



Tulane Economics Working Paper Series

Explaining the Growth of Government Spending in South Africa

James Alm
Department of Economics
Tulane University
New Orleans, LA
jalm@tulane.edu

Abel Embaye
Department of Economics
Andrew Young School of Policy Studies
Georgia State University
Atlanta, GA
prcaex@langate.gsu.edu

Working Paper 1105
April 2011

Abstract

What determines government spending in South Africa? The paper estimates the determinants of real per capita government spending in the Republic of South Africa, using annual data for the period 1960 to 2007, a tumultuous period during which South Africa experienced a variety of internally imposed changes (e.g., the abolition of apartheid, changes in political institutions) and externally generated shocks (e.g., war, oil shocks). Using multivariate cointegration techniques, we find that per capita government spending, per capita income, the tax share, and the wage rate are cointegrated, a result that supports the notion that government spending is associated not only with per capita income and the true cost of government service provision as given by the wage rate but also to the fiscal illusion caused by budget deficits. We also find evidence that per capita government spending was positively affected by external shocks. These external shocks seem to play a significant role in explaining the dynamics of government spending growth.

Keywords: median voter theorem, government spending, cointegration, unit roots, error correction method

JEL: C220, H500, H600

EXPLAINING THE GROWTH OF GOVERNMENT SPENDING IN SOUTH AFRICA

JAMES ALM
&
ABEL EMBAYE*

* Tulane University and Georgia State University. We are grateful for many helpful comments and suggestions to the Editors. Please address all correspondence to Abel Embaye, Department of Economics, Andrew Young School of Policy Studies, Georgia State University, Campus Box 3992, Atlanta, GA 30302-3992 USA (phone 404 273 9849; fax 404 413 0145; email: prcaex@langate.gsu.edu). We are grateful to the Editor and to two anonymous referees for many helpful comments.

Abstract

What determines government spending in South Africa? The paper estimates the determinants of real per capita government spending in the Republic of South Africa, using annual data for the period 1960 to 2007, a tumultuous period during which South Africa experienced a variety of internally imposed changes (e.g., the abolition of apartheid, changes in political institutions) and externally generated shocks (e.g., war, oil shocks). Using multivariate cointegration techniques, we find that per capita government spending, per capita income, the tax share, and the wage rate are cointegrated, a result that supports the notion that government spending is associated not only with per capita income and the true cost of government service provision as given by the wage rate but also to the fiscal illusion caused by budget deficits. We also find evidence that per capita government spending was positively affected by external shocks. These external shocks seem to play a significant role in explaining the dynamics of government spending growth.

JEL Classifications: C220, H500, H600

Keywords: Median voter theorem, government spending, cointegration, unit roots, error correction method

1. INTRODUCTION

In 1960 real per capita government spending in the Republic of South Africa was R 1,703 at constant 2000 prices. By 2007 real per capita spending had more than tripled, to R 7,959. During the same period real per capita gross domestic product (GDP) increased from R 15,938 to R 25,414 at constant 2000 prices, or by only 60 percent. What caused real per capita government spending to increase more than proportionately to that of income? Indeed, why did most all measures of government spending, including real government spending per capita and government spending relative to GDP, increase over time? See Figures 1 and 2 for the trends in these two different measures of government spending and Figure 3 for the evolution of real GDP per capita.

Understanding the reasons for government spending growth has been a central concern of public economists going back at least as far as Wagner (1893) and beginning in more recent times with Downs (1957). An “excessive” size of government is often alleged to be the cause of many economic ills in both developed and developing countries, including slow economic growth, large government deficits, internal imbalances (e.g., inflation, rising interest rates), and external imbalances (e.g., trade deficits, falling exchange rates).

Theories of why government spending grows can be broadly classified into “institutional” and “a-institutional” approaches (Borcherding and Lee, 2004). Institutional approaches focus on political/public choice considerations, such as the roles of government bureaucrats, voter-taxpayers, and special interests as they engage in rent-seeking; institutional approaches also rely upon structural changes (e.g., voter suffrage) and major shocks (e.g., war, economic crises) to the political system. A-institutional theories emphasize the impacts of changing market conditions (e.g., income and price effects) on the demands for government services.

The latter half of the 20th century was an especially turbulent time for South Africa. In addition to external shocks such as those generated by the various oil crises of this period, the country went through the difficulties of dealing with its own transition from apartheid, as well those stemming from the normal political transitions of one administration to another. A natural question to ask is whether these external and internal shocks affected in a systematic way the level and growth of government spending, or whether government spending varied more in response to changes in income and in the cost of government.

In this paper we examine the impact of these and other factors on real per capita government spending in South Africa over the 1960 to 2007 period, starting with a standard median voter model of government spending and extending it to allow for various internal and external shocks. An important part of our estimation strategy is the use of Johansen’s (1988, 1995) multivariate cointegration technique, which is useful in understanding the relationship between variables that have a unit root. Our estimation results indicate that government spending, per capita income, the tax share (as a measure of the taxprice of government expenditures), and the wage rate are cointegrated. We also find some evidence that government spending was positively affected by external shocks (e.g., war, oil prices). These external shocks seem to play a significant role in explaining the dynamics of government spending growth in South Africa. Our results therefore lend support to Borcherding and Lee’s (2004) view on the role of both institutional and a-institutional factors in government spending growth.

The next section reviews some of the theories of growth of government spending. Section 3 details our theoretical and empirical framework, including some econometric issues in the analysis of time series data. Our estimation results are presented in section 4, and we summarize our results in section 5.

