Elasticity of Public Expenditure on Primary Education in Kenya (1978 – 2018)

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Abstract: Education is key to any meaningful economic development of any country world over; Education is responsible for production of requisite human capital for necessary for economic development. Indeed, countries which have advanced economically and flourished in business have invested significantly in education starting from the primary level. Investment in primary education is vital for any economy which endeavours to remain on the development trajectory. Although the Kenya government has been revising its budgets upwards over time, the degree of responsiveness of public expenditure relative to changes in the determinants of education quality at primary level has been a mismatch. For instance enrolment in public primary schools has been increasing progressively since the inception of 844 system of education but government capitation remained constant. The main objective of this study was to analyse the elasticity of public expenditure relative to key primary education quality determinants namely staffing situation, teachers' remuneration, institutional infrastructure and enrolment at primary level of education. The study sought to test the composite null hypothesis that total public expenditure on education is elastic with respect to the following variables at primary level of education in Kenya during the sample period: Students enrolment, Staffing situation, Average annual teachers' salaries and, Institutional infrastructure. The study utilised multiple regression model premised into Cobb-Douglas production function to analyse the elasticity of government expenditure to changes in selected control variables at primary education level. The findings of the study revealed that public expenditure was quite responsive to changes in institutional infrastructure, staffing and teacher remuneration at primary level of education. This implied that more resources were allocated towards building primary schools and employment of additional teachers as public expenditure changed during the review period. The study concludes that, in primary education, the government gave more support to staffing, establishment of additional schools and increasing teachers' salaries. However, the government was less sensitive to changes in student enrolment.

Keywords: Public expenditure; Elasticity; Primary education

1.0 Introduction

Knowledge is the driving force in any rapidly growing and globalised economy and society world over. In this regard, quantity and quality of highly educated and specialised labour force determine their competence in the global market. It is now well recognised that the growth of the global economy has increased for those countries with good levels of education and vice versa for those without such developments (Stewart, 1996; Tilak, 2015; Mugambi, 2020). Indeed, the benefits of globalisation accrue to the countries with highly skilled human capital but turn out to be a curse for countries without such specialised and experienced human resources.

The purpose of this study is to analyse the responsiveness of public expenditure on primary education against some key primary education quality variables namely staffing situation, teachers' salaries, enrolment and institutional infrastructure in Kenya. Quite often the government has beed allocating resources to every education subsector, may it be primary secondary or tertiary, without clear guidelines based on the elasticity of budget to these driving factors. The paper seeksto analyse the elasticity of public expenditure to changes in selected explanatory variables namely: enrolment, staffing situation in schools, infrastructure establishment, as well as the salaries for teachers at at primary level.

Although the government has been spending huge amounts of budgetary resources to finance primary education systems in the country actual scenarios have always reflected sub-optimal achievements as revealed by increased demand for more teachers, more classrooms and inadequate instructional materials in schools. In addition more education wastage has been realised in terms of drop out rates. Regrettably, despite a lot of diversion of education resources to primary programmes, huge financial deficits are realised in each fiscal year depicting sub-optimal

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budgetary allocations in primary sector. The government has been revising teachers' salaries upwards over time such that today teachers are among the highly paid public servants at respective cadres in the country (Mugambi, 2015)). However the Kenya National Union of Teachers is still pushing for more increments while teachers are increasingly engaging in various income generating activities to supplement their monthly earnings. Moreover, quite a number of teachers are quitting employment every year to greener pastures (TSC, 2017) thereby adversely affecting the contact time between teachers and learners, with obvious implications on the standard of education in the country.

1.2 Objectives of the Study

The main objective of the study is to assess the responsiveness of public expenditure on education to changes in explanatory factors that determine education quality at primary level including enrolment, staffing situation, institutional infrastructure and teaching staff salaries in Kenya.

1.3 Hypotheses and Scope of the Study

The study aims to prove the research hypothesis that total public expenditure on primary education is elastic with respect to changes in the following variables at primary level of education in Kenya during the sample period:

- i. Students enrolment,
- ii. Staffing situation,
- iii. Average annual salary of a teacher and,
- iv. Institutional infrastructure.

2.0 Literature Review

2.1 Theoretical Literature

2.1.1 Primary Education in Kenya

Since Independence in 1964, Kenya has launched four Free Primary Education programmes: the first in 1974, the second in 1979, third in 2003 and the most recent in 2018 which is commonly known as 'CBC' that is, Competency-Based Curriculum (Somerset, 2008, MoE, 2018). In this regard, the government shouldered the responsibility of providing and maintaining physical facilities as well as supplying of learning materials in all public schools countrywide in addition to the training and employment of personnel. However the government is unable to meet the demand for these resources due to lack of adequate funds from public coffers to cater for increasing enrolment and personal emoluments. Consequently, this scenario has resulted in acute shortage of teachers and loss of quality education, coupled with over-stretching of physical facilities at primary level (MoE, 2016).

