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# Measuring the Determinants of Educational Spending in Africa\*

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## Abstract

This paper reports on research aimed at measuring the determinants of education spending in Africa and secondly, investigates whether expenditure on education in Africa optimizes social welfare. The empirical estimations are carried out using a public choice model on a panel of 29 selected African countries over the period 1995-2004. The results show that government expenditure on education is not resilient to shocks and the education sector is not seriously affected by allocative changes that favour corruption. However, expenditure on education in Africa does not comply with the rules outlined by the IMF in terms of their fiscal adjustment program.

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## **1. Introduction**

Investment in human capital through education has received much attention in the Millennium Development Goals (MDG) as a blueprint for building a better world in the 21<sup>st</sup> century. Education is seen as one of the main development challenges for especially African countries to sufficiently invest in their people in a sustainable fashion.

The priority given to education spending in the total government budget has received little emphasis thus far. Most empirical studies focus on the determinants of military spending. This is not surprising, though, since the latter absorbs more than 5 percent of world resources annually. However, there seems to be concensus that in developing countries, military expenditures are mostly constraining economic growth and absorb resources that should have been spent on capacity building such as educational expenditures (Hewitt, 1992). In fact, fiscal adjustment programs in developing countries have lately been featured by less expenditure on military and more on socio-economic development including education and health (Davoodi H., et.al (2001); Chu, Ke-young, and others, 1995; and IMF, 1997).

The relatively poor performance of most economies in African over the past few decades raises the question whether this is not because of its lack of capacity and therefore educational inadequacies.

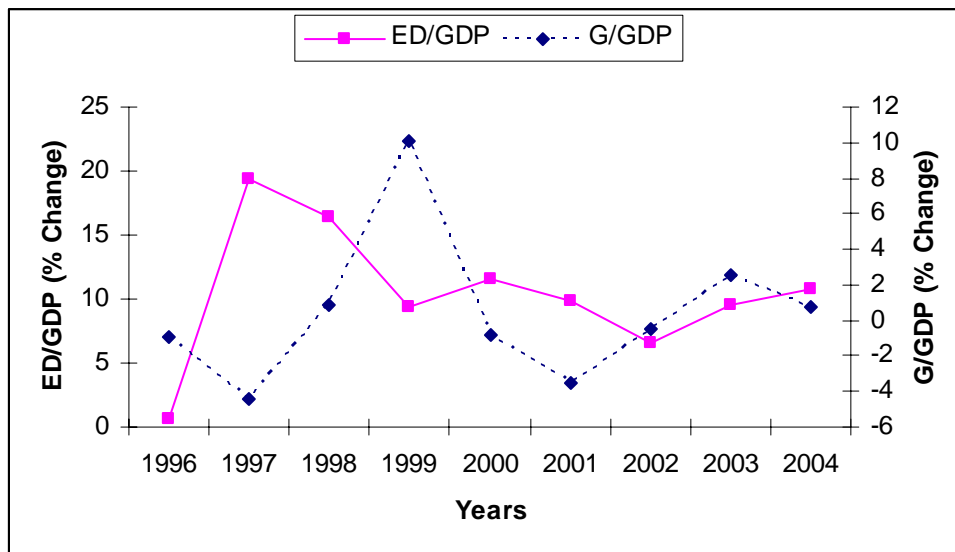
This study aims to provide some answers to the posed question by looking at educational expenditures in a selected number of African countries. The hypothesis is, therefore, to see what level of educational expenditure would optimize growth and social welfare and also to see how educational expenditure is affected by demographic and other factors.

The rest of the paper is organized as follows; Section 2 outlines trends in education spending in some selected African countries. In Section 3 the theoretical framework and methodology used in the study is presented and Section 4 contains a description of the data used in the study. In Section 5 the analysis of the results of the various estimations and diagnostic tests conducted is reported and lastly, Section 6 concludes.

## 2. Trends in Education Spending

A few basic facts have emerged over the past few years on the pattern of education expenditure as a share of Gross Domestic Product (GDP) in most African countries. Figure (1), shows the overall average of the pattern of education spending and total government expenditure as a share of GDP in some selected African countries. Total government expenditure as a share of GDP over the years has been fairly constant and education expenditure as a share of GDP has been increasing at a very slow pace over the same period.

**Figure 1. Overall Average of Education and Total Government Expenditure as a Share of GDP in the Selected African Countries**



Source: World Bank; African Development Indicators

The average annual rate of growth of educational expenditure as a share of GDP amounts to about 10 percent compared to the growth in total government expenditure as a share of GDP which amounts to about 0.45 percent. For education, the highest growth rate of about 19.3 percent was recorded in 1997, while a growth rate of about -4.38 percent was recorded for total government expenditure as a share of GDP in that year. Negative growth rates of about -0.84 percent in 2000, -3.57 percent in 2001 and -0.51 percent in 2002, were recorded for total government expenditure as a share of GDP. But education expenditure as a share of GDP in these years recorded a positive growth rate of 11.57, 9.83, and 6.51 percent, respectively.