2. WHAT EXPLAINS THE GROWTH OF GOVERNMENT SPENDING?

There are many theories on the causes of government spending growth, and many begin with some variant of the median voter hypothesis. The median voter hypothesis states that (under some conditions) government officials choose the level of government spending selected by the median voter (Bowen, 1943; Black, 1958).¹ The outcome of such a choice is a demand for public services by the median voter that depends upon such things as the median voter's income and tax price, where this price depends in turn on the voter's tax share and the relative unit cost of the public good as given by the technology of public provision.

Borcherding and Deacon (1972) and Bergstorm and Goodman (1973) are among the first to develop formally and test empirically the median voter model, focusing on the spending of local governments in the United States. Niskanen (1978) extends such empirical tests to the spending behavior of the federal government of U.S. and its aggregate money market behavior. Recent use of the median voter model includes Gemmell, Morrissey, Pinar (1999) for the U.K., Hondroyiannis, and Papapetrou (2001) for Greece, Christopoulos and Tsonas (2003) for a panel of European OECD countries, and Tridimas (1985) for South Africa.²

These studies are consistent with the "a-institutional" classification of Borcherding and Dong (2004). Related to the price and income effects of the median voter model is the approach of Baumol (1967). He showed that the relative price of public services was likely to increase over time because productivity growth in services is slower than in other sectors and government provision tends to focus on the provision of services. This increase in the relative price of government services is often termed the "cost disease" of the public sector.

Demographic factors are also determinants of public spending. The median voter hypothesis includes population as an explanatory variable, in part as a measure of the "publicness" of government services. Other aspects of demography can also affect government spending. For example, as the population grows, the density of population is likely to increase as the population becomes concentrated in more urban areas. Because of urbanization and its associated externalities, market solutions may no longer be efficient, so that government intervention and higher levels of government spending become necessary (Borcherding, 1977). Demographic factors (e.g., race) may also capture "taste" factors.

An approach more consistent with the "institutional" approach is sometimes termed "Wagner's Law" (Wagner, 1893), which argues that government spending increases more than proportionately with income; that is, the income elasticity of demand for government services is positive and greater than unity. However, empirical tests of this hypothesis do not typically focus on testing for a unit income elasticity of demand. Instead, this work often tries to find either a positive relationship between government spending and income and/or a unidirectional causality running from government spending to income. Indeed, empirical tests of Wagner's Law typically give somewhat mixed results, depending upon the country used and the issue examined. For example, Ansari, Gordon, and Akuamoah (1997) find no support for a long run relationship between government spending and income for South Africa and two other African countries. In contrast, recent important work by Ziramba (2008) demonstrates a long run relationship between income and government spending in South Africa, although he also does not find unidirectional causality between these variables.

Another institutional theory is associated with Peacock and Wiseman (1961), the so-called "displacement effect". They argue that the shocks to public spending during such events as war and economic crises that necessitate higher spending during the shock period have a permanent effect on subsequent post-shock spending, even after the shock is not present. This displacement effect occurs because taxpayers develop a

¹ However, see Romer and Rosenthal (1979) and Inman (1978, 1987) for discussions and critiques of the median voter approach.

² See also Lusinyan and Thornton (2007) for an analysis of the relationship between expenditures and revenues in South Africa for the extended period 1895-2005.

tolerance to higher taxes during the shock, and thus the higher level of government spending becomes permanent.

Openness may also affect government spending. Rodrik (1998) argues that a more open economy tends to be associated with a larger government sector because the latter functions in a risk-reducing role when the economy is more exposed to external shock. His empirical work finds that there is a positive relationship between openness (as measured by the ratio of imports and exports to GDP) and government spending, and this relationship is strongest when the terms of trade risk is highest. Macroeconomic factors can also be important determinants of government spending, especially in developing countries that are subject to various internal and external disturbances.

The next section discusses our approach to modeling and estimating the determinants of government Spending growth in South Africa, an approach that draws upon these different theories.

3. EMPIRICAL FRAMEWORK, DATA, AND ESTIMATION STRATEGY

Empirical Framework

Our framework combines the institutional and a-institutional approaches. We begin with a discussion of the standard median voter theory, and then extend this framework to allow for other factors such as internal and external shocks.

Following Niskanen (1978), the median voter's demand function is assumed to have the following form:

$$Q = As^\eta Y^\delta M^\phi, \quad (1)$$

where

Q = quantity of the public good demanded by the median voter

s = the perceived per unit price of government services paid by the median voter

Y = the median voter's income

M = other exogenous conditions affecting the demand for government services,

and where A is a scale parameter and (η, δ, ϕ) are parameters of the demand function with $\eta < 0$, $\delta > 0$, and $\phi > 0$.

