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THE EFFECT OF ACCESS AND QUALITY OF EDUCATION ON ECONOMIC DEVELOPMENT IN BOTSWANA

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ABSTRACT

The study investigates whether or not access and quality of education contributes to the development process and economic well being of Botswana by (1) examining the impact of access to education on economic development, (2) establishing the relationship between quality of education and economic development and (3) testing the causal relationship between education and economic development. The study uses time series data from 1980 to 2014 which was analyzed using vector error correction model and vector auto regression approaches to test both long and short run relationships respectively. The paper provides a strong background on the political economy of education in Botswana since independence to date as a departure from our current understanding in literature. Findings show that the level of access to education has a positive and significant effect on the level of economic development; there is bidirectional causality between quality of education and the level of economic development; unidirectional causality moves from economic development to access to education. The study suggests that access to education should be complemented by enhancing more employment creation to forester long term development and private investment in inventory and tangible assets should be enhanced. Attracting more foreign direct investment and maintaining low inflation improves quality of education in the short as they work through enhanced economic development.

Keywords: Botswana, Education, Quality, Access, Economic development, Causality, Cointegration.

JEL classification: O11, I25, H52.

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Contribution/ Originality

The paper contributes to the existing literature by showing bidirectional causality between quality of education and the level of economic development. Access to education has both long and short run effects on economic development. The impact during the former period depends on the measure of access to education employed.

1. INTRODUCTION

Education is an important element of human capital formation which in turn enhances growth by working through improved productivity levels (Reza and Valeecha, 2012). Human capital formation is important as explained by the endogenous growth theory. Sustainable economic growth is guaranteed in the presence of solid human capital development, thus the quality and quantity of education matters (Abiodun and Iyiola, 2011). The other important aspect of improving growth is to focus on primary education combined with information technology which improves quality. The incorporation of information technology into education has potential to

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increase productivity since all jobs functions are technology driven (Kausar, 2010). The more educated the society is the better it becomes in making good use of the current and future technologies. Education assists economies as they transition from industrial to a knowledge society which is now the focus of the Botswana policy makers. Education improves the future competitiveness of a country as it builds a solid foundation of knowledge. In any society people become free to participate in economic, socio and technological processes as they become educated. Education has the potential to trigger growth and diversification processes of a country and to help in the alleviation of poverty. The more educated the society becomes then the better placed they are in terms of creation of income generating opportunities. Development becomes a reality as the country's education expands and the quality of its education system improves. It is agreeable that development is driven by several factors among them is education which plays a vital role in increasing the rate of growth. It has the power to transform a nation as citizens gain the technical knowhow.

Considering the link between education and economic growth, one of the most worrisome observations is the fact that the average growth rate of per capita Gross Domestic Product for Botswana has been falling over the years. According to Leith (2005) the annual averages were 7.5% (1980 – 1990), 3.2% (1990-2000) and 3.5% (2000-2008). The country's growth potential was adversely affected by the global financial crisis in 2007/8 which saw the price fetched by diamonds, the key revenue generating source, falling. The global crisis was on its own a test of the sustainability of the country's robust growth and budget surpluses as such the GDP growth rates for 2007 and 2009 were 5.3% and 3.3% respectively, Africa Development Bank Report (2009). Growth in per capita GDP has been registered in 2013 at 5% per annum, which was underpinned by increased diamond exports and expansion in the mining sector being supported by robust government policies. The growth in per capita GDP in 2014 was 4.3% with an expected fall in the years 2015 and 2016 being 3.6% and 3.4% respectively (Honde and Abraha, 2015). These performance levels are still below the much coveted rate of growth of 7.5% as outlined in the country's Vision 2016 (Ministry of Finance and Development Planning, 2013). Greater strides have been made in improving access and quality of education in Botswana at a high cost. Quality is expensive to maintain, but it should make a huge contribution to the economic well being. The most important questions arise in this case: whether or not quality and access to education contributes to current and future economic development; whether or not the contribution of education to economic development is direct or indirect? This would form the basis upon which the government can justify spending a huge amount of its revenue on human capital development. Expenditure on education has been seen to have a positive and significant effect on enrolment at primary and secondary schools (Anyanwu and Erhijakpor, 2007). There is a high correlation between education and economic well being of a nation. The level of investment which the government of Botswana needs to make but still remains questionable.

The paper contributes to the existing literature on education and economic growth by assessing whether or not access and quality of education contributes to the development process and economic well being of Botswana; proving evidence on the direction of causality and the significance of the relationship between quality education and economic growth in both the short and long run. The paper provides evidence that shows a point of departure from literature by showing that there is bidirectional causality between quality of education and the level of economic development. The impact of access to education on the level of economic development in the long term is sensitive to the measure used to capture the access to education variable. For this reason access to education has both long and short run effects on economic development. An improvement in access to education has a positive and significant effect on economic development. The shocks to quality of education affect the behavior of economic development and vice versa. The level of quality of education is driven by the level of economic development in Botswana.

