cause GCF		15.1579	0.0000
LBF does not Granger Cause GEDU	63	0.19499	0.8234
GEDU does not Granger Cause LBF		6.67424	0.0025
LBF does not Granger Cause GCF	63	1.29633	0.2813
GCF does not Granger Cause LBF		4.52486	0.0149

**Source: Authors' Computation**

## CONCLUSION

According to economic theory, human capital or educational attainment in an economy has long been viewed as an important factor in enhancing and promoting output or economic growth. Therefore, this study aims at showing the Effect of Public Expenditure on Education and Economic Growth in Mozambique during the period 1996-2012.

Using the standard growth-accounting model and relying on cointegration and error-correction techniques we have confirmed empirically that the long run relationship between economic growth and government expenditure. The existence of a positive impact of education on economic growth is consistent with most of the previous studies.

The study found out that the government expenditure on education in Mozambique is quite low. The government has allocated not more than 20% from the budget in the past years. This is considered below the recommended percentage of 26% set by UNESCO and NEPAD (2002) which states the member countries to increase the share of the education budget in the total budget of the State (not below 20%).

One of the policy lessons from these results is the need for development plans of the country to set education as a prior sector to promote economic growth. Education can play its role in economic growth and benefit the society and individual as well. For individual education increases employment opportunities and higher income and improved life quality.

However, additional research needs to be conducted to examine the education - growth linkage at country level in greater detail and to analyze the impact of the quality of education on productivity and national growth rates.



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