The Composition of Public Expenditure and Economic Growth in Developing Countries

by

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Revised: December 2003

Keywords: Economic Growth, Public Expenditure, Public Sector, Panel and Cross-country Regressions.

JEL Classification: O4; E62 ; H6

The author would like to thank Jonathan Temple for his insightful comments in relation to this research. The permission to use World Bank Archives at Washington D.C. for data collection is gratefully acknowledged.

Abstract

We have evaluated the effect of changing the composition of public expenditure on economic growth in developing countries for cross-section and panel data. As we have found the evidences contradictory to each other while cross-section analysis supporting the conventional wisdom, we test for non-stationarity in the panel data. After correcting for non-stationarity found in the data for shares of current and capital expenditure in total public expenditure of developing countries, the results confirm the conventional wisdom and suggest that switching resources from consumption to investment type is growth enhancing in developing countries where governments face resource constraints.

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1. Introduction:

In the recent years, a sizable amount of research has been directed towards evaluating the role of fiscal policy in economic development with particular emphasis on public expenditures (Barro, 1990; Barro and Sala-i-Martin, 1992; Barro and Sala-i-Martin, 1995; Glomm and Ravikumar, 1997). Empirical attempts to link aggregate measures of fiscal policy with average per capita growth rates in cross-country studies have tended to use one or more of the following fiscal variables: (i) measures of the overall size of the government (Landau, 1983, 1985, 1986; Kormendi and Meguire, 1985; Levine and Renelt, 1992); (ii) disaggregated measures of public expenditures, the disaggregation either between consumption and investment expenditures or between sectoral expenditures (Barro, 1990, 1991; Easterly and Rebelo, 1993); (iii) growth of public expenditures (Ram, 1986); (iv) composition of government expenditures (Deverajan *et. al.*, 1996; Gupta *et.al.*, 2002); (v) government surplus / deficit (Fischer, 1993); (vi) various government taxes (Easterly and Rebelo, 1993) and (vii) different expenditures in the presence of government budget constraint (Kneller *et. al.*, 1999).

While the focus of these studies was mostly to identify the level effects of public expenditures on growth, little effort was spent on examining the pure composition effects of public expenditures (i.e., to examine the extent to which a resource switch between consumption and investment expenditure could enhance growth performance of the economy). Such analysis is of vital importance to many economies where resources are limited for raising current levels of public spending. Two recent exceptions in this direction are by Deverajan *et. al.* (1996) and Gupta *et.al.*, (2002). The study by Deverajan *et. al.* (1996) suggests that, for developing countries, switching public spending from investment to consumption type is growth enhancing. Using a panel data for 43 developing countries over 20 years, they find that an increase in the share of current (capital) expenditure has positive (negative) and statistically significant growth effects. The explanation given by Deverajan *et. al.* (1996) for their counterintuitive results is that if productive expenditure is already excessive, a further increase in its share in total expenditure would have a negative impact on growth. A counterintuitive policy implication follows from here suggesting that developing country governments have been misallocating public expenditures in favor of capital expenditures at the expense of current expenditures and they should allocate their resources to pay their bureaucrats rather than building infrastructure. The most recent study by Gupta *et.al.* (2002) uses the share of different types of spending in total public spending as one of the explanatory variables in growth regressions for thirty-nine low-income countries and found the result opposite to Deverajan *et. al.* (1996). One weakness of their study, however, is that they have not controlled for total spending within the regression specification, which would be discussed later.

Intuitively, investment (or, productive) expenditure by the government is supposed to raise private capital accumulation, which in turn will raise economic growth in the long run. And the impact of government consumption should be opposite to its investment counterpart. An interpretation given by Barro (1990) for government consumption is that government consumption introduces distortions, such as high tax rates, but does not provide an offsetting stimulus to investment and growth. Alternatively, the effect of an increase in government consumption should be nil if we view it as leaving the productivity of the private sector unaffected. In contrast, the effect of public investment should be positive since this type of activity is likely to enhance the productivity of the private sector (see Aschauer, 1989; Barro, 1990). If we consider switching expenditure from one component to another, especially in the context of developing countries where there is a tremendous scarcity of resources and infrastructure, standard theory predicts that switching from current to capital expenditures would give higher growth in the economy. This is because developing countries typically lack infrastructures like transport and communications that help promote private capital accumulation.

The paper evaluates this issue giving due consideration to properties of the time series data (especially, non-stationarity) for a panel of thirty-three developing countries[1]. Throughout our analysis, we use the specification of Deverajan *et. al.* (1996) to capture the growth effects of resource switch from current to capital expenditures or vice versa when the economy has the resource constraint. We find the results in panel and cross-section contradictory to each other, where the panel result (same as Deverajan *et. al.*, 1996[2]) belies the theoretical intuition.

[1] Our sample comes from the data set collected under a project on sectoral current and capital expenditures by the government after consulting World Bank Country Economic Reports and Public Expenditure Reviews. The project ended up collecting the data for only thirty-three countries.

[2] This confirms that our data set is qualitatively not different than that have been used by Deverajan *et. al.* (1996) even though our sample differs from theirs.

We investigate whether the reason for above lies in the time-series property of the panel. After correcting for the non-stationarity found in the data, the final result suggests that switching resources from consumption to investment type is growth enhancing rather than growth reducing. We also conduct various sensitivity analyses to ensure the robustness of the result obtained.

The structure of the paper is as follows. A simple descriptive analysis is provided in section 2 to show the direction of government's current and capital expenditures' shares in GDP and in total expenditures and growth in GDP per capita. In section 3, we report the results of base regressions for a panel of developing countries. Section 4 contains the cross-section evidence that contradicts the panel (as in Deverajan *et. al.*, 1996) findings. Section 5 tests for stationarity of data on expenditures' shares and find the results that support the cross-section evidence. Section 6 concludes.

2. A Simple Analysis:

The reason put forward by Deverajan *et. al.* (1996) for the negative co-efficient for capital expenditure's share was that perhaps developing countries were raising capital expenditure while it was already excessive. But in reality developing countries often cannot grow as they tremendously lack infrastructure like roads, highways, gas, electricity, etc. Due to the large-scale nature, there occurs market failure in building these infrastructures. Government has to come forward in order to develop these effectively through government capital expenditure. Our hypothesis is that given the resources to be spent in the public sector fixed over the years, resource switch from consumption (e.g., paying the bureaucrats) to investment (e.g., building infrastructure) type expenditure would lead to higher growth.