2. POLITICAL ECONOMY OF EDUCATION AND ECONOMIC DEVELOPMENT IN BOTSWANA

Human capital investment in Botswana is not an option but a priority as the country endeavors to build an innovation driven economy. Tertiary education makes attaining this dream possible by guaranteeing an adequate skills base. The country could be transformed into a regional education hub by strengthening current public-private partnerships and opening up to international players (Velde and Cali, 2007). The country is now classified a middle income economy with a population of 1.9 million as of 2007. It has enjoyed steady economic growth since independence in 1966 and even in the education sector with 250 primary schools and 9 secondary schools (Botswana Federation of Trade Unions, 2007). The number of primary and secondary schools is on the rise for example there were 740 primary schools and 210 junior and secondary schools by 2002 which is an improvement compared to the 1966 levels (Kinghorn *et al*., 2002). Evidence shows that by the end of 2008 there was over 790 and 276 primary and secondary schools respectively[1] and statistics also show that the numbers lightly increase between 2010 and 2012 to 805, 810 and 812 primary schools respectively. For the same period secondary schools were 274, 275 and 279 respectively. These figures include private primary and secondary schools which are 60 and 40 respectively in the year ending 2012 (Statistics Botswana, 2014). Post independence the government has managed to make progress in both human and economic development. The Ministry of Education and Skills Development (MESD) houses all the education related departments among them are primary, secondary and tertiary education.

The educational sector in Botswana went through a reform program in 1977 known as Education for Kagisano, which means Social Harmony, with the aim to improve access to education. This was to be achieved through providing basic education which would be completed upon reaching form two. This was in place until 1993 when the Revised National Policy on Education (RNPE) was put in place and facilitated the formulation Tertiary education Council (TEC) in 1999 which is an oversight board for all tertiary institutions. This had the duty among others: to check the quality of education programs being offered by tertiary institutions, whether private or public, in Botswana; give advice in the formulation of policy on tertiary education; coordination of long term planning in education; promotes research linked to industry; human development and accreditation of private tertiary institutions[2]. Botswana Training Authority (BOTA) came as a result of the Vocational Training Act in 2000 as a parastatal under the Ministry of Labor and Home Affairs[3]. The mandate was to reform, operationalize and monitor vocational training system in Botswana. It had the mandate to accredit both institutions and trainers with its main focus on education levels up to certificate which meant that there was duplication of activities which were also covered by TEC (Ministry of Education and Skills Development, 2008). The government through the MESD has managed to streamline the functions of the two institutions by formulating the Human Resource Development Council (HRDC) which was formally known as TEC and the Botswana Qualifications Authority (BQA) formally known as BOTA. TEC ceased to exist as a result of the coming in of the Human Resource Development Council (HRDC) by way of the HRDC act number 17 of 2013. In addition to the functions of TEC the HRDC manages funds for human development, promotes workplace and develop strategies for student attachment, internships and it ensures the existence of a link between different levels of education, training and skills development[4]. The BQA was formulated by way of the BQA Act of 2013 and commenced operations in November 2013. Its objectives are

[1] Statistics Botswana (2012).

[2] http://www.tec.org.bw/

[3] http://www.bota.org.bw/

[4] http://www.hrdc.org.bw/node/5

twofold: firstly providing and maintaining the National credit and qualifications framework and secondly coordinating the education, training and skills development quality assurance system. It is also now incorporating, among its functions, the registration and accreditation of institutions at Tertiary level which was formally done by TEC[5].

The government of Botswana in 1994 made effective RNPE with aim that this would guide the education sector for the next 25 years. It was put in place to continue to make the provision to basic education to every child a priority and to increase access to education. This policy focused much on quality with the aim to increase the rate at which students' transition from junior to secondary school and the target then was to attain a transitional rate of 49% (Kinghorn *et al*., 2002). The RNPE was somehow successful in identifying some key issues in the tertiary education sector among them the failure to have policies, lack of coordination and unified administration of tertiary education. This gave rise to the crafting of a policy known as "Towards a Knowledge Society" which had the aim to guide the future direction of the tertiary education for the following two decades and this would foster the development of the country as a knowledge society (MESD, 2008). This policy recognized the importance of education in the future of Botswana. The challenges identified during the crafting of this policy included (1) an education system which had multiple accountabilities, (2) failure to have a more economic educational system (there were many private and public colleges with few enrolments), (3) offering of poor education by private tertiary institutions, (4) release of graduates who were not work ready, (5) lack of access to education and inequality due to the skewed location of educational institutions and (6) poor governance within educational institutions, MESD (2008). All these six observations are potential areas of research in the Botswana educational sector.