Since Q and s are unobserved, we must replace them with observable variables before we can estimate the demand function. Assume that the cost of Q is priced by the government at a unit marginal cost equal to c , and let τ be the median voter's share of the unit cost of public services. Then, the perceived per unit price of government services paid by the median voter (s) is given by:

$$s = \tau c. \quad (2)$$

Defining cQ as government spending per capita and combining (1) and (2), we have:

$$cQ = A\tau^\eta c^{1+\eta} Y^\delta M^\phi. \quad (3)$$

The tax share variable τ is assumed to be a function of the fraction of government spending financed by tax revenues and the total number of taxpayers, or:

$$\tau = (R/E) (1/N), \quad (4)$$

where R is total government tax revenues, E is total government spending, and N is the number of taxpayers. (Note that E is equal to cQN .) It is assumed that the median voter may be subject to fiscal illusion due to deficit financing. Under perfect foresight, deficit financing should not affect government spending; however, with fiscal illusion a higher deficit may obscure the true cost of government, and so lead to a higher demand for government spending. Finally, it is assumed that the marginal cost c is a function both of the wage rate in the private sector W and of the number of voter-taxpayers N , or:

$$c = BW^\gamma N^\lambda, \quad (5)$$

where B is a scale parameter, and γ and λ are parameters measuring, respectively, the extent of “cost disease” (Baumol, 1967) and the degree of publicness of government services, with the parameter restrictions $0 \leq \gamma \leq 1$ and $\lambda \geq 0$.³

Combining equations (1) to (5), we have:

$$cQ \equiv G = A \left(\frac{R}{E} \frac{1}{N} \right)^\eta \left(BW^\gamma N^\lambda \right)^{1+\eta} Y^\delta M^\phi = AB^{1+\eta} (R/E)^\eta W^{\gamma(1+\eta)} N^{\lambda(1+\eta)-\eta} Y^\delta M^\phi. \quad (6)$$

Log linearizing, we get finally:

$$\ln(G) = \beta_0 + \beta_1 \ln(Y) + \beta_2 \ln(R/E) + \beta_3 \ln(N) + \beta_4 \ln(W) + \beta_5 \ln(M), \quad (7)$$

where $\beta_0 = \ln(AB^{1+\eta})$, $\beta_1 = \delta$, $\beta_2 = \eta$, $\beta_3 = \lambda(1+\eta)$, $\beta_4 = \gamma(1+\eta)$, $\beta_5 = \phi$.

All the variables in equation (7) are now observable, and this equation forms the starting point for our estimation. The expected sign of the coefficient of income Y (or β_1) is positive, and the coefficient β_2 on the ratio of current revenue to government spending (or R/E) is expected to be negative. (Note that R/E also measures the extent of the budget deficit through which any fiscal illusion may be detected.) If demand for government services is price inelastic (or if $|\eta| < 1$), then the expected sign of the coefficient on population N (or β_3) is positive; however, if demand is price elastic, any sign on β_3 is consistent with the theory. The expected sign on the coefficient estimate of the wage rate W (or β_4) can be positive, negative, or zero depending on the magnitude of the price elasticity of government services as given by estimate of η . The coefficient sign on exogenous conditions M (or β_5) is also ambiguous.

It should be noted that equation (7) can be estimated as a single equation but only if all of the right-hand side variables are weakly exogenous. This assumption has typically been made in many previous studies of government spending, but it is nevertheless quite restrictive. In particular, this assumption ignores the possibility

³ As long as productivity growth in the public sector is less than in the private sector γ is positive; further, if there is no growth in the productivity of the public sector, then $\gamma=1$. Similarly, $\lambda=0$, corresponds with services that are pure public goods, $\lambda=1$ when government provides purely private goods, and $\lambda>1$ when there is some crowding out of public services due, for example, to congestion.

that income and government spending are likely to be endogenous, affected not only by their own lagged values but also by the values of the other variables in the model, as suggested by the standard Keynesian view of income determination. The tax share, or the ratio of government revenue to government spending R/E , can also be endogenous. Put differently, the exogeneity assumption necessary to estimate equation (7) as a single equation ignores the time series properties of the various right-hand side variables. As with all time series data, the potential existence of unit roots in the variables complicates considerably the estimation of equation (7). Indeed, it is well known that estimating equation (7) via ordinary least squares (OLS) methods in the presence of unit roots may yield spurious estimates. The appropriate way of dealing with this potential problem is to determine first whether each of the variables has the same order of integration and then to test whether there is a cointegrating relationship between those variables with the same integration order.⁴

Because of these considerations, we do not assume that the right-hand side variables are exogenous, and instead we estimate equation (7) in a multi-equation setting in which income and government spending, the tax share, and the wage rate are allowed to be endogenous. The details of these procedures are discussed later.

Data

We use annual South African data for the period 1960 to 2007. The dependent variable is government spending per capita (G). In the absence of reliable data on median income for South Africa, the median voter's income Y is proxied by gross national income per capita. Indeed, it is common in the literature to use per capita income or per capita GDP to proxy for the median income, especially when analyzing government spending at the national level; for example, see Niskanen (1978). We follow this practice, although it suggests that we are dealing more with the average voter than with the median voter.⁵ The tax share R/E is given by the ratio of total government revenues to total government spending. The wage rate W is given by an index of unit labor cost in the manufacturing sector. All nominal variables are deflated by the consumer price index (2000 base year) to get the corresponding real quantities. The consumer price index is from IMF *International Financial Statistics CDRM* (2009). All other variables used in the estimation (including population N) are derived from the South African Reserve Bank (SARB) web page, available at <http://www.reservebank.co.za>. Table 1 presents the summary statistics on the main variables used in the estimation, and Figures 1, 2, 3, 4, and 5 depict the trends of real government spending per capita and relative to GDP, real government revenue per capita and relative to GDP, real GDP per capita, unit labor cost, and population, all for the period 1960-2007.

⁴ If all the variables are integrated of the same order and if they are not cointegrated (implying that there is no support for a long run relationship between the variables), then one can estimate them in first differences for assessing the short run relationship. Otherwise, estimating cointegrated variables in simple first differences is inappropriate; that is, if the linear relationship is already stationary, differencing the relationship entails a misspecification error (Enders, 2004).