Before conducting a formal test, we begin our preliminary investigation by simply looking at the data. We find that capital expenditure as a percentage of GDP and its share in total government expenditure are low in comparison to its consumption (current expenditure) counterpart. Table 1 shows the average GDP growth, the average shares of government current and capital expenditures in GDP, and average shares of current and capital expenditures in total government expenditure in the world, low-income, middle-income, developing and high income countries for available years during the periods 1980-90 and 1990-97 [3].

Table 1 is about here

While in all categories of countries, low, middle, developing and high, both growth and capital expenditure's share in GDP has declined, except for low-income countries current expenditure's share in GDP has increased. The world's average GDP growth rate has declined from 3.1 percent per year over 1980-90 to 2.3 percent over 1990-97, while this figure has marginally reduced from 4.3 to 4.2 in low-income countries, from 2.8 to 2.5 in middle-income countries, from 3.0 to 2.8 in developing countries, and most markedly from 3.2 to 2.1 in high-income countries. Current expenditure's share in GDP has risen during the same period from 21.9 percent to 25.4 percent in the world, from 20.1 percent to 23.0 percent in middle income countries, from 18.8 percent to 21.7 percent in developing countries and from 30.7 percent to 34.3 percent in high income countries, except for low income countries where it has not moved in either of direction, i.e., a negligible decline from 17.2 percent to 16.9 percent. However, for capital expenditures all categories of countries experienced the same direction in movement (i.e., declined as for GDP growth) for capital expenditure's share in GDP; from 5.1 percent to 3.4 percent in the world, from 5.8 percent to 4.6 percent in low income countries, from 6.2 percent to 3.7 percent in middle income countries, from 6.0 to 3.9 percent in developing countries, and from 2.6 percent to 2.2 percent in high income countries.

If we consider the composition of total government expenditure, we can see from the same table that current expenditure's share in total government expenditure increased over these two periods while capital's share decreased for all categories of countries. Especially, the increasing rate for current expenditure's share is much higher in all categories of developing countries (low and middle income, and the developing as a whole). It may suggest that (i) both the level and the share of capital expenditure in total expenditure are positively associated with growth, while those of current expenditure have a negative association with growth; (ii) all countries are switching on average their expenditures from the capital to the current component of their total expenditures over time, while this switch is bigger in the case of low income and developing countries than in high income countries. This analysis

[3] Source: World Development Report, 1999. The classification of Low-income, Middle-income, Developing and High-income countries is taken from World Bank. "Developing" countries comprise "low" and "middle" income countries.

suggests that particularly developing countries are not switching their expenditures from current (consumption) to capital (investment) components over time as has been suggested by Deverajan *et. al.* (1996) as an explanation of their result, rather the flow is the reverse while having the experience of lower growth. Hence, switching the expenditure from current to capital should affect growth positively and the affect should be higher for developing countries, while switching in the opposite direction should have a negative effect.

3. Empirical Analysis:

Our empirical analysis focuses on the link between the share of the components of public expenditure in total expenditure and economic growth in developing countries. Aschauer and Greenwood (1985), Barro (1990, 1991) and others emphasize the distinction between public goods and services that enter into the household's utility function and those that complement private sector inputs in production. Government consumption is likely to have a negative effect on growth, as the reduction in the returns on and incentives for investment due to higher tax-finance outweigh the utility derived from it. Grier and Tullock (1989) confirm this negative effect of government consumption by using pooled cross-section/time-series data for 115 countries. By contrast, government investment expenditure, like infrastructure services, is thought to help promote investment and growth. Aschauer (1989) finds the 'core infrastructure' – streets, highways, airports, mass transit, and other public capital - has the most explanatory power for private sector productivity in the United States over the period 1949-85. Easterly and Rebelo (1993) show that public investment in transport and communication raises growth by increasing the social return to private investment, not by raising private investment itself.

3.1. Equation Specification:

The specification used by Gupta *et. al.* (2002) automatically takes care of non-stationarity in data as they have taken the first difference of the shares of different expenditure components in total public spending. But they have not controlled for total public spending within the regression specification. Hence their analysis does not exactly show the growth effect of resource switch from one expenditure component to another while the total public spending is fixed. Throughout our analysis, we use the following specification taken from Deverajan *et. al*. (1996) as it is the most suitable specification for our purpose:

$$GRPGDP^{i}_{(t+1,t+5)} = \sum_{j=1}^{6} \alpha_j D_j + \alpha_7 (TE/GDP)^{i}_{t} + \alpha_8 BMP^{i}_{t}$$

$$+ \alpha_9 SHOCK^{i}_{t} + \alpha_k \left(G_k / TE\right)^{i}_{t} + \mu^{i}_{t} \qquad (1)$$

Where the variables are,

(i) $GRPGDP^{i}_{(t+1,t+5)}$ = Five-year forward moving average of per-capita real GDP growth for country *i*.

(ii) D_j = Continental dummy variables; j = 1, 2, …, 6 corresponding to Central and North America, East Asia and the Pacific, Latin America and the Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa [4].

(iii) $(TE/GDP)^{i}_{t}$: Share of total government expenditure in GDP for country i at time t.

(iv) BMP^{i}_{t} = Premium in the black-market for foreign exchange in country *i* at time *t*, calculated as $BMP_t = \left[\left(BER_t - OER_t\right)/OER_t\right]$ where BMP = Black Market Premium, OER = Official Exchange Rate and BER = Black Market Exchange Rate [5].