From the above description, some economic questions are addressed in this paper. First, we investigate whether government expenditure, in trying to maximize social welfare is harmonized with the fiscal adjustment programs promoted by the IMF. Secondly, we investigate the factors that tend to determine the level of education expenditure in Africa.

### **3. Theoretical Framework and Methodology**

The framework used in this study follows a public choice approach similar to that used by Hewitt (1991, 1992, 1993) and Davoodi H., et.al (2001). Our model analyses the relationship between education spending and overall government spending. Thus, the determination of education spending is modeled as a government optimization problem. Meaning that the decision on the size of a budget and how much to be spent on education and others is being taken by the political leadership.

We assume the welfare function of the government to be:

$$W = f(C, E, O, Z), \quad (1)$$

Where

$C$  = private consumption;

$E$  = education spending;

$O$  = non-education government spending; and

$Z$  = state variables (i.e; the corruption index, IMF programs, Population index e.t.c).

The government's choice of the level of education and overall government spending is affected by the state variables. Overall government spending is represented by:

$$G = E + O. \quad (2)$$

Abstracting from private investment and the external account, the budget constraint is determined by the available resources in the economy:

$$G = Y - C, \quad (3)$$

Where  $Y$  represents the value of gross domestic product.

To get a simple analytical solution, a Cobb-Douglas specification for equation (1) is assumed, while abstracting from the presence of state variables. Thus,

$$W = C^\alpha E^\beta O^\gamma. \quad (4)$$

Choices of  $E$  and  $G$  that maximize equation (4) subject to equations (2) and (3) will result in<sup>†</sup>:

$$E = \frac{\beta}{\beta + \gamma} G \quad (5)$$

and

$$G = \frac{\alpha}{\alpha + \gamma} E + \frac{\gamma}{\alpha + \gamma} (Y) \quad (6)$$

Equations (5) and (6) show the simultaneous relationship between education spending and overall government spending. Higher education spending will lead to higher overall spending and vice versa. Dividing both equations by  $Y$  and allowing for the state variables to enter the equations, results in:

$$\frac{E}{Y} = f_1\left(\frac{G}{Y}; Z\right) \quad (7)$$

And

$$\frac{G}{Y} = f_2\left(\frac{E}{Y}; Z\right) \quad (8)$$

Where  $f_1$  and  $f_2$  are functions. Equations (7) and (8) form a structural model.

Furthermore, we also analyse the assessment of the impact of IMF-supported adjustment programs on education spending. That has also been addressed by Davoodi H., et.al (2001) and other authors such as (De Masi and Lorie, 1989; Abed, George, and others

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<sup>†</sup> The solution for the optimal choice of  $E$  and  $G$  is shown in Appendix 1.

1998; Schiff, Gupta, and Clements, 1998; and Gupta, Sanjeev, McDonald, and Ruggiero, 1998). However, the framework adopted in this study also allows for measuring the effects of corruption on education and overall government spending equations. Similar work has also been investigated in Mauro (1998) using a cross sectional data of countries and corruption is found to reduce government spending on education.

The econometrics models are specified in natural logarithms form based on equations (7) and (8) which are presented below:

$$\ln(educ_{it}) = \alpha + \alpha_1 \ln(ypc_{it}) + \alpha_2 \ln(gov_{it}) + \alpha_3 imf_{it} + \alpha_4 imf_{it} * \ln(gov_{it}) + \alpha_5 \ln(pop14_{it}) + \alpha_6 cor_{it} + u_{it} \quad (9)$$

$$\ln(gov_{it}) = \beta + \beta_1 \ln(ypc_{it}) + \beta_2 \ln(educ_{it}) + \beta_3 imf_{it} + \beta_4 \ln(ur_{it}) + \beta_5 cor_{it} + \beta_6 \ln(pop65_{it}) + v_{it} \quad (10)$$

Where

educ = ratio of education spending to GDP ,

ypc = real per capita GDP,

gov = ratio of overall government spending to GDP,

pop14 = population 14 years and under,

cor = corruption index,

imf = existence of IMF supported adjustment program (Dummy variable),

ur = urbanization ratio,

pop65 = population above 65 years,



and  $u_{it}$  and  $v_{it}$  are error terms. The subscript ( $it$ ) refers to country and time period respectively. The state variables in the specified equations (9) and (10) includes an IMF dummy variable, real per capita GDP, population under 14 years, corruption index, urbanization ratio, and population above 65 years. These variables are assumed to influence the parameters of education and government expenditures similar to the approach followed by Davoodi H., et.al (2001), Hewitt and van Rijckeghem (1995), Mauro (1998) and Heller, Peter, and Diamond (1990). The specification of the models also shows simultaneity between education spending and overall government spending.