⁵ Note that strict application of the median voter model requires that we use the income of the median voter. For South Africa, this would entail using the median income of the white population before 1994 (because only the white population could vote for that period), and then the median income of the total population after 1994. However, such data are not available for South Africa on a yearly basis. From Wyk (2003), we are able to find the mean personal income of white population before 1994 and the mean personal income of the total population for the period 1994-2000; for the period 1960-1990 these data are available only every other five years, which requires that we interpolate between the years in order to have continuous annual data. In fact, we have tried to estimate the cointegration relationships using this measure of income. However, these results perform poorly, and are not reported. Indeed, it is not surprising that this income measure is not cointegrated with the other variables of the model (which are $I(1)$) because there is a huge break in this income variable in 1994. Note also that we have used GDP per capita as an alternative measure of income, and our results are not affected.

Our primary focus is on explaining real aggregate government spending per capita G and its relationship to the variables in the median voter model.⁶ However, as the median voter model might not capture all the variations in government spending per capita, we also include several exogenous variables in our estimation. Such variables are represented by the variable M in equation (7), and include variables meant to capture external and internal shocks. We include a measure of the importance of the international market to the economy, or *Openness*, defined as the interaction of the *Terms of Trade* (measured by an index of the price of exports relative to the price of imports) and *International Trade* (calculated as the ratio of the value of imports and exports to GDP). In including the interaction term *Openness*, we focus both on the price effects of international trade and the volume of trade. We also include a dummy variable (*Oil Shock*) for the oil shock of 1973, equal to 1 for the year 1974 and 0 otherwise, and a *War* dummy variable for when South Africa started to be involved indirectly in a proxy war with Mozambique and Angola in an attempt to contain the spread of communism in the region, equal to 1 for the years 1975 and 0 otherwise.⁷ For internal shocks, we include a dummy variable for the post-apartheid period, equal to 1 for the year when apartheid was abolished in 1990 and 0 otherwise (*Post-Apartheid*). We also include a separate dummy variable for the year in which all inclusive elections were first instituted (*All-inclusive*), which has a value equal to 1 for the year 1994 and 0 otherwise. All of these dummies are included in the estimations in part to test the displacement hypothesis of Peacock and Wiseman (1961).⁸

Estimation Strategy

We estimate equation (7) using the Johansen (1988, 1995) multivariate cointegration technique, which is especially useful in understanding the relationship between series that have unit roots. The method starts with determining the degree of integration of the variables. If the variables have the same order of integration (as verified by the unit root test), estimation can be undertaken to find out if the variables are also cointegrated, using maximum likelihood estimation of a finite-order vector autoregression (VAR). For example, the estimation for an I(1) variable entails the identification of stationary error processes on a linear combination of the variables, as in:

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \psi M + \mu + \varepsilon_t, \quad (8)$$

where X is a 4x1 vector containing government spending per capita G , per capita income Y , the tax share R/E , and the wage rate W . Γ_i denotes parameters to be estimated, ε_t is a vector of errors assumed to be white noise, Π is a matrix of the long run parameters, and M is a matrix containing dummy and other exogenous variables. If there is cointegration between the variables, then Π has a rank of r ($1 \leq r \leq 4$), so that Π can be decomposed

⁶ We examine disaggregated government spending, breaking total government spending into the components of government consumption expenditure, government fixed capital formation (investment), and government transfers in the form of subsidies. These results are available upon request.

⁷ Note that the data show a marked increase in government spending per capita for the years 1974 and 1975. Since the oil shock started in the fourth quarter of 1973, the actual effect of *Oil Shock* on government spending must have occurred in 1974 as the data show. Moreover, given that involvement of South Africa in the proxy war began in 1975, what is attributed to the *War* dummy variable could also partly be due to the effect of the *Oil Shock* dummy.

⁸ It should be noted that we also included in some specifications various regime dummy variables that embrace the years of administration of a given head of state in South Africa. These periods include the regimes of Vorster (1967 to 1977), Botha (1978 to 1988), de Klerk (1989 to 1993), Mandela (1994 to 1998), and Mbeki (1999 to 2007); in all cases these regime dummies are equal to 1 in the initial year of the specific regime and 0 otherwise. These variables were introduced to capture internal (political) shocks to government spending. However, these variables were not significant, and are not reported.

as $\Pi = \alpha\beta'$, with α and β both $4 \times r$ matrices, where β is a matrix of the coefficients in the cointegrating relationship and α is a matrix of the adjustment coefficients.

4. ESTIMATION RESULTS

Unit Root Tests

We begin our cointegration analysis by undertaking the unit root tests to determine the order of integration of the variables. We employ the Augmented Dickey-Fuller (ADF) procedure for unit root tests, and undertake the test both for levels and for first differences of each series. The null hypothesis is that there is a unit root for a given series. If the null is rejected, then the series has no unit root (i.e., the series is stationary); if it is not rejected, then the series has a unit root (i.e., the series is non-stationary). The test is valid when the lag length for each series is selected such that there are no serial correlations in the errors. The lag length for this test is selected using the Akaike final prediction error (FPE) criterion.