(v) $SHOCK^{i}_{t}$: The shock variable for country *i* at time *t*, is a weighted average of changes in the world real interest rate (R) and the export price index (PX) and import price index (PM) for each country. The export and import prices are index numbers expressed in U.S. dollars converted at the annual average of the country's official exchange rate. The weights are the ratios to GDP of debt, export (X), and import (M), respectively. By 'changes' we mean the difference in the average value of these variables between t to t+4 and t+1 to t+5. In symbols it is defined as,

Shock $_t$ =

$$\left(R_{t+1,t+5} - R_{t,t+4}\right)\left(Debt/GDP\right) + \left(PX_{t+1,t+5} - PX_{t,t+4}\right)\left(X/GDP\right) + \left(PM_{t+1,t+5} - PM_{t,t+4}\right)\left(M/GDP\right)$$

and $R = \dfrac{\left(r - dP/P\right)}{\left(1 + dP/P\right)}$; $r = \dfrac{TotalInterestPayments}{TotalDebt}$; R = World real interest rate.

dP/P = World inflation rate measured by the percentage change in the USA GDP deflator.

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[4] Classification of Continents is taken from Global Development Finance, 1998.

[5] Source: Fischer (1993) for the period 1970 – 88 and various World Currency Yearbooks for the observations onward.

(vi) $(G/TE)_t^{\,i}$: A vector of government expenditure ratios to GDP for country *i* at time *t*. Expenditure shares are by economic classification: Ncur/Te = ratio of current expenditure to total expenditure and Cap/Te = ratio of capital expenditure to total expenditure.
Note that the data for all the variables are annual.

In constructing the shock variable we take the difference in the average value of the real interest rate, import price index and export price index between periods *t* to *t*+4 and *t*+1 to *t*+5. In this way, we capture a similar type of distortion to the shock variable of DSZ and get more time series data [6]. The growth rate of GDP per capita, exports, imports, export price index and import price index are taken from the World Bank CDROM. Debt and interest rate are taken from World Debt Tables. The data on the expenditure variables for the regressions are taken from Haque (2002) [7].

In the base case, we use the continent dummies to capture the uneven growth experiences across continents. The other two control variables, the black market premium and the composite shock variable, are used to control for the effects of external shocks and domestic policies.

3.2. Regression Results:

As the dependent variable is a five-year forward moving average of per capita real GDP growth (%), we correct the standard errors by using the extended method of Deverajan *et. al.*, (1996) for serial correlation based on Hansen and Hodrick (1980). Table 2 contains the estimates of equation 1.

Model 1.1 shows a positive (0.035) and significant (p-value = 0.05) relationship between the five-year forward moving average of per capita real GDP growth and the ratio of current expenditure to total expenditure[8]. It suggests that a unit increase in this ratio would increase the growth rate by 0.035 percentage points. Clearly this is an unusual finding, as Deverajan *et. al.* (1996) acknowledge. As already mentioned, it is unusual, because standard public finance theory predicts that government consumption should have either a negative or nil impact on production as it can not provide sufficient stimulus for private capital

[6] This is a slight change from Deverajan *et. al.* (1996) in order to raise the number of observations in the sample.
[7] The data are available upon request.
[8] Devarajan, *et. al.* (1996) estimate the coefficient 0.046 for current expenditure's share with significance at 5 percent and 0.045 for capital expenditure's share with significance at 10 percent.

accumulation, rather it creates distortion through taxation for its financing. Barro (1990, 1991), Levine and Renelt (1992) and others have confirmed this intuition. The relationship between the capital component's share in government expenditure and per capita growth is negative (-0.036) and significant (p-value = 0.05) as shown in Model 1.2 [9]. Once again this belies the standard hypothesis. Intuition suggests that the resulting stock of infrastructure from capital expenditure would complement private sector productivity, and hence, has favorable growth effects.

Table 2 is about here

As the dummy variable coefficients for Central and North America, Middle East and North Africa and South Asia are almost the same; we use two alternative specifications (models. 1.3 – 1.6). For models 1.3 – 1.4, we use only 3 continent dummies for East Asia and the Pacific, Latin America and the Caribbean and sub-Saharan Africa. The coefficients of regional dummies in models 1.2 – 1.4 suggest that the growth rate in sub-Saharan Africa and Latin America are below the mean while that for East Asia and the Pacific is above the mean[10]. For models 1.5 – 1.6, we exclude the dummy for East Asia and the Pacific[11]. The interpretation of the estimated coefficients on these variables is somewhat problematic, however, because the choice of which regions to assign dummies is endogenous. In any case, if we have already included enough explanatory variables to explain why growth was below expectations in sub-Saharan Africa and Latin America and the Caribbean and above expectations in East Asia and the Pacific, then the estimated coefficients of the dummy variables would differ insignificantly from zero.

However, even after doing the exercise of including and excluding the regional dummies we find almost the same coefficient for the shares of current and capital expenditures in total expenditures. The ratio of current to total expenditure has the coefficient 0.035 for the first two specifications which is marginally significant (p-value = 0.05). But when we regress with dummies for only Latin America and the Caribbean and sub-Saharan Africa, we get a slightly higher positive coefficient (0.04) for current expenditure's share with strong statistical significance (p-value = 0.01). The result is reversed for the ratio of capital to total expenditure. While the coefficient for the first two specifications is -0.036 (p-value = 0.05),

[9] It may be noted that the coefficient is not exactly the negative of that for current expenditure because the latter is net of interest payments (so that the two shares do not sum to exactly one).
[10] It confirms the findings of Barro and Sala-i-Martin (1995).

the coefficient for this with continent dummies for only Latin America and the Caribbean and sub-Saharan Africa is -0.04 (p-value = 0.01). This analysis suggests a counterintuitive policy that a resource switch towards current (capital) expenditures is growth-enhancing (growth-reducing).

4. Cross-Section Evidence:

As the result we obtained from the panel regression is somewhat puzzling, we examine the relationship further using the same data and the same specification in a cross-sectional context. Specifically, we have taken the average over 1970-89 for the data on all variables. Since we are left with one data point for each country in a cross-section study compared with several data points in a panel, continental dummies would be weak explanatory variables. Instead, following standard cross-section models, pioneered by Barro (1991), we use the country-specific control (/environmental) variables, which are initial GDP per capita, initial human capital (proxied by primary and secondary school enrolments) and political instability (proxied by number of assassinations and number of revolutions and coups)[12]. In summary, we find that for the cross-section the results are reversed from the panel case and confirm the standard findings of earlier studies (Barro, 1991, 1998; Barro and Sala-i-artin, 1995, 1999;Easterly and Rebelo, 1993).