The government of Botswana, since 1966, adopted a series of National Development Plans (NDP) but the first of this kind was produced in 1965 which was known as Transitional Plan for social and Economic Development. NDP 10 was brought into the picture to direct the country's overall development process in 2007 but it was operational in 2009. It is expected to drive the country's development agenda for the period 2009-2016 in which case the vision 2016 objectives would be translated into policies and actions that were more concrete. NDP10 was intended to improve the skills base through educating and training the labor force. In an effort to achieve the aims of NDP10 the government came up with three programs. It is within the first program that the government, through the MESD, aimed to improve access to education at five levels: early childhood, primary, secondary, tertiary and vocational. This goal also encompasses those children who are out of school, the disadvantaged and those who have special needs. The program aims to bring to fruition the country's diversification agenda (ADBR, 2009).

The management and performance of the entire economy has been above board with most of locally generated resources, especially from diamonds which are a key revenue source, financing all the key economic activities. According to MESD (2008) few citizens managed to gain entry into tertiary education level around the 1970s. The average literacy rate, according to ADBR (2009) was at 82% in 2009 which can be compared to a rate of 54.8% in 1991. The literacy levels have shown an increase over the years being 68.9% (1993), 81.2% (2003) and 88.6% in 2014. This calls for the country to come up with useful policies and programmes which will contribute to economic development, Statistics Botswana (2015). In terms of giving priority to financing education the government has been of late allocating quite a sizeable amount the tax payer's money to this sector. The allocations as percentage of the national budget were as follows[6]: 20% (2009), 32.6% (2010), 31.1% (2011), 27.3% (2012), 22.98% (2013), 29.4% (2014) and 28.1% (2015). The government has shown its commitment in improving both access and quality of

[5] http://www.bota.org.bw/?q=node/195

[6] See http://www.finance.gov.bw/

education by giving the MESD the largest share in 2012 national budget for example though it was lower in percentage terms than what was allocated in the previous year's budget due to the fall in bursaries for tertiary education students in foreign institutions[7]. In the year 2012 the Government launched an Education and Training Strategic Plan which aimed among other things to guide on the prioritization and allocation of resources and fostering improvements in delivery of education and development of skills in Botswana. The development budget in 2013 accounted for 82% of the money set aside by the education ministry for development (expansion and refurbishment of secondary schools) purposes[8]. The key observation is that, in each budget period, the education ministry received a lion's share though percentages appeared to be falling compared to previous years.

The levels of enrolment in primary and secondary education have been around 100% and 90% respectively and equal chances were given to all with no respect for gender and geographical factors. The rural populace was afforded an equal chance as well. Evidence on table 1 shows that the rate of transition from junior to senior secondary schools increased by 32.5% between 2001 and 2008. This rate is still low which can be explained by deficiencies in the examination system or the problem of low admission capacity thus access level will be low. The rate of transition from standard seven to first year at secondary level was high, increased from 96.4% (2000) to 98.5% (2008), which shows that there was a positive response by citizens to the policy requiring access to education by all. One of the factors threatening the access to education has been the HIV-AIDs pandemic that has seen nearly a third of the adult population being infected (Kinghorn *et al.*, 2002). The report by Kinghorn *et al.* (2002) further show that huge losses in investment in education would be incurred by the government due to AIDS related deaths of students. The HIV-AIDS pandemic has left children being orphaned but conceited efforts have been made by the government to protect access to education and outcomes through the provision of welfare grants, meals at schools and fostering a culture of school attendance (Kinghorn *et al.*, 2002). Evidence shows that since 2000 the government of Botswana has taken measures to develop and implement an education sector HIV/AIDS strategy with the aim to protect accessibility.

There are also private players at both primary and secondary levels though the government is still the key player in the provision of education. There is an even spread of primary schools in the country but secondary schools are placed in what appears to be central places. Children currently spend seven years in primary school and 5 years in secondary schools after which they are directly admitted into colleges and universities. The government meets the full educational bill throughout the student's enrolment period for those enrolled in public schools. Education is heavily subsidized as from primary to secondary education and parents meet very low costs towards the education of their children in all government schools. At tertiary level the government pays all the educational expenses for the students. Students are given a facility containing both a loan and a grant with the requirement that the student pays back the portion representing grant upon getting employment.

The global financial crisis of 2007/8 resulted in a reduction in the government funding towards the educational sector. This saw few students being enrolled especially at tertiary level during the crisis period and a huge number of retrenchments were conducted in the tertiary sector. The crisis put pressure on the government to reduce the number of students to be supported at tertiary level. Focus shifted from sponsoring students in foreign institutions to supporting more students in local private and public tertiary institutions. The tertiary education sector is currently composed of two state funded universities, two private universities, several private colleges offering up to degree levels, and vocational colleges which are government funded. In 2011 all students who had failed to gain entry in the public universities were called forth to return school which may be an indication of the government

[7] Ministry of Finance and Development Planning, Botswana, Budget speech 2012. Retrieved from: http://www.finance.gov.bw

