

**THE IMPACT OF GOVERNMENT EXPENDITURE ON
ECONOMIC GROWTH IN A SMALL CARIBBEAN ECONOMY:
A DISAGGREGATED APPROACH**

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INTRODUCTION

The large size of the fiscal deficit of less developed countries (LDCs) and its deleterious effects on the macroeconomy has become one of the hottest economic and political issues in these countries during the 1980s and 1990s. Commentators from both domestic and international institutions generally agree that focussing only on revenue reforms is not enough to mitigate the deficit since most of these countries have reached their optimal revenue capacity. Public expenditure policies aimed at increasing public expenditure productivity, though not sufficient, is desirable.

Given this, many researchers have examined the effects of aggregate public expenditure on economic growth with mixed results: some support the hypothesis that the share of public spending is negatively associated with economic growth (Landau (1986)); others have found that public spending is positively correlated with economic growth (Ram (1986)); and some have found no significant relationship (Kormendi and Meguire (1985)). In general, as noted by Levine and Renelt (1992), studies on the relationship between aggregate public expenditure and economic growth have not yielded robust results. In fact they are very sensitive to small changes in the model specification.

This has led to, and rightfully too, a number of studies testing the effects of certain public expenditure components on economic growth. These results have also been contradictory. For example, most studies have found a strong positive correlation between education indicators and growth (Barro (1991), Easterly and Rebelo (1993) and Otani and Villanvera (1990)) while, in contrast, others have reported a statistically insignificant relationship between economic growth and public investment (Barro (1991)).

This paper falls into this latter set of studies. Specifically it uses the analytical framework of Devarajan et al (1994) to determine which components of government expenditure in Barbados are growth inducing and which are growth retarding for a given level of government expenditure. The results indicate that there is a positive and statistically significant relationship between economic growth and capital, agriculture, transport, health and housing expenditure, respectively. By contrast, the relationship between the current component of public expenditure and economic growth is negative. A similar result is obtained for the share of expenditure devoted to education. Section two discusses the empirical model to be estimated. Section three presents the data, empirical methodology and the results. Conclusions are made in the final section.

THE EMPIRICAL MODEL

The empirical model used in this study is based on the optimizing framework developed by Devarajan (1994) et al. The model expresses the difference between productive and unproductive expenditure by how a shift in the mix of the two alters the economy's long term growth rate. Productive government expenditure is classified as that component of public expenditure, an increase in whose share will raise the steady-state growth rate of the economy. Likewise, unproductive government expenditure is defined as that component which, if its share is increased, will lead to a lower growth rate. Therefore, these conditions imply that transferring resources from "unproductive" to "productive" expenditures will raise the steady state growth rate. Rather than a priori classification of expenditure into productive or unproductive, the data determines the categories under which the classification falls.

The model to be estimated is:

$$DGDP_t = \beta_0 + \sum_k \beta_k (G_k / TEXP)_t + \beta_6 SHOCK_t + \beta_7 TEXPGDP_t + \beta_8 DOM_t + \mu_t \quad (1)$$

DGDP_t is the growth rate of real per capital gross domestic product. The term

$$\sum_k \beta_k (G_k/TEXP)_t = \beta_1 \text{AGRTEXP} + \beta_2 \text{HOMEXP} + \beta_3 \text{HLTMEXP} + \beta_4 \text{ROADEXP} + \beta_5 \text{EDUCEXP}$$

where AGRTEXP is the ratio of agriculture expenditure to total expenditure, HOMEXP is the ratio of housing and community amenities to total expenditure, HLTMEXP is the ratio of health expenditure to total expenditure, ROADEXP is the ratio of roads and other transport expenditure to total expenditure and EDUCEXP is the ratio of education expenditure to total expenditure. We expect that these components of public expenditure will have a positive sign, implying that they are productive expenditures.

The variable SHOCK_t represents external shocks on the economy and is defined as a weighted average of changes in the world real interest rate (R), the export price index (PX) and the import price index (PM). Explicitly we have

$$SHOCK_t = (R_t - R_{t-1}) (DEBT/GDP)_t + (PX_t - PX_{t-1}) (X/GDP) + (PM_t - PM_{t-1}) (M/GDP)$$

where X/GDP is the ratio of exports to nominal GDP, M/GDP is the ratio of imports to nominal GDP and DEBT/GDP is the ratio of external debt to nominal GDP. The larger

the shock, the more distorted the economy, the worst its growth performance. Hence, the sign on the SHOCK variable is a priori negative. DOM_t is also a control variable but representing domestic policies. Several proxies were used to measure this variable but none proved significant. However, we do report the results of the money supply to GDP ratio proxy for the readers perusal. The variable TEXP_t is the ratio of total expenditure to nominal GDP and is used to control for level effects and also for the effects of financing government expenditure. This sign is expected to be positive if the productivity of government spending exceeds the deadweight loss associated with the distortionary taxes required to pay for it. (See Deverajan et al (1994)). Finally, μ_t is an error term assumed to be identically independently normally distributed with zero mean and constant variance.