Table 2 reports the results of testing for unit roots in levels and in first differences of the variables. The results indicate that all series are $I(1)$ at the 5 percent level, except for the population variable N , which is $I(0)$, not $I(1)$. Note that the level of population is highly trend stationary, so that the null of a unit root for this series is easily rejected at 1 percent; see figure 5. We therefore conclude that population cannot be cointegrated with the $I(1)$ variables. For this reason, we do not include population in the cointegration equation along with the other $I(1)$ variables; however, we include population as an exogenous variable in the error correction equation.

Cointegration Tests

In this section, we focus on testing the potential long run relationship between government spending per capita, per capita income, tax share, and the wage rate by employing Johansen's (1988, 1995) procedure. Since the results of Johansen's procedure depend on the number of lags included, we need to determine the initial lag length in the VAR model, which should be high enough to ensure that the errors are approximately white noise but small enough to have enough degrees of freedom for estimation. Using the Akaike final prediction error (FPE) criterion and the Akaike information criterion (AIC), we find that the appropriate lag length is two. However, since both the Hannan-Quinn information criterion (HQIC) and the Schwarz-Bayesian information criterion (SBIC) select one lag, we also address later whether the two lag length can be reduced to have a more parsimonious specification.

Table 3 reports the trace test of cointegration for the variables government spending per capita, per capita income, the tax share, and the wage rate. This test shows that the null of no cointegration is rejected while the null of at most one cointegrating vector cannot be rejected at the 5 percent significance level. Hence, we estimate the cointegration relationship with one cointegration vector.

The results of the estimation based on the assumption that there is one cointegration relationship are reported in Table 4. Before we discuss the significance of the coefficients, it is important to check whether the standard assumptions of the model are preserved after estimation. The diagnostic tests, which are given at the bottom of the table, show that the errors from the model are approximately white noise. The first statistic is the LM statistic for serial correlation. The null of this test is that there is no serial correlation and no cross-correlation for the model's errors of up to 12 ($\approx T/4$) lags. The test resulted in an LM statistic of 14.11, which when compared to the critical value leads us to not reject the null at 5 percent. The second statistic is from the Jarque and Bera (1987) normality test. The null of the test is that the errors of the model are normally distributed, and this statistic has a chi-square distribution with 8 degrees of freedom. The result shows that the

null (i.e., the errors of the model are normally distributed) is not rejected at 1 percent level. We conclude that the errors of the model are approximately independently identically normally distributed.

Turning to the coefficient estimates, Table 4 also reports the standardized estimates. These estimates indicate that the estimated coefficients in the cointegrating vector (β) are all statistically significant, and all have signs as predicted by the theory. In particular, per capita income and the wage rate are positively associated with government spending per capita in the cointegrating vector, while the tax share is negatively associated with government spending per capita. A negative coefficient on the tax share lends support to the notion that higher budget deficits are associated with higher levels of government spending per capita in South Africa, working perhaps through fiscal illusion. Table 4 also reports the estimates for the adjustment parameters (α) for each equation. These results show that the adjustment parameters of government spending per capita and the tax share equation are significant while the adjustment parameters for the per capita income and wage rate variables are not significant. Note that the wage rate has particularly very low t-statistics.

These results are from the unrestricted version of the model. Since the elements of α and β in equation (8) are not uniquely identified in the Johansen estimation method, we can restrict them further, and then find a more parsimonious model in terms of the number of equations in the model. In light of the relatively highly insignificant adjustment coefficients on the wage rate, we test whether the wage rate can be treated as weakly exogenous. Since we do the test recursively, we initially do not treat per capita income as weakly exogenous.

The results of re-estimating the cointegration relationship with the imposition of weak exogeneity of the wage rate variable are reported in Table 5. Again, the diagnostic tests show that the errors of the model are approximately white noise, which implies that there is no any violation of the standard assumptions after the imposition of the restrictions. Turning to the validity of the restriction of weak exogeneity, the test that $\alpha_4 = 0$ yields a likelihood ratio statistic of 0.142 with p-value of 0.706, which implies that the restriction is not binding at the 5 percent level. Weak exogeneity tests on the other variables of the relationship (which are not reported here), however, result in restrictions that are binding at 5 percent level, which can informally be inferred from the highly statistically significant adjustment coefficients for government spending per capita and the tax share, and a marginally significant adjustment coefficient for the per capita income variable in Table 5. Under the Johansen procedure, the weak exogeneity of the wage rate variable implies that the wage rate behavior is explained only by the short run dynamics, and hence its equation in the ECM estimation will not include an error correction term, as discussed later.

Given these results, we can now say that these I(1) variables move together toward a meaningful, stationary, long run equilibrium. Looking at the estimates of the cointegrating vector, the individual estimates are again consistent with the theory that income is positively associated with government spending per capita and that the tax share is negatively associated to the same. The latter lends support to the fact that taxpayers exhibit fiscal illusion because of budget deficits. The wage rate is also positively related to government spending per capita, which is in accord with the theory.