[8] Ministry of Finance and Development Planning, Botswana, Budget speech 2013. Retrieved from: http://www.finance.gov.bw

policy on access to education for all. This saw the rise in many private tertiary institutions developing programmes up to degree level to take advantage of this shift in policy. A huge influx of students was witnessed especially in vocational and private colleges where the entry points were lower than those required at state universities. Enrolment levels rose but again the quality of these new students was low as some would fail to catch up with learning at a tertiary institution having been out of school for many years. Currently, in 2015, the government appears to have moved again from this position as it currently sponsors few students to private tertiary institutions per each programme than in the previous years. There is huge fall in the numbers that are being supported to study for an undergraduate program especially in private institutions. The other development, though premature to examine, is the call by the government to all the drop outs from junior secondary schools to join the ranks of those enrolled. They are being sponsored to get vocational training in private tertiary institutions but it is not yet clear on the programs of study which they will pursue as most of them are still under construction. The aim is to reorient these students but the danger is that the training program may not realize the expected result. It is possible for employers to fail to recognize their qualification as such gaining employment may be a challenge. The alternative, depending on the effectiveness of the training obtained, will be to promote employment creation by graduates with qualifications which fall short of an undergraduate degree. This is outside the scope of this paper as such it can be pointer for further investigation. But these claims still need to be substantiated with evidence from policy makers as well as regulators.

Table-1. Transition rates

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Grade 7 to Form 1	96.4	96	96.7	97.0	97.4	96.9	97.7	97.3	98.5
Junior to Secondary		52.5	55.4	55.0	70.3	55.3	61.6	63.6	69.7

Source: Statistics Botswana (2012).

3. LITERATURE REVIEW

There are mainly two strands of literature on economic development and education found in literature: the first is of the view that education enrolments have an effect on economic growth. Barro (1996) using a cross country study, argues that the growth rate of real per capita Gross Domestic Product (GDP) is increased by high levels of initial schooling among other factors. Barro (2003) argued that for a given level of human capital, GDP growth would be dependent on other factors like the rule of law and the investment ratio. The direction of causality between good macroeconomic policies and growth has been ambiguous. Evidence however shows that the growth in the labor force, physical and human capital, low inflation and less trade barriers are vital for growth (Dewan and Hussein, 2001). Education has a positive effect on economic growth; and the public sector plays a key role in enhancing growth through education (Gyinah-Brempong *et al*., 2005; Beskaya *et al*., 2010; Lee, 2012). Abiodun and Iyiola (2011) support the increasing of investment in education as it has a direct impact on growth. Javed *et al*. (2013) argue that expenditure on education has a positive effect on economic growth. According to Hanushek and Wobmann (2007) educational quality, rather than mere school attainment, is important in explaining economic growth as such both minimal and high level skills are important as well as the quality of institutions.

The second strand of literature argues that enrolment levels have no or insignificant impact on growth. Barro (1996) gives evidence to the fact that high growth rates in per capita GDP were not explained by levels of schooling but rather it was explained by factors like government consumption, rule of law, low fertility and investment. This was the case because Chile's level of schooling was average. Bils and Klenow (2000) provides evidence that schooling has an impact of less than one third on growth using cross country data. Their findings support a positive

effect of schooling on growth. They argue that countries with high rates of enrolment show rapid growth in labor supply per capita. Schooling still needs to be supported by other factors to enhance growth efforts. Ahmad and Luqman (2013) argue that growth does not necessarily result from high enrolment due to the rise in unemployment among educated people. Growth can only result from education where there are more job creators than seekers. Al-Samarrai (2003) examined the relationship between education outcomes and expenditure on education for three countries including Botswana. Findings show that there was a weak connection between education outcomes and resources. Institutional composition governing resources was vital in producing better outcomes. The other important finding is that improved access to primary education was rather demand driven.

The direction of causality in literature is not definite due to varying findings in different studies. Dewan and Hussein (2001) argue that education and economic growth show bidirectional causality. Dahal (2010) suggests that causality is unidirectional from real GDP to enrolment in higher education. This is supported by Viracheat and Dash (2011) who suggests per capita GDP has a positive impact on growth in higher education enrolment. Bils and Klenow (2000) in their paper suggest that there is reverse causality from GDP to education. Evidence from a study by Huang *et al.* (2009) using Vector error correction model shows that higher education enrolment and actual GDP per capita are positively co-integrated; higher education enrolment adjust at a rate of 7% back to equilibrium upon deviation and higher education increased due to shocks from its own variable and it is driven by GDP per capita in the short term. This is also supported by Afzal *et al.* (2010) who finds a co-integrating relationship between education and growth both in the short and long run. The relationship is however inverse in the short run. Reza and Valeecha (2012) also support the fact that education and economic growth are not related in the short term. They have a long term relationship in which education enhances growth. However in the short term (Beskaya *et al.*, 2010) are of the view that education granger cause real income in the short term. Their results on the long term relationship were confirmed by Reza and Valeecha (2012). Javed *et al.* (2013) argued that primary and secondary enrolments have positive and negative impact on economic growth in both long and short run respectively.