Table 3 is about here

Table 3 shows that after controlling for the initial environment of the respective countries in terms of initial GDP per capita, initial human capital, and political instability, we get negative (-0.06) and significant (at 5% level) coefficient for current expenditure's share but positive (0.07) and significant (at 5% level) coefficient for capital expenditure's share[13]. We have also tested for robustness by controlling for the black market premium (BMP) as an external shock variable and the initial trade share and M2 (as ratio to GDP) as policy shocks, and we get similar results suggesting negative and significant coefficients (ranging from –0.08 to –

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[11] In these last two specifications, we selected regions for which previous researchers have observed that growth rates are surprisingly low.

[12] The data for GDP per capita, initial trade share (export plus import as percentage of GDP) and M2 are collected from World Bank CDROM and other initial conditioning variables are from Barro and Lee (1994).

[13] Again we need to mention that the coefficient is not exactly the negative of current expenditure because the latter is net of interest payments (so that the two shares do not sum to exactly one).

0.04) for current expenditure's share and the equivalent opposite result for capital expenditure's share (ranging from 0.036 to 0.08).

Our findings suggest that the reason for the puzzling result above may lie with the time series for each cross-section, *i.e.*, whether the data for the corresponding expenditure's shares is stationary. Because, if a time-series for a variable is non-stationary (i.e., having unit roots), then the regression with its level would give spurious results.

5. Regression Results with Stationary data

In order to address the issue of non-stationarity we examine whether the data for the expenditure's share of different components in government expenditure are stationary. We know from Nelson and Plosser (1982) that generally real macroeconomic variables are non-stationary and integrated of order one, i.e., I(1). This means that these variables should be stationary if we take their first difference.

Table 4 is about here

Table 4 provides us with tests for the order of the integration of different components' share in total public expenditure. Out of 33 countries we can test for stationarity only for 24 countries due to insufficient time series data for the rest of the countries. Of these, 22 countries are found to have non-stationary data for current and capital expenditures' shares, among which data are judged to be I(1) for 21 countries.

India seems to have I(2) data for these variables, which is rather strange. It may be a reflection of the fact that the number of observations is only 14 for which explanatory power of the test may be reduced. Within our sample we have only 2 countries (Sierra Leone and Thailand) having stationary or trend stationary data according to the augmented Dicky-Fuller (ADF) test. From this exercise, we can conclude in general that the shares of different components in total expenditure are I(1) variables.

As discussed above, the presence of I(1) variables can give spurious results. In order to correct for non-stationarity we can take the first difference of these variables. This approach has got another added advantage in that it explicitly looks at the effect of switching resources (government expenditure) from one type to another, as suggested by Deverajan *et.al.* (1996).

Using the first difference of components' shares in total government expenditure, rather than taking the current year levels, may be more appropriate in capturing the switching effect.

We use the same specification as in equation 1 with the first difference of the explanatory variables[14]. With the error term $u_{it} = \mu_i + \varepsilon_{it}$ (i = 1, …., N countries; t = 1, …, T time), there are three alternative econometric specifications of the model, each differing in its treatment of μ_I (see Hsiao, 1992): pooled OLS, one-way (country) fixed effects, two-way (country and time) fixed effects and random effects regressions, keeping the same specification as before. The "pooled OLS" (first two columns in Table 6) estimator assumes the error term as independent of the cross-sectional units (countries) and *iid* normal (that is, the panel is estimated as if it were a cross-country regression). The "one way fixed effects" estimator (see third and fourth columns in Table 6) treats μ_i as a fixed (time invariant) but unknown constant differing across individual countries.

$$u_{it} = \mu_i + \varepsilon_{it} \qquad (7)$$

where μ_i is a country-specific constant and ε_{it} is white noise. In the fixed effects approach it is assumed that differences across countries can be captured in differences in the constant term, and so each μ_i is an unknown parameter to be estimated. In effect, differences between countries are viewed as parametric shifts of the regression function.

The "two way fixed effects" (see fifth and sixth columns in Table 6) show the estimated β under the assumption of fixed country and time effects, that is,

$$u_{it} = \mu_i + \lambda_t + \varepsilon_{it} \qquad (8)$$

where μ_i and ε_{it} are defined as above, and λ_t is an exclusively time-dependent constant effect.

Finally, the "random effects" or variance components specification assumes that country-specific constant terms are randomly distributed across cross-sectional units (that is, countries). In this approach, each μ_i ~ N (0, σ_μ^2), given that $\mu_i = \mu + \eta_i$, where μ is the group mean intercept and η_i is the error associated with the country (which are random deviations from this common mean, and constant over time). The error term becomes,

$$u_{it} = \varepsilon_{it} + \eta_{it} \qquad (9)$$

[14] We have also checked the whole analysis using the level of other variables, total expenditure's share in GDP, black market premium and the shock variable. The results are essentially the same.

As the coefficients for one-way fixed effects and random effects models are almost the same, we chose to report both rather than selecting between them using a Hausman specification test. Table 6 shows that resource switch from capital expenditure (investment) to its current (consumption) counterpart lowers economic growth in the long run while the resource switch in the opposite direction raises economic growth. In all the regressions for the growth rate in per capita GDP, we have found negative and significant coefficients (ranging from -0.13 to -0.20) for current expenditure's share and positive and significant coefficients for capital expenditure's share (ranging from 0.12 to 0.19), after controlling for the change in total government expenditures (see the first part of Table 6).

Table 5 is about here

For sensitivity analysis, we have also used a 5-year forward moving average of per capita real GDP growth rate as the dependent variable with Hansen and Hodrick (1980) standard error correction. Although the coefficients become smaller (ranging from -0.05 to -0.03 for current expenditure's share and 0.037 to 0.056 for capital expenditure's share), the signs (negative for current expenditure's share and positive for capital expenditure's share) and the strong significance remain the same (see the second part of Table 5).