Short Run Relationships: Error Correction Model Estimations

To give more insight on the short run relationship between government spending per capita and its potential determinants, we report further results from the error correction model (ECM). Since we have one cointegrating vector and the wage rate is weakly exogenous, we estimate a 4-equation system in which only government spending per capita, per capita income, and the tax share have an error correction representation and the wage rate is explained only by the short run dynamics of the form:

$$\begin{aligned}
\Delta G_t &= \alpha_1 v_{t-1} + \sum_{i=1}^s \phi_{11,s} \Delta G_{t-s} + \sum_{i=1}^s \phi_{12,s} \Delta Y_{t-s} + \sum_{i=1}^s \phi_{13,s} (R/E)_{t-s} + \sum_{i=1}^s \phi_{14,s} \Delta W_{t-s} + \phi_{15} \times M + \varepsilon_{1,t} \\
\Delta Y_t &= \alpha_2 v_{t-1} + \sum_{i=1}^s \phi_{21,s} \Delta G_{t-s} + \sum_{i=1}^s \phi_{22,s} \Delta Y_{t-s} + \sum_{i=1}^s \phi_{23,s} (R/E)_{t-s} + \sum_{i=1}^s \phi_{24,s} \Delta W_{t-s} + \phi_{25} \times M + \varepsilon_{2,t} \\
\Delta (R/E)_t &= \alpha_3 v_{t-1} + \sum_{i=1}^s \phi_{31,s} \Delta G_{t-s} + \sum_{i=1}^s \phi_{32,s} \Delta Y_{t-s} + \sum_{i=1}^s \phi_{33,s} (R/E)_{t-s} + \sum_{i=1}^s \phi_{34,s} \Delta W_{t-s} + \phi_{35} \times M + \varepsilon_{3,t} \\
\Delta (W)_t &= \sum_{i=1}^s \phi_{41,s} \Delta G_{t-s} + \sum_{i=1}^s \phi_{42,s} \Delta Y_{t-s} + \sum_{i=1}^s \phi_{43,s} (R/E)_{t-s} + \sum_{i=1}^s \phi_{44,s} \Delta W_{t-s} + \phi_{45} \times M + \varepsilon_{4,t}
\end{aligned} \tag{9}$$

where s is the number of lags of the ECM, α_i is the adjustment coefficient for each equation, v_{t-1} is the lagged value of the cointegrating vector and the remaining expressions are the lagged values of the first differences of the endogenous variables. Population, which is highly trend stationary in level, is now also included in the ECM as exogenous variable. However, we include its first difference since including its level creates a spurious result that arises from a variable with trend explaining dependent variables that are stationary in first difference without trend. We also include various exogenous variables for internal and external shocks, starting with the *Oil Shock* and *War* dummy variables, and then adding the *Post-Apartheid* and *All-inclusive* dummy variables along with a measure of external shocks *Openness*; recall that these variables are in their entirety denoted M in equation (9).

Our Baseline ECM model begins with a second-order lag of the endogenous variables, and includes government spending per capita G , per capita income Y , the tax share R/E , the wage rate W , and the dummy variables *Oil Shock* and *War*. The first row of Table 6 reports the AIC and the SBIC results for the Baseline ECM model. The other rows show results of testing the adequacy of the Baseline model by recursively adding external shock variable (*Openness*), the first difference of *Population*, and the *Post-Apartheid* and *All-inclusive* dummy variables. We also test if the lag length can be reduced to 1 to have more parsimonious specification.

As the results in Table 6 show, the dummy variable *All-inclusive* of election year 1994 and the external shock measure *Openness* each seems to have little effect on government spending per capita as they are insignificant. *Apartheid* dummy is significant and improves the fit of the baseline model as can be seen from the AIC and SBIC criterion of the second row; however, this result is not robust to the reduction of lag length of the ECM model. Since most of the second lagged values of the first difference of the endogenous variables are insignificant, we also test whether a one lag formulation is appropriate for the ECM relationship. We do this lag reduction with and without the inclusion of the apartheid dummy variable and the first difference of *Population*, as shown in the last three rows of Table 6. The results show that a one lag error correction model without these variables fits the data well, as given clearly by the SBIC criteria.

Table 7 reports the results from our preferred specification, the ECM with one lag of the endogenous variables along with the dummies for *War* and *Oil Shock*. The cointegration vector for each ECM equations is $v_{t-1} \equiv G_{t-1} - 1.90Y + 0.30(T/E)_{t-1} - 0.17W_{t-1} + 11.16$. The coefficient estimates of the variables in the cointegrating vector are all significant at 5 percent level, and the coefficients on *War* and *Oil Shock* are significant in the government spending per capita equation. In the ECM model, the effect of the *War* dummy variable suggests that the *level* of government spending per capita is permanently higher starting in 1975 compared to its level before the shock.⁹ This can be taken as some support for the Peacock and Wiseman (1961) hypothesis that

⁹ In the ECM equation, the dependent variable is in first difference form, and given also that it is in logarithmic form, the dependent variable measures the yearly growth of government spending per capita. Hence, such a structural break of the variable detected by the dummy variable implies that the *level* of government spending per capita has permanently increased since the shock; see Figure 1.

(external) shocks can have permanent effects on government spending per capita by displacing expenditures to a new, sustained, and higher level. The same conclusion applies for the *Oil Shock* dummy variable.

Granger Causality Tests

We also report in Table 8 the results from tests for Granger causality between these variables, where we consider the directional Granger causality between government spending per capita, per capita income, and other variables in a multivariate formulation rather than in the usual bivariate model. According to Engel and Granger (1987), if two variables are cointegrated, then Granger causality must run at least in one direction. The Granger causality test from per capita income to government spending per capita, for instance, can be checked by testing whether imposing the restriction $\alpha_1 = \phi_{12} = \mathbf{0}$ in equation (9) is binding or not. Such tests are usually performed using the F-test. However, when the variables are I(1) and cointegrated, the F-statistic does not have the usual standard distribution. Dolado and Lütkepohl (1996) and Toda and Yamamoto (1995) show that it is possible to have an F-statistic with the usual standard distribution. Their procedure entails the over-fitting of the optimal model with lag length s by adding d additional lags, where d is the maximum degree of integration of the endogenous variables of the model. In our case, the optimal lag is 1 and the variables are I(1); consequently, the model is re-estimated with 2 lags, and then restrictions are imposed on the first lag of the variable that is expected to Granger-cause the relevant dependent variable.¹⁰