Empirical studies have failed to agree on whether or not education and economic growth are related in the short and long run. Other studies for example suggest the existence of only a short as opposed to a long run relationship. Literature failed to explain the direction of causality between quality of education and the level of economic development which gives room for further examination. The debate on the discussion on the relationship between quality of education and economic growth is still inconclusive and warrant further research. In this study we provide evidence on the varying schools of thought to justify the need for further research.

4. METHODOLOGY AND DATA

The study used annual time series data for the period 1980 to 2014 which consist of macroeconomic variables for Botswana. The data was obtained from World development Indicators which was last updated in July 2015. For a given starting level of real per capita GDP, the growth rate is enhanced by higher initial schooling and life expectancy, lower fertility, lower government consumption, lower inflation, and improvements in the terms of trade, Barro (1996). In this study we argue that the levels of enrolment at secondary (*ser*) and tertiary (*ter*) levels are important in capturing access to education in Botswana in the long and short term respectively; economic development is captured by the annual rate of growth of GDP (gd*pgrowth*) as a proxy and labor force participation rate (*lfpr*) is used as a proxy for quality of education. These are the key variables that were employed in this research. We also included some control variables which have been found to affect economic development in literature. These include: inflation (*cpi*) represented by the annual percentage of the country's consumer price index which captures the impact of stable prices on growth; foreign direct investment (*fdi*) which is represented by the net

capital inflows as a percentage of GDP; gross fixed capital formation (*gfcf*) being represented by the additions to levels of inventory and assets that used over a long time as a percentage of GDP; trade openness (*tot*) which is measured as a difference between the percentages of exports and imports over GDP. The level of economic development was captured as follows:

gdpgrowth = f(ser, ter, lfpr, cpi, fdi, gfcf, tot)……...…..*(1)*

We estimated the model using variables in the percentages except life expectancy rates which was measured in levels. Model (2) and (3) captures the effect of access to education on economic development in both long and short run respectively. Model (4) captures the effect of educational quality of economic development in the short run. Specifically our models are as follows:

$$\text{gdp growth} = \beta_0 + \beta_1 ser_t + \beta_2 fdi_t + \beta_3 cpi_t + \beta_4 gfcf_t + \beta_5 tot_t + \varepsilon \quad \text{……...…..(2)}$$

$$\text{gdp growth} = \beta_0 + \beta_1 ter_t + \beta_2 fdi_t + \beta_3 cpi_t + \beta_4 gfcf_t + \beta_5 tot_t + \varepsilon \quad \text{……...….(3)}$$

$$\text{gdp growth} = \beta_0 + \beta_1 lfpr_t + \beta_2 fdi_t + \beta_3 gfcf_t + \beta_4 cpi_t + \beta_5 tot_t + \varepsilon \quad \text{……...…(4)}$$

The study employed the vector error correction model (VECM) to test the long run relationship between access to education and economic development. The vector auto regression (VAR) approach was used to estimate the short relationship between quality of education and economic development. The Impulse response functions (IRF) and Forecast error variance decompositions (FEVD) were used to test the response of each variable to innovations in another and to test how each variable was important in driving the other respectively. We also conducted some preliminary time series tests for stationarity of data using the Augmented Dickey Fuller (ADF) tests and the Johansen co-integration technique to test for the existence of long term relationship, see Mbulawa (2015) for detailed survey.

5. EMPIRICAL RESULTS: PRESENTATION AND DISCUSSION

5.1. Descriptive Statistics

Table 1 in the appendix shows the results for descriptive statistics which are summarized as follows: the annual averages ranged from 3.53 to 96.63 being for foreign direct investment and trade openness respectively. The highest maximum value was obtained for trade openness (124.65) while the lowest minimum value was for economic development (-8.5). Standard deviation was used as a measure for volatility in which case secondary school enrolments were most volatile during the period while the educational quality was stable. This can be explained by the government's efforts to improve access to education in the post independence period. The distributions for inflation, economic development and foreign direct investment were normally distributed while the rest of the variables showed signs of non normality. Access to education and economic development variables were skewed leftwards while all the other variables were skewed to the right. Evidence, from table 2 in the appendix, shows that there were both positive and negative associations among the variables. Multicollinearity was found between secondary and tertiary enrolments (measures of access to education); educational quality and access to education variables and between trade openness and the two variables measuring access to education. Therefore to avoid spurious results these combinations of variables were not included in the same models. We also tested for stationarity and all variables were not stationary at levels. We then first differenced all the variables after which

they all became stationary as indicated in table 3 in the appendix. All the variables have lag numbers of zero. The null hypothesis was rejected at 5% and 1% levels of significance.