In an attempt to isolate the effects of the broad expenditure categories on growth we also estimated the following equation:

$$DGDP_t = \beta_0 + \beta_1 \text{CAPTEXP}_t + \beta_2 \text{TEXPGDP}_t + \beta_3 \text{SHOCK}_t + \beta_4 \text{DOM}_t + \mu_t \quad (2)$$

where CAPTEXP is the ratio of capital expenditure to total expenditure. Public expenditure on capital goods is supposed to add to a country's physical capital (mainly infrastructure - roads, bridges, etc.) which, in turn, could complement private sector productivity and increase growth in the process. The sign of this variable should therefore be positive.

Equation (2) was also re-estimated with current expenditure replacing capital expenditure, that is:

$$DGDP_t = \beta_0 + \beta_1 CURTEXP_t + \beta_2 TEXP GDP_t + \beta_3 SHOCK_t + \beta_4 DOM_t + \mu_t \quad (3)$$

where CURTEXP is the ratio of current expenditure (net of interest payments) to total expenditure. Since most current expenditures are for consumption purposes an increase in this ratio should reduce growth (Barro (1991)).

DATA METHODOLOGY AND EMPIRICAL RESULTS

The data used in this study is annual and covers the period 1969-1993. The sources of the data are the Central Bank of Barbados, Annual Statistical Digest, the International

Monetary Fund, International Financial Statistics, and the World Bank, Annual Tables.

The government data employed relates to the central government; expenditure of government owned or controlled public sector enterprises are omitted. Details of the data are given in an appendix available from the authors.

Following Engle and Granger (1987) we first attempt to determine whether a long run relationship exists between the variables. If the variables are cointegrated, they cannot move too "far away" from each other. In contrast, a lack of cointegration suggests that the variables have no long run link and can move arbitrarily far away from each other. The cointegration method involves checking to see whether the individual series are stationary (I(0)) or not (I(1)) and then testing the residuals from the regression equations for stationarity. The specific method used to test for stationarity is the well known Augmented Dickey Fuller (ADF) method. All computations are done using the TSP computer programme.

Table 1 suggests that the series are either I(0) or I(1). Table 2 presents the results of the regression of the ratio of capital and current expenditure to GDP (equation 2 and 3 above). These equations are not cointegrated and hence the findings should be interpreted with some caution. Nevertheless, the effect of capital expenditure is positive but significant only at the 10% level. This result is in tune with the standard hypothesis that the capital component of public expenditure and per capita growth is positively related. For current expenditure, we have a similar level of significance but its sign is negative. Again, this result is in tune with our a priori belief and gives some credence to the policy advice dished out by various international institutions prescribing a cut in current, rather than capital, expenditure in order to foster long-term economic growth.

Table 2 implies that cointegration does not exist for equation one mentioned in section two above. Moreover, a look at this equation indicates that the domestic policy proxy (DOM) is insignificant. Omitting (DOM) from the equation not only removed the serial correlation but gave a cointegrating relationship between the variables. Consequently we focus on the model that exclude the domestic policy variable.

Formal testing of the resultant model for the presence of first and second order serial correlation is rejected using the Lagrange Multiplier Test. The ARCH test results in the null hypothesis of homoscedasticity while the CUSUM test suggests that the parameters of the system are stable. A misspecification test in the form of the Ramsey (RESET) test implied acceptance of the hypothesis that the model is correctly specified in its linear form. These diagnostics are presented in Table 3.

Of note is the positive and significant relationship between economic growth and agriculture, housing and community, and health expenditures respectively; road and other transport is positively signed but not significant. As economic infrastructure expenditure generally has a high proportion of capital expenditure, the finding that it has a positive relation with economic growth is consistent with the correlation between capital expenditure and growth discussed above. The result concurs with that of Easterly and Rebelo(1993) who report that public investment in transport and communication in developing countries seem to be consistently positively correlated with growth with a very high coefficient. On the other hand, Devarajan et al (1994) found a negative relationship between public infrastructure expenditure and per capita growth. The surprising finding

in the study is that education expenditure carries a negative sign though insignificant. The result may imply that a finer disaggregation is required for education as exemplified by in Devarajan et al (1994) who found that spending on subsidiary services to education (for example, transportation, food, medical and other services to students) and program units engaged in teaching methods and objectives is positively related to growth.

As for the other variables in the model the shock variable has the incorrect sign if only at while the shock variable is only significant at the 13% level. Total expenditure to GDP tends to be negative and significant, suggesting that the productivity of government spending in Barbados does exceed the deadweight loss associated with the tax used to pay for it.

CONCLUSIONS

This paper develops a simple model to show how the composition of public expenditure affects growth. The cointegration method is employed on data for Barbados over the period 1969-1993. The results indicate that an increase in the share of capital expenditure

has a positive relation to growth and so does health, housing, agriculture and road expenditures. By contrast, the relationship between current expenditure and growth is negative. A similar result holds true for education through this is not a significant one.