6. Conclusion

We have re-evaluated and tested the impact of resource switch from one type of public spending to another while the total spending is fixed. We find in our initial analysis that the results in panel and cross-section contradict with each other, while the panel results are counterintuitive (as in Deverajan *et. al.*, 1996). When we look at the time series property of the data for different countries in the panel, we find that the shares of current and capital expenditure in total public expenditure are non-stationary [i.e., I (1) variables]. After correcting for non-stationarity, taking first differences of the variables, the result we obtain supports the conventional wisdom and the cross-section findings and suggest that switching resources from consumption to investment type is growth enhancing and vice-versa. Our result also confirms the view of Ram (1986) that it is the growth not the level of government expenditure that influences growth. The paper also includes various sensitivity analyses to ensure the robustness of the obtained result, applying different econometric methods.

The paper suggests that in the presence of non-stationarity in data, one needs to take first difference in order to avoid spurious results. The two studies we have re-evaluated are Deverajan *et. al.* (1996) and Gupta *et. al.* (2002). While the former uses a correct specification to capture the growth effect of resource switch in a resource constrained economy without considering the issue of non-stationarity, the later considers non-stationarity without controlling for the resources available to spend. Combining both, we find the support for conventional wisdom.

Table 1: Public Expenditures and Economic Growth

	World	Low Income	Middle Income	Developing	High Income
GDP Growth Y1980-90 (%)	3.1	4.3	2.8	3	3.2
GDP Growth Y1990-97 (%)	2.3	4.2	2.5	2.8	2.1
Current Expenditure/GDP 1980 (%)	21.9	17.2	20.1	18.8	30.7
Current Expenditure/GDP 1996 (%)	25.4	16.9	23.4	21.7	34.3
Capital Expenditure/GDP 1980 (%)	5.1	5.8	6.2	6.0	2.6
Capital Expenditure/GDP 1996 (%)	3.4	4.6	3.7	3.9	2.2
(Current, Capital)	(-, +)	(+, +)	(-, +)	(-, +)	(-, +)
Total Expenditure/GDP 1980 (%)	27.0	23.0	26.3	24.8	33.3
Total Expenditure/GDP 1996 (%)	28.8	21.5	27.1	25.6	36.5
Current/Total 1980 (%)	81.0	75.0	76.0	76.0	92.0
Current/Total 1996 (%)	88.0	79.0	86.0	85.0	94.0
Capital/Total 1980 (%)	19.0	25.0	24.0	24.0	8.0
Capital/Total 1996 (%)	12.0	21.0	14.0	15.0	6.0
(Current/Total, Capital/Total)	(-, +)	(-, +)	(-, +)	(-, +)	(-, +)

Source: calculated from World Development Report 1998-99.

Note: ‘+’ means movement in the same direction with growth. ‘-’ means movement in the direction opposite to growth.

Table 2: Composition of government expenditure and economic growth, with t-statistics in parentheses (Dependent variable = five-year forward moving average of per capita real GDP growth rate)

	Model 1.1	Model 1.2	Model 1.3	Model 1.4	Model 1.5	Model 1.6
Constant	-	-	0.01	0.04	0.01	0.05
			(0.73)	(1.00)	(0.64)	(4.73)
Central and North America	0.007	0.04	-	-	-	-
	(0.42)	(8.93)				
East Asia and the Pacific	0.015	0.05	0.01	0.01	-	-
	(1.07)	(5.08)	(1.91)	(1.90)		
Latin America and the Caribbean	-0.03	0.005	-0.04	-0.04	-0.04	-0.04
	(-2.07)	(0.46)	(-4.89)	(-4.90)	(-5.52)	(-5.55)
Middle East and North Africa	0.007	0.04	-	-	-	-
	(0.50)	(3.56)				
South Asia	0.005	0.04	-	-	-	-
	(0.46)	(3.71)				
Sub-Saharan Africa	-0.02	0.01	-0.03	-0.03	-0.03	-0.03
	(-1.57)	(1.64)	(-4.93)	(4.91)	(-5.99)	(-6.01)
Te/GDP	0.006	0.006	-0.004	-0.004	-0.0005	-0.001
	(0.27)	(0.27)	(-0.19)	(-0.19)	(-0.02)	(-0.03)
Curt	0.035	-	0.035	-	0.04	-
	(1.97)		(1.97)		(2.32)	
Capt	-	-0.036	-	-0.036	-	-0.04
		(-1.95)		(-1.95)		(-2.38)
Black Market Premium	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
	(-4.70)	(-4.70)	(-4.68)	(-4.66)	(-4.74)	(-4.72)
Shock	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
	(-2.24)	(-2.24)	(-2.10)	(-2.11)	(-2.27)	(-2.28)
Adj. R-sq.	0.30	0.30	0.30	0.30	0.29	0.29
No. of Observations	378	378	378	378	378	378
DW	0.65	0.65	0.65	0.65	0.64	0.64

Notes: Estimation is by OLS with Hansen and Hodrick (1980) error correction for forward moving average of the dependent variable, used in Deverajan *et. al.* (1996). Data are for 33 countries for 1970-89.

Table 3: Cross-section regression for growth of real GDP per capita on Composition of government expenditure, with t-statistics in parentheses