5.2. Regression Analysis

5.2.1. Results on the Long Run Relationship Using VECM

In testing for the long run relationship we employed GDP growth as the dependent variable and access to education as the key explanatory variable being combined with other control variables (foreign direct investment, inflation, trade openness and gross fixed capital formation). We employed the VECM framework which allowed us to determine the lag order and the number of co-integrating equations using variables in first differences. The number of lags was chosen by using the Akaike's information criterion which gave a maximum of 4 lags. The Johansen co-integration technique was used to determine the number of co-integrating equations which found to be one at a 1% level of significance as given by trace statistics. After fitting the model we found that there was no short run relationship between access to education, as measured by secondary school enrolments and economic development, thus the two variables converge to a long run relationship. We then provided estimations of normalized co-integrating coefficients of all the variables in the model (Mbulawa, 2015).

Table 4, in the appendix, provides the findings on the long run relationship between economic development and access to education. Evidence shows that the net inflows of capital and the additions to levels of inventory and assets that were used over a long time as percentages of GDP had negative and positive effect respectively on economic development in Botswana over the long term. The reason could be that capital flows could have an adverse effect on development due to them being unsuitable for the environment. Thus inflows for capital promote development as they move in line with the country's needs and being combined well with other factors that enhances development like human capital. The rate of inflation's effect on development was found to be positive but insignificant. This is true for Botswana since the rate of inflation less than double digit.

One of the key explanatory variables in this research was access to education. Findings show that access to education had a positive and significant effect on economic development. Consistent with previous findings (Beskaya *et al*., 2010; Lee, 2012) our study shows that for the case of Botswana economic development has come into being as result of the country improving the level of access to education. Thus the efforts made since independence to increase access to education are paying dividends. The improvements in access to education does not have any significant contribution to development in the short term, but this is a long term oriented policy which drives the growth rate of gross domestic product. According to Ahmad and Luqman (2013) the positive impact of access to education on development may not be automatic due to the existence of factors like unemployment. They argue that for access to have a positive effect on development there should be more job creators than seekers which have a huge policy implications for Botswana in relation to our study.

5.2.2. Results on the Short Run Relationship Using VAR

Understanding the contribution of education to economic development in the short term was done using granger causality approach. Access to education was measured using tertiary enrolment while quality of education was captured using the labour force participation rates. The study provides evidence that access and quality of education were important in the short term. First we present results focusing on quality of education and later on those focusing on access to education. In the appendix we provide Table 5a and 5b which show results for the system of 2 equations using VAR with economic development and quality of education being the dependent variables respectively. Our results, table 5a, show that economic development is negatively affected by its own performance even up to 4 lags in the short term (this result were further interrogated using the IRF and FEVD

tests below). Thus the level of development in the economy in previous period is important in explaining the level of development in future years. Findings also show that the level of economic development is negatively and positively affected by the quality of education in the short term in the third and fourth lag respectively which is consistent with Abiodun and Iyiola (2011). For lags one and two the effect is positive though insignificant. Thus quality of education is an important variable explaining the level of economic development in the short term in Botswana. Table 5b also shows that the quality of education was mainly development led which agrees with findings by Hanushek and Wobmann (2007) showing that educational quality and economic development were significantly related. An increase in the level of economic development in the short term positively contributes to the enhanced quality of education during the second and third lags. The results from the system of equations shows that economic development is also positively affected by foreign direct investment in the forth lag and it is negatively affected by inflation and gross fixed capital formation in the first and fourth lags respectively. These results are not reported but can be provided by the authors upon request but they provide opportunities for future research.

5.2.3. Results on Causality

The findings using the VAR systems of equations with four lags pointed to the fact that there was causality among the variables. First our results, table 6a in the appendix, show that there is unidirectional causality moving from economic development to access to education and not the other way round. Our findings are sensitive to the measure of access to education used. As already discussed above the study shows that there is a long run relationship between the two variables where access to education is captured using secondary school enrolments. Consistent with results by Dahal (2010) the findings show that changes in the rate of economic development helps predict the movements in the level of access to education in the short term. Findings show that the level of economic development has predictive power on the level of access to education in the short term which is consistent with previous studies (Bils and Klenow, 2000; Viracheat and Dash, 2011). The study also analyzed the contribution of quality of education to economic development. Findings, table 6b in the appendix, show that bidirectional causality runs from economic development to quality of education and vice versa. In the long term there is no relationship between the two variables. Thus for the case of Botswana the quality of education has the predictive power to explain the level of economic development and vice versa and this provides a point of departure from the existing literature.

5.2.4. Results Using IRF and FEVD

This section analyses results for impulses on quality of education on economic development and vice versa and also we measure the extent to which changes in economic development would be explained by innovations in quality of education and vice versa. The results in figure 1 in the appendix show that shocks in economic development would produce both negative and positive responses from the quality of education. Any shock in economic development would produce positive responses between period 1 and 3; period 6 and 9 while persistent positive responses were experienced beyond period 12. The lowest negative responses were experienced only at period 10. Thus our results show that shocks in economic development are important in influencing the trend in the quality of education in the short to medium term. On the other hand the shocks from provision of quality education resulted in both positive and negative shocks in economic development. The highest positive response was experienced during period 10 while the lowest negative shocks was experienced after period 12 onwards. The impact of shocks of one variable on the other would become more pronounced after 10 periods.