The relationship that exists between total government expenditure and education expenditure is found to be ambiguous. Thus the growth in overall government expenditure may lead to budget resources being shifted to other functional sectors.

The GDP per capita which serves as a measure of welfare or development is expected to show evidence in favour of Wagner's law. This means that a higher level of welfare is accompanied by an increased share of government expenditure to GDP. However, evidence in favor of this phenomenon in the literature is mixed (Easterly, et.al (1993); Rodrik (1996); and Commander, et.al (1997)).

Also taking into consideration the two population age groups that are being used in the paper, it is expected that the size of the age group below the age of 14 years should have a positive correlation with education expenditure. The reason for choosing this population group is that most government expenditure on education goes to primary and secondary school pupils which happen to fall within this group. The age group above 65 years is also expected to have a positive sign with overall government expenditure. This is

because as the number of aged increases, government spending on social welfare and pension will also increase. The same argument goes for the urbanization ratio that is included in the estimation. Evidence from Hewitt (1992) has shown that increases in the population will lead to increased overall government spending.

The corruption control index is constructed based on the fact that a high value of this index means a cleaner government<sup>‡</sup>. Therefore, it is expected that a more corrupt government will spend less on education than on other components of expenditure where corrupt expenditures are less visible. The IMF dummy reflects those countries that embrace the IMF supported programs and those that do not. It is expected that countries that embrace the IMF programs will spend more on education and reduce their general expenditures.

#### **4. Data**

A panel data econometric technique is used in estimating the required models with 28 cross-sectional data points of selected African countries over the period 1995-2004<sup>§</sup>. The data used have been obtained from the World Bank data base except the IMF dummy variable which was taken from the IMF country reports. The real per capita GDP, size of the population under 14 years, urbanization ratio, population above 65 years, total population, real GDP, education expenditure, and total government expenditure series have been obtained from the World Bank: African development indicators. The corruption control index comes from the World Bank: Governance indicators.

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<sup>‡</sup> Most corrupt (-2.5) and Least corrupt (+2.5)

<sup>§</sup> List of the countries is shown in Appendix 2.

## 5. Estimation Results

The structural models of equations (9) and (10) are estimated using a two-stage least squares (2SLS) procedure. This is done to address the underlying problem of simultaneity that exists between education expenditure and total government expenditure. The instruments used in the model are the lagged values of the independent variables. The advantage of estimating the structural model with these instruments is that it provides point estimates of the response of education spending to exogenous changes in government spending, and the response of government spending to exogenous changes in education spending.

The results shown in Table 1 are encouraging with R-square coefficients of 0.92 and 0.98 in equations (9) and (10), respectively. The significance of the coefficient of the ratio of government spending to GDP reflects the impact of the IMF structural adjustment program. It indicates that a decline by 1 percent in total government spending as a share of GDP will lead to an increase of about 0.24 percent in education expenditure as a share of GDP. According to the IMF rules, it is expected that every government should tend to reduce its expenditure size but also devote a significant portion of its expenditure to education.

The significance of the real per capita GDP shows that the higher the welfare level of a country, the more that country spends on education. The positive relationship shows that, a one percent increase in real per capita income will lead to a 0.24 percent increase in education spending. This reflects strong evidence of Wagner's law. Also, a one percent increase in the size of the population under 14 years will increase spending on education

by about 0.05 percent. Similar results have been found in Mauro (1998) where he included the share of the population aged between 5 and 20 in order to raise the magnitude of the coefficient on corruption.

The response of education spending to the corruption index shows that as the government becomes less corrupt it's spending on education rises. This is not surprising since the education sector is not an attractive sector for politicians trying to seek their own personal interest.

The existence of IMF supported programs is associated with higher expenditure on education. Given the statistically significant relationship between the IMF dummy variable and education spending, the result shows that the IMF supported programs cannot be associated with increased spending on education. Also, the interactive dummy variable which is the product of the IMF dummy variable and the overall government spending to GDP ratio, does not conform to the expected outcome. In fact the response of education spending to cuts in total government spending is negative when these countries conform to the IMF supported programs. The finding is therefore not consistent with the suggestions for fiscal adjustment laid down in IMF (2002).

The indirect influences of the exogenous variables on education spending can be seen through the total government spending equation. Since education expenditure is a component of total government expenditure it is expected that higher spending on education will result into higher total government spending. From the estimation, total government expenditure will rise by about 0.07 percent if education spending increases

by one percent. The statistical significance of this coefficient shows that education expenditure is still a very small share of total government expenditure in Africa.