	Model (1.7)	Model (1.8)	Model (1.9)	Model (1.10)	Model (1.11)	Model (1.12)	Model (1.13)	Model (1.14)
Constant	0.03	-0.025	0.04	-0.04	0.01	-0.04	0.02	-0.02
	(1.92)	(-0.21)	(1.90)	(-2.17)	(0.79)	(-2.04)	(1.30)	(-0.79)
Initial GDP per capita	-0.00001	-0.00001	-0.00001	-0.00001	-0.0000	0.00000	-0.0000	0.00001
	(-1.25)	(-1.21)	(-0.71)	(-0.66)	(-0.01)	(0.01)-	(-0.63)	(-0.62)
Initial Primary School	0.02	0.02	0.01	0.01	0.04	0.036	0.03	0.025
Enrollment	(0.70)	(0.74)	(0.57)	(0.51)	(1.70)	(1.69)	(1.23)	(1.18)
Initial Secondary School	0.07	0.07	0.03	0.03	-0.03	-0.034	-0.002	-0.0004
Enrollment	(1.12)	(1.07)	(0.55)	(0.56)	(-0.63)	(-0.62)	(-0.04)	(-0.62)
Number of Assassinations	0.02	0.02	0.01	0.01	0.01	0.004	0.002	-0.003
	(0.74)	(0.67)	(0.34)	(0.24)	(0.24)	(0.20)	(0.10)	(-0.12)
Number of revolutions and	-0.04	-0.04	-0.01	-0.01	-0.03	-0.026	-0.002	-0.003
coups	(-1.13)	(-1.06)	(-0.34)	(-0.30)	(1.27)	(-1.24)	(-0.12)	(-1.16)
Te/GDP	0.07	0.06	0.07	0.07	0.14	0.136	0.12	0.12
	(1.31)	(1.24)	(1.65)	(1.61)	(2.25)	(2.22)	(2.19)	(2.21)
Ncur/Te	-0.06	-	-0.08	-	-0.05	-	-0.04	-
	(-2.01)		(-3.10)		(-2.51)		(-2.18)	
Cap/Te	-	0.07	-	0.08	-	0.05	-	0.036
		(2.42)		(3.44)		(2.55)		(2.19)
M2/GDP	-	-	0.04	0.03	0.045	0.04	0.04	0.03
			(0.80)	(0.66)	(0.94)	(0.86)	(0.34)	(0.87)
Initial trade share	-	-	-	-	-0.10	-0.10	-0.07	-0.08
					(-2.62)	(-2.53)	(-2.62)	(-1.83)
Black Market Premium	-	-	-	-		-	-0.03	-0.03
							(-2.20)	(-2.13)
Adj. R-sq.	0.10	0.12	0.09	0.09	0.27	0.27	0.36	0.36
Obs.	30	30	30	30	25	25	25	25

Table 4: Test for Stationarity of Current and Capital Expenditures' shares in Government Expenditure

Country	Description	t_{ADF}	$t_{0.05}$	$t_{0.01}$	Observations
1. Bahamas	CURT (Constant, Lag = 1)	-2.9278	-3.040	-3.857	20
	DCURT (Constant, Lag = 1)	-5.7861**	-3.052	-3.888	19
	CAPT (Constant, Lag = 1)	-2.8210	-3.040	-3.857	20
	DCAPT (Constant, Lag = 1)	-5.7090**	-3.052	-3.888	19
2. Bangladesh	CURT (Constant, Lag = 2)	-1.3864	-3.180	-4.221	14
	DCURT (Constant, Lag = 1)	-4.2748**	-3.180	-4.221	14
	CAPT (Constant, Lag = 2)	-1.5402	-3.180	-4.221	14
	DCAPT (Constant, Lag = 2)	-3.4735*	-3.220	-4.326	13
3. Congo	CURT (Constant, Trend, Lag = 1)	-1.2352	-3.761	-4.732	17
	DCURT (Constant, Trend, Lag = 1)	-3.892 *	-3.792	-4.802	16
	CAPT (Constant, Trend, Lag = 1)	1.2352	-3.761	-4.732	17
	DCAPT (Constant, Trend, Lag = 1)	-3.892 *	-3.792	-4.802	16
4. Ethiopia	CURT (Constant, Trend, Lag = 1)	-1.7281	-3.692	-4.574	20
	DCURT (Constant, Trend, Lag = 1)	-4.2546*	-3.712	-4.619	19
	CAPT (Constant, Trend, Lag = 1)	-1.7281	-3.692	-4.574	20
	DCAPT (Constant, Trend, Lag = 1)	-4.2546*	-3.712	-4.619	19
5. Ghana	CURT (Constant, Trend, Lag = 1)	-1.3426	-3.829	-4.887	15
	DCURT (Constant, Trend, Lag = 1)	-5.4452**	-3.873	-4.989	14
	CAPT (Constant, Trend, Lag = 1)	-1.4158	-3.122	-4.068	15
	DCAPT (Constant, Trend, Lag = 1)	-5.7589**	-3.873	-4.989	14
6. Malysia	CURT (Constant, Lag = 1)	-1.6765	-3.066	-3.923	18
	DCURT (Constant, Lag = 1)	-3.0884 *	-3.082	-3.963	17
	CAPT (Constant, Lag = 1)	-1.6765	-3.066	-3.923	18
	DCAPT (Constant, Lag = 1)	-3.0884 *	-3.082	-3.963	17
7. Guatemala	CURT (Constant, Trend, Lag = 1)	-2.6196	-3.692	-4.574	20
	DCURT (Constant, Lag = 1)	-5.9078**	-3.052	-3.888	19
	CAPT (Constant, Trend, Lag = 1)	-2.6196	-3.692	-4.574	20
	DCAPT (Constant, Lag = 1)	-5.9078**	-3.052	-3.888	19
8. India	CURT (Constant, Lag = 1)	-1.3121	-3.180	-4.221	14
	DCURT (Constant, Lag = 1)	-2.0048	-3.220	-4.326	12
	DDCURT (Constant, Lag = 1)	-4.3381*	-3.270	-4.461	11
9. Indonesia	CURT (Constant, Lag = 2)	2.7977	-3.100	-4.011	17
	DCURT (Constant, Lag = 1)	4.1073*	-3.100	-4.011	16
	CAPT (Constant, Lag = 2)	2.7977	-3.100	-4.011	17
	DCAPT (Constant, Lag = 1)	4.1073*	-3.100	-4.011	16
10. Kenya	CURT (Constant, Lag = 1)	-2.2850	-3.040	-3.857	20
	DCURT (Constant, Lag = 1)	-6.7099**	-3.052	-3.888	19
	CAPT (Constant, Lag = 1)	-2.2850	-3.040	-3.857	20
	DCAPT (Constant, Lag = 1)	-6.7099**	-3.052	-3.888	19
11. Malawi	CURT (Constant, Lag = 1)	-1.5455	-3.100	-4.011	16
	DCURT (Constant, Lag = 1)	-4.3657**	-3.122	-4.068	15
	CAPT (Constant, Lag = 1)	-1.5455	-3.100	-4.011	16
	DCAPT (Constant, Lag = 1)	-4.3657**	-3.122	-4.068	15
12. Marocco	CURT (Constant, Lag = 1)	-2.1120	-3.052	-3.888	19
	DCURT (Constant, Lag = 1)	-4.9278**	-3.066	-3.923	18
	CAPT (Constant, Lag = 1)	-2.1120	-3.052	-3.888	19