The findings also show that the main driver of quality of education was economic development which accounted for about 30% of the variations from the first period onwards. Thus the behavior of quality of education is predicted by the level of economic development which remains positive even beyond 15 periods. In the case of Botswana there is a need to understand the variables driving economic development as it also have an impact on the quality of education. There is no evidence to suggest that quality of education drove economic development. The study shows that both variables were not driven by their own performance but impulses in their own performance helped to explain the responses for their own performances even beyond 10 periods. However our findings are consistent with that we found using the VAR model as well as granger causality. In the next section we suggest some policy recommendations derived from this study.

6. CONCLUSION AND POLICY ISSUES

The study investigated whether or not access and quality of education contributes to the development process and economic well being of Botswana. Specifically the study sought to examine the impact of access to education on economic development; establish the relationship between quality of education and economic development and examine the key drivers of the level the educational quality in Botswana. The study used time series data from 1980 to 2014 for selected variables capturing economic development, quality and access to education. The data was analyzed using VECM and VAR approaches to test both long and short run relationships respectively. Our key findings suggest that access to education has a positive and significant effect on economic development as such government efforts to have an all inclusive approach on education was paying dividends. This result should be interpreted with care as access to education also have a short term relationship with education in the short term; findings on causality suggests that there is unidirectional causality moving from economic development to access to education as measured by level of tertiary enrolment and that there bidirectional causality moving from economic development to quality of education and vice versa. This suggests that during this period the quality of education was development led and vice versa. The changes in the level of development will have significant impact on quality of education after 5 periods and the same applies to the impact of changes in quality of education on development.

This study suggests that access to education will bring more economic development in the long term. This means that the government should deal with problems of unemployment and formulate policies that will give rise to more job creation and reduce the number of those who are not gainfully employed. This will help complement the positive impact of access to education on the development process. Long term policies should also focus on improving access to secondary education and improving private investment in inventory and tangible assets which help to improve the production base and hence output. In the short term the government should put in place policies to enhance development like attracting more foreign direct investment, maintaining low inflation and improving access to tertiary education. This will help to quickly improve the quality of education.

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APPENDIX

Table-1. Summary statistics

Stats	Gdpgrowth	Fdi	Ser	Ter	Lfpr	cpi	gfcf	Tot
Mean	4.49	3.53	57.29	5.08	74.31	9.70	29.83	96.63
Max	15.79	13.45	79.98	8.00	78.46	16.43	43.41	124.65
Min	-8.50	0.04	18.54	1.13	72.50	6.56	15.50	60.50
Sd	4.21	3.33	22.73	2.31	1.61	2.63	5.99	16.32
Skewness	-0.39	1.30	-0.49	-0.40	0.60	0.94	0.11	0.27
Kurtosis	4.94	4.00	1.62	1.82	2.53	3.28	2.79	2.28
Range	24.29	13.42	61.44	6.86	5.96	9.87	27.905	64.15
N	35	35	35	35	35	35	35	35

Summary statistics obtained from Stata 12 based on all explanatory variables and gdpgrowth as the only dependent variable. Data is for balanced panels for the period 1980-2014. Variables used: foreign direct investment (fdi); secondary enrolment (ser), tertiary enrolments (ter), inflation (cpi), gross fixed capital formation (gfcf), terms of trade (tot) and labour force participation rate (lfpr).

Table-2. Correlation matrix

Stats	gdpgrowth	Fdi	Ser	Ter	lfpr	Cpi	Gfcf	tot
gdpgrowth	1							
Fdi	0.045	1						
Ser	-0.371	-0.138	1					
Ter	-0.373	-0.113	0.970	1				
Lfpr	-0.274	-0.054	0.854	0.826	1			
Cpi	-0.029	0.184	-0.532	-0.453	-0.496	1		
Gfcf	0.059	0.065	-0.085	-0.058	-0.024	0.296	1	
Tot	0.433	0.096	-0.873	-0.908	-0.686	0.305	0.070*	1

Output from stata 12 using pairrwise correlation used to check strength of relationship between economic development, a dependent variable and seven explanatory variables.