**Table 1. Results of Education and Government Expenditure Equations**

<i>Independent Variables</i>	<i>Dependent Variables</i>	
	<b>Ratio of Education Spending to GDP</b>	<b>Ratio of Government Spending to GDP</b>
Real per capita GDP	0.24*** (8.45)	0.39*** (24.55)
Ratio of Government Spending to GDP	-0.24*** (-3.14)	
Ratio of Education Spending to GDP		0.07** (2.2)
Urbanization Ratio		-1.14*** (-18.34)
Population Below 14	0.05*** (3.06)	
Population Above 65		-0.04*** (-3.65)
IMF Dummy	-2.79*** (-7.93)	-0.11*** (-2.78)
IMF Dummy*Govt Spending to GDP	2.02*** (8.17)	
Corruption Control Index	0.06** (2.1)	-0.08*** (-4.7)
Number of Observation	280	280
R-Square	0.92	0.98
Note: *** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level		

The response of total government expenditure to less corrupt government is in line with expectations. The statistical significance of the corruption index shows that as the corruption index declines by one unit, total government expenditures tend to decline by about 0.08 units. This is contrary to what is found with education spending and could be because corruption contributes towards total government expenditure since it reflects the self interest of politicians and bureaucrats.

Total government expenditure portrays the influence of IMF supported programs. The results are also compatible with that of Davoodi H., et.al (2001) when the two measures of international tensions and an interaction term are included.

An increase in the size of the population above 65 years of age as well as an increase in the urbanization ratio by one percent, will lead to a decline in government expenditure of about 0.04 and 1.14 percent, respectively. One would expect total government expenditure to increase as the number of aged people increases and also the rate of urbanization rises. The contrary results found may be due to the fact that this population group is somehow neglected in the total government budget and that much of government expenditure in Africa is not really directed to urban infrastructural development.

## **6. Conclusion**

The robust estimate of the impact of total government expenditure on education spending shows the expected results namely, that the share of education spending to total government spending increases when fiscal policy is contractionary. This means that government expenditure on education is not resilient to shocks while total government expenditure on the other hand is resilient to shocks in education spending.

The positive, significant and robust relationship found between corruption and education spending also shows that the education sector is not really affected by corrupt governance. Similar results were reported by Mauro (1998) who ascribed this relationship to the fact that most corrupt governments find it easier to collect bribes on non-educational expenditures such as infrastructure spending and the military. Although,

Mauro uses a different index for corruption with a negative correlation with education spending, but the interpretation is similar to what is found in this paper.

The results show that IMF supported programs have not contributed to increased spending on education. A possible explanation for this is that most governments in Africa are not complying with the set rules of IMF fiscal adjustment.

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## APPENDICES

### Appendix 1.

Forming a Langragian from (4) subject to (2) and (3).

$$L = C^\alpha E^\beta O^\gamma + \lambda(Y - C - E - O)$$

Since;  $E+O = Y-C$

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$$L_c = \alpha C^{\alpha-1} E^\beta O^\gamma - \lambda = 0 \quad (1)$$

$$L_E = \beta C^\alpha E^{\beta-1} O^\gamma - \lambda = 0 \quad (2)$$

$$L_O = \gamma C^\alpha E^\beta O^{\gamma-1} - \lambda = 0 \quad (3)$$

$$L_\lambda = Y - C - E - O = 0 \quad (4)$$

Equating (2) and (3)

$$\begin{aligned} \beta O &= E\gamma \\ O &= \frac{\gamma}{\beta} E \end{aligned} \quad (5)$$

Substituting (5) into (4)

$$Y - C - E - \frac{\gamma}{\beta} E = 0$$

But  $Y - C = G$

$$G - \left(1 + \frac{\gamma}{\beta}\right)E = 0$$

$$E = \frac{\beta}{\beta + \gamma}G \quad (6)$$

Also, equating (1) and (3)

$$\begin{aligned} \alpha O &= \gamma C \\ C &= \frac{\alpha}{\gamma}O \end{aligned} \quad (7)$$

Substituting (7) into (4)

$$Y - \frac{\alpha}{\gamma}O - G = 0 \quad \text{for } G = E + O$$

$$Y - \frac{\alpha}{\gamma}(G - E) - G = 0$$

$$Y + \frac{\alpha}{\gamma}E = \left(1 + \frac{\alpha}{\gamma}\right)G$$

$$G = \frac{\alpha}{\alpha + \gamma}E + \frac{\gamma}{\alpha + \gamma}Y$$

## **Appendix 2.**

List of Countries included in the paper

Angola  
Burundi  
Botswana  
Ivory Coast  
Cameroon  
Djibouti  
Eritrea  
Ethiopia  
Ghana  
Gambia  
Guinea  
Bissau  
Kenya  
Lesotho  
Morocco  
Madagascar  
Mali  
Mauritius  
Malawi  
Namibia  
Niger  
Nigeria  
Rwanda  
Senegal  
Seria Leone  
Swaziland  
Tunisia  
Uganda  
South Africa