The results for Granger causality test are reported in Table 8; we focus on the Granger causality represented in the government spending per capita and per capita income equations. The results show that there is causality between government spending per capita G and income Y that runs from income to government spending per capita. However, there is no Granger causality running from government spending per capita to per capita income, so it seems that the causality here is unidirectional. Also, the test does not demonstrate strong Granger causality from the tax share R/E or the wage rate W to government spending per capita G . This finding should not be seen as a conflicting result, given that these two variables (the tax share and the wage rate) are cointegrated with government spending per capita. As noted by Dolado and Lütkepohl (1996), Granger causality tests for cointegrated variables have low power; this occurs because the estimators are inefficient due to the over-fitting that is needed to have standard Wald distributions. Indeed, in small samples the power problem makes it difficult to reject the null of Granger non-causality. Even so, given that government spending per capita, per capita income, the tax share, and the wage rate are cointegrated, it is important to recognize that Granger causality must run at least in one direction. The fact that we have uncovered significant Granger causality from per capita income to government spending per capita gives credence to the cointegration results found earlier. Also, the presence of Granger causality from per capita income to government spending per capita might represent, in a multi-equation setting, the indirect effects of the tax share and/or the wage rate on government spending per capita (Lütkepohl and Krätzig, 2004); moreover, as Granger causality tests can detect only linear relationships, there can be a non-linear relationship that exists between government spending per capita and other variables of the model that are not shown by the test.

5. CONCLUSIONS

This study investigates the growth of government spending per capita in the Republic of South Africa for the period 1960-2007 using multivariate cointegration procedures. We find that government spending per capita, per capita per capita income, the tax share, and the wage rate are cointegrated. This cointegration result lends support to the notion that government spending per capita is associated not only with per capita income

¹⁰ The test statistic has the standard Wald F-distribution. The numerator degrees of freedom is given by the number of restrictions imposed; the denominator degrees of freedom is given by the number of observations minus the number of coefficients estimated.

and the true cost of government service provision as given by the wage rate but also to the fiscal illusion caused by budget deficits, which make voters discount the true cost of provision of government services. This result also suggests that government spending per capita is not just adjusting to per capita income (as in the usual bivariate analysis) but to a long run equilibrium in which the tax share and the wage rate play a significant role in keeping the relationship stable.

Our results on Granger causality show clear unidirectional Granger causality from per capita income to government spending per capita. We do not find Granger causality running from the tax share and the wage rate to government spending per capita, mainly due to the low power of such tests for cointegrated variables. The fact that these two variables are statistically significant in the cointegration relationship means that it is possible that there might be an indirect Granger causality of these two variables on government spending per capita through per capita income. From our cointegration relationship, we therefore conclude that both “institutional” and “a-institutional” factors explain fairly well the relationship between government spending per capita, per capita income, the tax share, and the wage rate in the Republic of South Africa. We also find some evidence that government spending per capita was positively affected by external shocks (e.g., war, oil prices). These external shocks seem to play a significant role in explaining the dynamics of government spending per capita growth in South Africa. Internal shocks seem less important factors.

REFERENCES

- ANSARI, M. I., DANIEL V. GORDON, and C. AKUAMOAH (1997). Keynes versus Wagner: Public spending and national income for three African countries. *Applied Economics*, 29 (4): 543-550.
- BAUMOL, WILLIAM J. (1967). Macroeconomics of unbalanced growth: The anatomy of the urban crises. *The American Economic Review*, 57 (3): 415-426.
- BERGSTROM, THEODORE C. and ROBERT GOODMAN (1973). Private demand for public goods. *The American Economic Review*, 63 (2): 280-296.
- BLACK, DUNCAN (1958). *The Theory of Committees and Elections*. Cambridge, UK: Cambridge University Press.
- BORCHERDING, THOMAS E. (1977). The sources of growth of public spending in the United States, 1902-1970. In Thomas E. Borcharding, ed., *Budgets and Bureaucrats*. Durham, NC: Duke University Press, 45-70.
- BORCHERDING, THOMAS E. and ROBERT T. DEACON (1972). The demand for the services of non-federal governments. *The American Economic Review*, 62 (4): 891-901.
- BORCHERDING, THOMAS E. and DONG LEE (2004). The growth of the relative size of government. In Charles K. Rowley and Friedrich Schneider, eds., *Encyclopedia of Public Choice*. Dordrecht, The Netherlands: Kluwer Academic Publishers, 273-277.
- BOWEN, HOWARD R. (1943). The interpretation of voting in the allocation of economic resources. *The Quarterly Journal of Economics*, 58 (1): 27-48.
- CHRISTOPOULOS, DIMITRIS K. and EFTHYMIOS G. TSIONAS (2003). Testing the Buchanan-Wagner hypothesis: European evidence from panel unit root and cointegration tests. *Public Choice*, 115 (3 – 4): 439-453.
- DOLADO, JUAN and HELMUT LÜTKEPOHL (1996). Making Wald tests work for cointegrated VAR systems. *Econometric Reviews*, 15 (4): 369-386.
- DOWNS, ANTHONY (1957). *An Economic Theory of Democracy*. New York, NY: Harper & Row Publishers, Inc.
- ENDERS, WALTER (2004). *Applied Econometric Time Series*. New York, NY: John Wiley & Sons, Inc.
- ENGLE, ROBERT F. and CLIVE W. J. GRANGER (1987). Cointegration and error correction: Representation, estimation, and testing. *Econometrica*, 55 (2): 251-276
- GEMMELL, NORMAN, OLIVER MORRISSEY, and ABUZER PINAR (1999). Fiscal illusion and demand for government spending in the U.K. *European Journal of Political Economy*, 15 (4): 687-704.
- HONDROYIANNIS, GEORGE and EVANGELIA PAPAPETROU (2001). An investigation of the public deficits and government spending relationship: Evidence for Greece. *Public Choice*, 107 (2): 169–182.
- INMAN, ROBERT P. (1978). Testing political economy's 'as if' proposition: Is the median voter really decisive? *Public Choice*, 33 (1): 45-65.