Table-3. Results on Augmented Dickey Fuller (ADF)

Variables	Optimal lags	Test statistics			
		Trend only		No constant	
Gdpgrowth	0	-8.336*		-8.615*	
Fdi	0	-6.790*		-6.956*	
Per	0	-0.320		-0.591	
Ser	0	-5.421*		-3.596*	
Ter	0	-5.001*		-4.139**	
Lfpr	0	-4.538*		-4.220**	
Cpi	0	-8.652*		-8.704*	
Gfcf	0	-6.354*		-6.371*	
Tot	0	-7.426*		-7.345*	
Levels of significance & Critical values		Level	Value	Level	Value
		1%	-4.306	1%	-2.647
		5%	-3.568	5%	-1.950
		10%	-3.221	10%	-1.603

Source: Authors' computation

* = Reject null hypothesis at all levels of significance

** = Reject null hypothesis at 5% level of significance

Table-4. VECM model

Variable	Coefficient	Statistic
D_ser	0.519	2.20*
D_fdi	-0.28	3.48*
D_cpi	0.168	0.32
D_gfcf	0.719	4.35*

*significant at 5%

Table-5a. Vector auto regression model (dependent variable D_gdggrowth)

Variables	Number of Lags	Coefficient	Test statistic	
Gdpgrowth	1	-0.527	3.17*	
	2	-0.480	2.10*	
	3	-0.777	3.20*	
	4	-0.520	2.18*	
Lfpr	1	0.340	0.13	
	2	1.246	0.54	
	3	-9.818	2.87*	
	4	10.383	1.82**	
R^2		85.11		
Chi2		171.49[0.0000]		

*significant at 5%; **significant at 10

[ ] probability values in parenthesis

Table-5b. Vector auto regression model (Dependent variable D_lfpr)

Variables	Number of Lags	Coefficient	Test statistic	
Gdpgrowth	1	-0.0209	1.21	
	2	0.148	6.95*	
	3	0.0485	1.92**	
	4	-0.0415	1.67**	
Lfpr	1	-0.286	1.05	
	2	0.0957	0.40	
	3	-0.329	0.93	
	4	-0.855	1.45	
Fdi	1	-0.0373	1.39	
	2	-1.1228	3.14*	
	3	0.116	3.44*	

	4	-0.0280	1.06	
Gfcf	1	-0.0874	4.55*	
	2	0.0312	2.27*	
	3	0.0647	2.86*	
	4	0.0052	0.41	
R^2		88.93		
Chi2		181.69 [0.0000]		

*significant at 5%; **significant at 10%

Table-6a. Granger causality Wald tests (1980-2014)

Equations	Variables Excluded	χ^2	Df	Prob> χ^2
D_gdpgrowth	D.ter	10.188	4	0.037*
D_gdpgrowth	D.fdi	23.329	4	0.000*
D_gdpgrowth	D.cpi	26.746	4	0.000*
D_gdpgrowth	D.gfcf	17.581	4	0.001*
D_ter	D_fdi	2.291	4	0.682
D_ter	D_cpi	5.448	4	0.244
D_ter	D_gfcf	20.767	4	0.000*
D_ter	D_gdpgrowth	28.985	4	0.000*

*Reject the null hypothesis at 5%

Table-6b. Granger causality Wald tests (1980-2014)

Equations	Variables Excluded	χ^2	Df	Prob> χ^2
D_gdpgrowth	D_lfpr	11.883	4	0.018*
D_gdpgrowth	D_fdi	29.286	4	0.000*
D_gdpgrowth	D_cpi	23.373	4	0.000*
D_gdpgrowth	D_gfcf	13.452	4	0.009*
D_lfpr	D.gdpgrowth	80.678	4	0.000*
D_lfpr	D.fdi	32.228	4	0.000*
D_lfpr	D.cpi	21.678	4	0.000*
D_lfpr	D.gfcf	64.589	4	0.000*

*Reject the null hypothesis at 5%

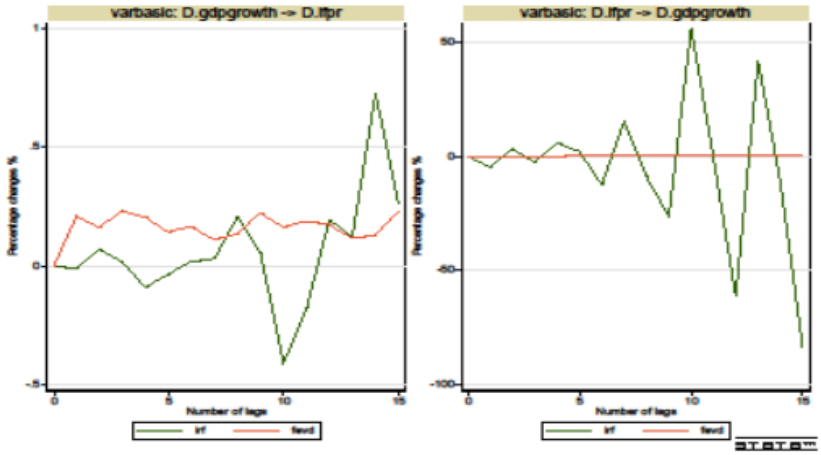

Figure-1. IRF and FEVD graphs

Source: Extracted by author from stata 12