	DCAPT (Constant, Lag = 1)	-4.9278**	-3.066	-3.923	18
13. Mauritius	CURT (Constant, Lag = 1)	-0.5770	-3.100	-4.011	16
	DCURT (Constant, Lag = 1)	-3.2240 *	-3.122	-4.068	15
	CAPT (Constant, Lag = 1)	-0.5770	-3.100	-4.011	16
	DCAPT (Constant, Lag = 1)	-3.2240 *	-3.122	-4.068	15
14. Nepal	CURT (Constant, Lag = 1)	-2.1139	-3.04	-3.857	20
	DCURT (Constant, Lag = 1)	-3.7238*	-3.052	-3.888	19
	CAPT (Constant, Lag = 1)	-2.1139	-3.04	-3.857	20
	DCAPT (Constant, Lag = 1)	-3.7238*	-3.052	-3.888	19
15. Nigeria	CURT (Constant, Trend, Lag = 1)	-1.1172	-3.873	-4.989	14
	DCURT (Constant, Trend, Lag = 1)	-5.3775**	-3.927	-5.115	13
	CAPT (Constant, Trend, Lag = 1)	-1.1167	-3.873	-4.989	14
	DCAPT (Constant, Trend, Lag = 1)	-5.3752**	-3.927	-5.115	13
16. Pakistan	CURT (Constant, Trend, Lag = 1)	-1.5379	-3.735	-4.671	18
	DCURT (Constant, Trend, Lag = 1)	-3.7746 *	-3.761	-4.732	17
	CAPT (Constant, Trend, Lag = 1)	-1.5379	-3.735	-4.671	18
	DCAPT (Constant, Trend, Lag = 1)	-3.7746 *	-3.761	-4.732	17
17. Rwanda	CURT (Constant, Trend, Lag = 1)	-2.2151	-3.735	-4.671	18
	DCURT (Constant, Lag = 1)	-3.6679*	-3.082	-3.963	17
	CAPT (Constant, Trend, Lag = 1)	-2.2109	-3.735	-4.671	18
	DCAPT (Constant, Lag = 1)	-3.6424*	-3.082	-3.963	17
18. Sierra Leone	CURT (Constant, Trend, Lag = 1)	-3.9454**	-3.04	-3.857	20
	CAPT (Constant, Trend, Lag = 1)	-3.9454**	-3.04	-3.857	20
19. Sri Lanka	CURT (Constant, Lag = 1)	-1.8086	-3.04	-3.857	20
	DCURT (Constant, Lag = 1)	-4.5421**	-3.052	-3.888	19
	CAPT (Constant, Lag = 1)	-1.8086	-3.04	-3.857	20
	DCAPT (Constant, Lag = 1)	-4.5421**	-3.052	-3.888	19
20. Sudan	CURT (Constant, Trend, Lag = 1)	-1.2062	-3.792	-4.802	16
	DCURT (Constant, Lag = 1)	-3.1848 *	-3.122	-4.068	15
	CAPT (Constant, Trend, Lag = 1)	-1.2062	-3.792	-4.802	16
	DCAPT (Constant, Lag = 1)	-3.1848 *	-3.122	-4.068	15
21. Syria	CURT (Constant, Lag = 1)	-2.4434	-3.066	-3.923	18
	DCURT (Constant, Lag = 1)	-5.4547**	-3.082	-3.963	17
	CAPT (Constant, Lag = 1)	-2.4434	-3.066	-3.923	18
	DCAPT (Constant, Lag = 1)	-5.4547**	-3.082	-3.963	17
22. Thailand	CURT (Constant, Trend, Lag = 1)	-4.0942*	-3.712	-4.619	19
	CAPT (Constant, Trend, Lag = 1)	-4.0942*	-3.712	-4.619	19
23. Tanzania	CURT (Constant, Lag = 1)	-0.9209	-3.04	-3.857	20
	DCURT (Constant, Lag = 1)	-5.2944**	-3.052	-3.888	19
	CAPT (Constant, Lag = 1)	-0.5768	-3.04	-3.857	20
	DCAPT (Constant, Lag = 1)	-3.9214**	-3.052	-3.888	19
24. Zambia	CURT (Constant, Lag = 1)	-1.8392	-3.04	-3.857	20
	DCURT (Constant, Lag = 1)	-8.3604**	-3.052	-3.888	19
	CAPT (Constant, Lag = 1)	-1.8392	-3.04	-3.857	20
	DCAPT (Constant, Lag = 1)	-8.3604**	-3.052	-3.888	19

Notes: CURT = Current Expenditure's Share in Total Government Expenditure; DCURT = First Difference of CURT; CAPT = Capital Expenditure's Share in Total Government Expenditure; DCAPT = First Difference of CAPT; ** = Significant at 1% level; * = significant at 5% level. Constant, lags and trends are chosen based on Akaike Information Criterion and scatter plots of the variables.

Table 5: Regressions of Growth in Real GDP per capita on Changes in Expenditure Shares, with t-statistics in parentheses.