2.1.2 The Concept of Public Expenditure

Public expenditure refers to the expenses which the government incurs purposely for its own maintenance; developing the society and the economy; and for helping other countries in solving their own socio-economic problems. (Bhatia, 2003, MoE, 2017). Public expenditure is determined by political will of the leading forces in the state: their priorities, their desired state model, and their interpretation of current economic and political phase (Piana, 2011). Thus, government bureaucracy plays an important decision role for the actual expenditure. In this regard, public expenditure would thus be fully in the hands of political decision-makers without dependency from the economic context. If education expenditure is undertaken not only because it is in the interest of the student, but because it is in the interest too of society, then the expenditure should be borne by the government (Low, 2011; Mugambi 2020). Financing of education can support several national goal such as educational, social, economic and political (Morriss and Gopinathan, 2007).

2.2. Empirical Literature

Reddy (2015) made an attempt to analyse the pattern of financing primary education in India, during the period between 1992 and 2012. Among the main findings of this study was that both national and the state levels,

primary education was given top priority by the government.

Morriss and Gopinathan (2013) carried out a study on trends in education funding in Singapore for a 15 years period in an attempt to link changes with economic situation, and fiscal and education reforms. The study involved the comparative analysis of the changes in Singapore's gross national product; government operating expenditures; and recurrent educational expenditures, while keeping track on the gross funding trend. According to the findings, education in Singapore was well funded by the government and that the impetus for investing in education came from a number of factors which addressed a number of challenges experienced.

Manda, Mwabu and Kimenyi (2012) conducted a study to establish the impact of human capital externalities with respect to returns in education in Kenya. In Kenya, private returns to education generally increase with the level of education as revealed by this study, and that human capital externality for male and female students has a positive impact on earnings for all workers. This analysis gives strong justification for design of suitable financing mechanisms for post-primary education, particularly secondary education, which is a transitional level to tertiary and university education. Thus for this aspect, the government should always be the principal investor in education. Such a role cannot be left entirely to the private sector because future objectives of human resource development involve long-term planning and large financial resources outlays, which only the government is capable of mobilising.

3.0 Research Methodology

This study used the deductive scientific method premised into an econometric model based on the extended version of Cobb-Douglas production function. The model was applied in the analysis of historical time series trends in public expenditure at primary level of education against the selected explanatory variables during the sample period. The regression of the modelled equations was carried out using Ordinary Least Squares (OLS) method utilising Eviews Version 11. The choice of the model was deemed appropriate for the study because of its versatility in addressing the problem of non-linearity of the relationship among the variables. The model also allows interpretation of the parameters in terms of elasticities since the study is concerned with the relative responsiveness of dependent variable to changes in each independent variable in the model.

3.1 Research Data

This study used secondary data from the existing government records and documents in Kenya. Public expenditure on primary education was obtained from various issues of economic survey from the minister of finance. Primary education data on enrolment, staffing situation, institutional infrastructure and teachers' salaries were obtained from various issues of Economic Survey; Budget Statistical Annex; Kenya Bureau of Statistics (KEBS); International Financial Statistics (IFS) and Government Printed Estimates (GPE) by the Kenya's Ministry of Finance.

3.2 Choice of Variables

For the purpose of this study Total Public Expenditure on Education was used as the dependent variable against four explanatory variables at primary level of education namely: Students enrolment; number of teachers; number of primary schools, as well as average annual salary per teacher. These variables were selected because they are the main drivers of government expenditure in primary education sub-sector in Kenya (GoK, 20014; MoE, 2016).

3.3 Model Specification and Econometric Analysis

3.3.1 The Model

The model is developed based on the extended version of the Cobb-Douglas Production Function to give the relationship between public expenditure on education and the selected explanatory variables.

Education budget in any fiscal year need to be financed in a multidimensional way considering all the key variables in the education system that cause direct implication on expenditure. This functional relationship can be expressed in general form as follows:

$$E_t = f(X_i) \tag{1}$$

This can be mathematically expressed as:

 $E_t = \alpha + \beta X_i + e_i$ (2) Where: E_t = Total public expenditure on education X_i = A set of key explanatory variables e_i = The error term α and β = Constants

For the purpose of this study equation (2) can be specified mathematically as follows taking into consideration the identified explanatory variables:

$$E_t = a N_t^{\beta_1} P_{\beta_2} S_t^{\beta_3} T_t^{\beta_4}$$
(3)

Where: N_t = Total students enrolment primary level of education

- P_t = Total number of teachers in primary level of education (Staffing Situation).
- S_t = Number of schools in primary level of education (Institutional Infrastructure).
- T_t = Average annual primar teacher's salary in a primary level of education.