Clear directions for future research have emerged from this paper. Of first importance is the need for future disaggregation of the data. Health expenditure for example needs to be disaggregated to explicitly measure the effects of hospital and polytechnic expenditure on growth. Given the small size of the sample it is also necessary to extend the analysis to cover a wide cross-section of Caribbean economies.

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REFERENCES

- Barro, Robert J., "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, Vol. 106 (May 1991), pp. 407-43.
- Devaran S., Swaroop V., Zou H, "What Do Governments Buy? The Composition of Public Expenditure and Economic Performance" (1994) World Bank Work
- Easterly, William, and Sergio Rebelo, "Fiscal Policy and Economic Growth: An Empirical Investigation", *Journal of Monetary Economics*, Vol 32 (December 1993), pp. 417-58.
- Engle, R. F. and Granger C. W., "Co-integration and Error Correction: Representation, Estimation and Testing" *Econometrica* Vol 55 (1987), pp. 251-276.
- Kormendi Roger C., and Philip G. Meguire, "Macroeconomic Determinants of Growth: Cross-Country Evidence", *Journal of Monetary Economics*, Vol. 16 (September 1985), pp. 141-63.
- Landau, Daniel, "Government and Economic Growth in the Less-Developed Countries: An Empirical Study for 1960-80", *Economic Development and Cultural Change*, Vol. 35 (October 1986), pp. 35-75.
- Levine, Ross, and David Renelt, "A Sensitivity Analysis of Cross-Country Growth Regressions", *American Economic Review*, Vol. 82, (September 1992), pp. 942-63.
- Otani, Ichiro, and Delano Villanueva, "Long-Term Growth in Developing Countries and its Determinants: An Empirical Analysis", *World Development*, Vol. 18 (June 1990), pp. 769-83.
- Ram, Rati, "Government Size and Economic Growth: A New Framework and Some Evidence from Cross-Section and Times-Series Data", *American Economic Review*, Vol. 76 (March 1986, pp. 191-203.

TABLE 1: UNIT ROOT BEST RESULTS

VARIABLE	AUGMENTED DICKEY FULLER	McKINNON CRITICAL VALUES 5%
DGDP	-2.35	-3.01
D (DGDP)	-3.98	-3.02
AGRTEXP	-2.03	-2.99
D (AGRTEXP)	-5.79	-3.01
HOMEXP	-2.27	-2.99
D (HOMEXP)	-3.48	-3.01
HLTHEXP	-2.18	-2.99
D (HLTHEXP)	-4.31	-3.01
ROADEXP	-2.28	-3.00
D (ROADEXP)	-3.83	-3.01
EDUCEXP	-2.84	-3.00
D (EDUCEXP)	-6.22	-3.00
SHOCK1	-2.11	-3.00
D (SHOCK1)	-3.15	-3.01
TEXPGDP	-4.04	-3.00
CURTEXP	-0.95	-3.00
D (CURTEXP)	-4.41	-3.01
CAPTEXT	-0.95	-3.00
D (CAPTEXT)	-4.41	-3.01
MY	-2.28	-3.00
D (MY)	-2.68	-3.00

TABLE 2: ENGLE-GRANGER COINTEGRATION TEST RESULTS.

	A		B
DGDP	1.000	1.000	1.000
AGRTEXP	-3.106 (2.068)		
HOMEXP	-3.552 (2.770)		
HLTHEXP	-4.258 (2.288)		
ROADEXP	-0.488 (0.802)		
EDUCEXP	1.060 (-0.801)		
SHOCK1	-0.005 (0.892)	-0.009 (1.614)	-0.009 (1.614)
TEXPGDP	1.464 (-1.830)	2.375 (2.792)	2.375 (-2.792)
CURTEXP		0.903 (1.710)	
CAPTEXP			-0.903 (1.710)
MY	0.527 (-0.601)	-0.649 (0.699)	-0.649 (0.699)
DICKEY FULLER T	-4.335	-3.930	-3.930
MacKinnon Crit Val 5%	-5.545	-5.116	-5.116
D.W Statistic	2.183	1.540	1.540

Note: D() before the variable represents first differences .

TABLE 3: A VARIANT OF EQUATION(1) AND DIAGNOSTIC TESTS.

Equation	Coefficient	T-Statistic	F Statistic
CONSTANT	-0.0891	-0.280	
AGRTEXP	3.554	2.785	
HOMEXP	3.380	2.763	
HLTHEXP	3.572	2.485	
ROADEXP	0.473	0.794	
EDUCEXP	-0.831	-0.670	
SHOCK1	0.007	1.601	
TEXPGDP	-1.667	-2.350	
LM TEST(1)			0.0693
ARCH TEST(1)			0.109
RESET TEST(1)			2.065
R-SQUARED	0.771		
DICKEY FULLER	-6.840		
McKLNNON Crit 5%	-5.992		