	Model (1.15)	Model (1.16)	Model (1.17)	Model (1.18)	Model (1.19)	Model (1.20)	Model (1.21)	Model (1.22)
	Pooled-OLS	Pooled-OLS	One-way FE	One-way FE	Two-way FE	Two-way FE	RE	RE
Dependent Variable: per capita real GDP growth rate								
Δ Te/GDP	-0.15	-0.14	-0.14	-0.13	-0.15	-0.14	-0.16	-0.15
	(-1.89)	(-1.74)	(-1.78)	(-1.60)	(-1.95)	(-1.86)	(-2.03)	(-1.86)
Δ Cur/Te	-0.146	-	-0.20	-	-0.13	-	-0.20	-
	(-3.07)		(-4.09)		(-2.72)		(-4.22)	
Δ Cap/Te	-	0.135	-	0.18	-	0.12	-	0.19
		(2.77)		(3.69)		(2.51)		(3.82)
Δ BMP	-0.0001	-0.0001	-0.00004	-0.0001	-0.0003	-0.0001	0.0001	0.0001
	(-3.41)	(-3.41)	(-0.23)	(-0.26)	(-0.53)	(-0.55)	(0.80)	(0.75)
Δ SHOCK	-0.001	-0.001	-0.003	-0.002	-0.002	-0.001	-0.004	-0.004
	(-1.64)	(-1.64)	(-1.14)	(-1.05)	(-1.61)	(-1.61)	(-1.71)	(1.62)
Adj. R-sq.	0.08	0.07	0.14	0.14	0.15	0.15	0.14	0.14
Obs.	378	378	378	378	378	378	378	378
DW	1.56	1.54	1.82	1.81	1.76	1.76	1.73	1.73
Dependent Variable: five-year forward moving average of per capita real GDP growth rate								
Δ Te/GDP	-0.04	-0.04	-0.002	-0.002	-0.05	-0.05	-0.004	-0.005
	(-0.97)	(-1.04)	(-0.05)	(-0.06)	(-1.36)	(-1.41)	(-0.10)	(-0.13)
Δ Cur/Te	-0.037	-	-0.05	-	-0.03	-	-0.05	-
	(-1.96)		(-2.33)		(-2.07)		(-2.37)	
Δ Cap/Te	-	0.04	-	0.055	-	0.037	-	0.056
		(2.28)		(2.47)		(2.26)		(2.52)
Δ BMP	-0.0002	-0.0002	-0.0003	-0.0003	-0.0005	-0.0005	-0.0002	-0.0002
	(-4.57)	(-4.55)	(-3.21)	(-3.20)	(-2.23)	(-2.20)	(-2.54)	(-2.53)
Δ SHOCK	-0.001	-0.001	-0.0004	-0.0004	-0.0003	-0.0003	-0.0001	-0.0001
	(-1.45)	(-1.45)	(-0.44)	(-0.39)	(-0.54)	(-0.55)	(-0.15)	(-0.10)
Adj. R-sq.	0.34	0.34	0.45	0.46	0.47	0.47	0.45	0.45
Obs.	345	345	345	345	345	345	345	345
DW	0.49	0.49	0.58	0.58	0.59	0.59	0.66	0.66

References:

Aschauer, D. (1989): "Is Government Spending Productive?", *Journal of Monetary Economics*, 23, 177-200.

Aschauer, D. A. and Greenwood, J. (1985): "Macroeconomic Effects of Fiscal Policy", *Carnegie–Rochester Conference on Public Policy*, 23, 91 – 138.

Barro, R.J. (1990): "Government Spending in a Simple Model of Endogenous Growth", *Journal of Political Economy*, 98, 5 (October), Part II, S103-S125.

Barro, R.J. (1991): "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, CVI (May 1991), 407-444.

Barro, R. J. (1998): "Determinants of Economic Growth: A Cross-Country Empirical Study", MIT Press.

Barro, R.J. and Lee, J-W (1994): "Sources of Economic Growth", *Carnegie-Rochester Conference Series on Public Policy*.

Barro, R.J. and Sala-i-Martin, X. (1992): "Public Finance in Models of Growth", *Review of Economic Studies*, 59, 645-661.

Barro, R.J. and Xavier Sala-i-Martin (1995), "Economic Growth", McGraw-Hill, Boston, Mass.

Barro, R.J. and Xavier Sala-i-Martin (1999), "Economic Growth", First MIT Press Edition.

Capolupo (1997):

Devarajan, S., Swaroop, V., Zou, H. (1996): "The Composition of Public Expenditure and Economic Growth", *Journal of Monetary Economics*, 37 (1996), p. 313-344.

Easterly, W. and Rebelo, S. (1993), "Fiscal Policy and Economic Growth: An Empirical Investigation", *Journal of Monetary Economics*, 32 (December), p. 417-458.

Fischer, S. (1993): "The Role of Macroeconomic Factors in Growth", *Journal of Monetary Economics*, 32 (December), p. 485 – 512.

Glomm, G., Ravikumar, B., (1997): "Productive Government Expenditures and Long-run Growth", *Journal of Economic Dynamics and Control*, 21 (1), 183 – 204.

Grier, K.B., and Tullock, G., (1989): "An Empirical Analysis of Cross-National Economic Growth, 1951-1980", *Journal of Monetary Economics* 24, 259 – 276.

Gupta, S., Clements, B., Baldacci, E., and Mulas-Granados, C., (2002): "Expenditure Compoition, Fiscal Adjustment, and Growth in Low-income Countries", *IMF Working Paper*, WP/02/77.

Hansen, L. P. and Hodrick, R. J. (1980): "Forward Exchange Rates as Optimal Predictors of Future Spot Rates: An Econometric Analysis", *Journal of Political Economy*, 88, 830 – 853.

Haque, M.E. (2002): "Essays on Government Policies and Growth", PhD Dissertation, School of Economic Studies, University of Manchester.

Hsiao, C. (1992): "Analysis of Panel Data", Econometric Society Monograph, Cambridge, UK: Cambridge University Press.

Kneller, R. Bleany, M.F. and Gemmell, N. (1999): "Fiscal Policy and Growth: Evidence from OECD Countries", *Journal of Public Economics*, Vol. 74, pp. 171 – 190.

Kormendi, R.C., and Meguire, P.G., (1985): "Macroeconomic Determinants of Growth: Cross-Country Study", *Journal of Monetary Economics*, 16 (September), pp. 141 –163.

Landau, D. L., (1983): “Government Expenditure and Economic Growth: A Cross Country Study”, *Southern Economic Journal*, 49 (January 1983), pp. 783 – 792.

Landau, D. L., (1985): “Government Expenditure and Economic Growth in the Developed Countries, 1952 – 76”, *Public Choice*, No. 3, 1985, 47, 459 – 477.

Landau, D. L. (1986): “Government and Economic Growth in the Less Developed Countries: An Empirical Study for 1960-88”, *Economic Development and Cultural Change*, 35, 35-75.

Levine, R and Renelt, D. (1992): “A Sensitivity Analysis of Cross-Country Growth Regressions”, *American Economic Review*, 82 (4), 942 – 963.

Nelson, C. R. and Plosser, C. I. (1982): “Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications”, *Journal of Monetary Economics*, 10 (September), 139 – 162.

Ram, R. (1986): “Government Size and Economic Growth: A New Framework and Some Evidence from Cross-section and Time Series Data”, *American Economic Review*, 76, 191-203.

World Bank (1999): World Development Report 1998-99, Washington, D.C.