 α and β_i = Constants.

A close observation reveals that equation (3) is an extended version of Cobb-Douglas Production Function and can be expressed in double- logs as follows to make it linear:

$$InE_{t} = Ina + \beta_{1}I_{n}N_{t} + \beta_{2}I_{n}P_{t} + \beta_{3}I_{n}S_{t} + \beta_{4}I_{n}T_{t} + U$$
(4)

This modelling technique was previously used by Deolalikar (1997; Omutor, 2013) on household data for Kenya and the study found a positive and significant relationship between school spending and primary school enrolment. Prudently, the present study utilises this approach in an extended version to cover other variables besides enrolment.

In estimating the model (Euation 4), Total Public Expenditure on Education was taken as a dependent variable against the four independent variables at primary level of education namely: Students Enrolment; Number of Teachers; Number of Schools and, Average Annual Salary of a Teacher. These variables were selected because they are among the key determinants of government expenditure in the education sector. The variables are assumed to influence the parameters of education and government expenditures similar to the approach followed by Davoodi, et.al (2011), Hewitt and Van-Rijckeghem 2012), Mauro (1998) and Heller, Peter, and Diamond (1990). The advantage of estimating the structural model with these instruments is that it provides the interactive effect between the control variables and qualitative variables within the model besides the direct influence of individual explanatory variables.

3.2 Estimation Results and Interpretation

As pointed out in the foregoing chapters, the analysis of public expenditure on education can be done by looking at the relationship between this expenditure and some key factors that impinge on education expenditure (Dutt, 1988; Ayanwou, 2004). For the purpose of this study the explanatory variables selected for analysis at primary level of education includes: Enrolment of students; staffing situation in schools; the number of schools representing infrastructure, and the average annual salary of a teacher. In this regard, the elasticity of public expenditure on education with respect to these explanatory variables is analysed to determine the responsiveness of education expenditure to changes in these key factors.

3. Problems Encountered during Estimation

The main problem associated with OLS method when applied on time series data of this nature is autocorrelation. This problem is detected through Durbin-Watson (DW) test. As a rule of thumb the value of DW should be around two (2) if there is no first-order autocorrelation (Gujarat and Sangeetha, 2007). However, for the model estimated the DW statistic was indicating a positive relationship but its value was about one (1) except for the case of University Level for which this value was approximately two (2) as required. When the DW value is positive

and statistically smaller than 2, it indicates the presence of positive autocorrelation and vice versa if it is negative. This means that the autocorrelation problem was acute in the model equation at Primary level. For this case where autocorrelation was serious, Cochrane-Orcutt iterative process was utilised to rectify the problem.

4.1 Analysis of Public Expenditure on Education at Primary Level

Table 6.2 gives the estimation results of public expenditure on education at primary level for the period 1978 – 2008. The model was found to be fit for analysis because the F-value was relatively high at 475.39 while the corresponding Prob (F-statistic) was 0.00 implying that the overall model was valid, and hence all the coefficients in the model were statistically different from zero. Likewise the R-squared and the adjusted R-squared displayed high values of 0.98 and 0.96 respectively meaning that the model was a good predictor of the dependent variable. Moreover the Durbin-Watson value was 1.63 and statistically close to 2 implying that there was no autocorrelation problem in the model. The Constant factor in the model refers to the intercept of the regression model and shows the value of the regressad when all the parameters of the regressors are statistically equal to zero. The constant had a coefficient of 18.05 and was found to be quite significant at 1 percent level, implying that the factor was necessary for the model fitness.

Table 4.1: Regression	Results for Public Exper	nditure on Education a	at Primary Level

VARIABLE		COEFFICIEN T
Constant		18.0481*** (3.9148)
Students Enrolment		0.5957 (0.6256)
Staffing Situation		0.6870 (0.6334)
Institutional Infrastructure		1.4188* (0.7039)
Average Annual Teacher's Salary		0.7980*** (0.2613)
R-Squared	0.9972	
Adjusted R-Squared	0.9951	
F-statistic	475.3858	
Durbin-Watson Statistic	1.6277	

Source: Raw regression results from E-Views 11 plus author's construction

Note: Figures in parenthesis are Standard Errors; *** Indicates significance at 1% level whereas; * * Indicates significance at 5% level; *Indicates significance at 10% level.

All the control variables namely: enrolment, staffing situation, school infrastructure, and average annual teacher salary, had the correct positive signs as indicated in the table. However, most of these explanatory variables were found to be insignificant even at the conventional 10 percent level except Average Annual Teacher Salary which was significant at 1 percent level and infrastructure at 10%.

4.1.1 Students Enrolment

This variable had a coefficient of 0.60 but was statistically insignificant. This situation points out that the responsiveness of government expenditure on education was perfectly inelastic with respect to enrolment of

students at primary level. This implies that the government does not readily respond to changes in enrolment at primary level.

4.1.2 Staffing Situation

As pointed out earlier, staffing situation refers to the number of teachers employed by the government in public primary schools in Kenya during the sample period. This variable was not significant even at the 10% level although it had a coefficient of 0.69. This means that the government responds to schools staffing situations mainly by replaces teachers who quit employment through attrition probably when there is from trade unions and other stakeholders.

4.1.3 Institutional Infrastructure

This variable had a coefficient of 1.42 and was significant 5 percent level. This scenario means that public expenditure on education was fairly elastic to changes in institutional infrastructure at primary level of education. In this regard, a 100 percent increase in the number of primary schools in the country led to a 142 percent increase in public expenditure on education. This implied that institutional infrastructure at primary level was a good booster for public expenditure on education during the sample period as the government made delivery attempt to support universal primary education.

4.1.3 Average Annual Salary of a Teacher

This variable was significant at 1% with a coefficient of 0.80and hence inelastic. This means that that an increase in average annual teacher salary by 100 percent lead to about 80 percent increase in public expenditure on education at primary level holding other variables constant. This clearly shows that public expenditure on education at primary level was fairly inelastic to relative to teacher salary in Kenya during the period under review. This corroborate to the fact that teachers salary hike in the country has always been implemented with pressure from trade unions or after strikes.4

4.2 Hypothesis Testing

The four hypotheses were tested based on the results analysis of the results of the estimated equations. For the control variables, that is, student enrolment; staffing situation, institutional infrastructure and salaries, testing of the null hypothesis was done based on the significance and the coefficient value being greater or less than one (1). Thus, a coefficient higher than 1 indicates a situation of elasticity where as the value below 1 shows inelastic response of dependent variable relative to changes in the independent variable. These criteria were used in rejecting or accepting a particular hypothesis within the purview of the empirical evidence.

The composite null hypothesis was that total public expenditure on education is elastic with respect to the following variables at primary levels of education in Kenya during the sample period:

- Students enrolment,
- Staffing situation,
- Average annual salary of a teacher and,
- Institutional infrastructure.

This null hypothesis is accepted with respect to the institutional infrastructure only because public expenditure on education was quite elastic relative to this variable as adduced by the empirical findings. However, public expenditure on education was fairly inelastic relative to the staffing situation and average annual teacher's salary based on the empirical evidence. Moreover, student enrolment at primary level of education was insignificant as revealed in the results analysis. Consequently, the same null hypothesis is rejected with respect to these three variables and an alternative hypothesis - that total public expenditure on education - is accepted on the basis of empirical evidence. Therefore, the study concludes that, in primary education, the government gave more support to changes in institutional infrastructure compared to that accorded to changes in enrolment, staffing situation and remuneration of teachers during the review period.

5.0 Conclusion

The econometric model used in this study proved appropriate in demonstrating the relationship between the dependent and explanatory variables selected for the analysis at the primary level of education in Kenya. Four selected dependent variables were analysed including Enrolment; Staffing Situation; Institutional Infrastructure and, Teacher's Average Annual Salary.

At primary level of education, teachers' salary and institutional infrastructure were significant at the conventional 1% and 10% levels of confidence respectively. Nevertheless, students' enrolment and staffing situations were found to be insignificant. However, even the significant variable on teachers' annual average salary was inelastic showing reluctance by the government in responding to salary demands of teachers.

5.1 Policy Implication

This study suggests following steps to improve the conditions in Kenya:

- 1. The government needs to allocate more funds to finance public education at primary level of schooling guided by strategic planning rather than by discretionary policies.
- 2. The study established that there was inadequate growth of educational expenditure to match the changes in the selected factors such as enrolment, physical facilities and staffing. In this regard the government needs to allocate more funding at primary level of education to address the gaps.
- 3. The government should be more proactive in planning for education resources such as physical facilities and staffing ahead of any discretionary policies that could have negative implications on factors such enrolment because these facilities take time to source and supply.
- 4. The current teacher recruitment policy at basic education levels to replace those who exit the profession through natural attrition is obsolete. Thus, Teachers Service Commission (TSC) needs to adopt a dynamic policy to address projected staffing needs instead of static replacements.
- 5. TSC should develop an appropriate teacher projection model that can be applied during employment and deployment of teachers to ensure minimal staffing gap and optimal capacity utilisation of school personnel.

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