- INMAN, ROBERT P. (1987). Markets, governments, and the 'new' political economy. In Alan J. Auerbach and Martin Feldstein, eds., *Handbook of Public Economics, Volume 2*. Amsterdam, The Netherlands: Elsevier Science Publishers B.V., North-Holland, 647-777.
- INTERNATIONAL MONETARY FUND (2009). *International Financial Statistics CDRom*. Washington, D.C.: International Monetary Fund.
- JARQUE, C. M. and A. K. BERA (1987). A test for normality of observations and regression residuals. *International Statistical Review*, 55 (1): 163-172.
- JOHANSEN, SOREN (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12 (2-3): 231-254.
- JOHANSEN, SOREN (1995). *Likelihood-based Inference in Cointegrated Vector Autoregressive Models*. Oxford, UK: Oxford University Press.
- LUSINYAN, LUSINE and JOHN THORNTON (2007). The revenue-expenditure nexus: Historical evidence for South Africa. *South African Journal of Economics*, 75 (3): 496-507.
- LÜTKEPOHL, HELMUT and MARKUS KRÄTZIG (2004). *Applied Time Series Econometrics*. Cambridge, UK: Cambridge University Press.
- LJUNG, G. E. and G. E. P. BOX (1978). On a measure of lack of fit in time series models. *Biometrika*, 65 (2): 297-303.
- MACKINNON, JAMES G. (1994). Approximate asymptotic distribution function for unit root and cointegration tests. *Journal of Business and Economic Statistics*, 12 (2): 167-176.
- NISKANEN, WILLIAM A. (1978). Deficits, government spending, and inflation: What is the evidence? *Journal of Monetary Economics*, 4 (4): 591-602.
- PEACOCK, ALAN T. and JACK WISEMAN (1961). *The Growth of Public Spending in the United Kingdom*. Princeton, NJ: Princeton University Press.
- RODRIK, DANI (1998). Why do more open economies have bigger governments? *The Journal of Political Economy*, 106 (5): 997-1032.
- ROMER, THOMAS AND HOWARD ROSENTHAL (1979). The elusive median voter. *Journal of Public Economics*, 12 (2): 143-170.
- SOUTH AFRICAN RESERVE BANK. *Economic and Financial Data for South Africa*, available at <http://www.reservebank.co.za/>. Accessed on June 15, 2009.
- Toda, H. Y and T. Yamamoto (1995). Statistical inference in vector auto-regressions with possibly integrated processes. *Journal of Econometrics*, 66 (1): 225-250.
- TRIDIMAS, GEORGE (1985). Budget deficits and the growth of public spending in South Africa. *The South African Journal of Economics*, 53 (4): 393-401.
- WAGNER, ADOLPH (1893). *Grundlegung der Politischen Ökonomie*. Leipzig, Germany: C. F. Winter.

WYK, H. DE J. VAN (2003). National personal income of South Africans by population group, income group, life stage and life plane 1960-2007. Research Report 333, Bureau of Market Research (UNISA), Pretoria, South Africa.

ZIRAMBA, EMMANUEL (2008). Wagner's law: An econometric test for South Africa, 1960-2006. *South Africa Journal of Economics*, 76 (4): 596-606.

Table 1. Summary Statistics^a

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Real Per Capita Government Spending, G	48	4388	1476	1635	7960
Real GDP Per Capita	48	21211	1982	15938	25414
Real GNI Per Capita, Y	48	20925	2300	15292	25791
Revenue/Spending, R/E	48	0.872	0.068	0.745	1.031
Population, N	48	31.69	9.63	17.13	48.55
Wage Rate, W	48	44.33	44.02	3.23	128.55
International Trade (as fraction of GDP)	48	0.52	0.06	0.39	0.66
Terms of Trade	48	107.40	10.90	88.70	134.20

^a All real variables are in 2000 constant prices.

Table 2. Augmented Dickey-Fuller Unit Root Tests

Variables ^a	H ₀ : Non-stationary in Levels		H ₀ : Non-stationary in First Differences	
	Test Statistic	p-value	Test Statistic	p-value ^b
G	-2.246	0.190	-5.698	0.000
Y	-2.024	0.276	-3.719	0.004
R/E	-1.475	0.546	-5.521	0.000
N	-14.615	0.000	---	---
W	-0.941	0.774	-3.216	0.012
Openness ^c	-1.658	0.453	-5.44	0.000

^a All variables are in logarithm form, and all real variables are in 2000 constant prices.

^b p-values are based on Mackinnon (1994).

^c *Openness* is defined as *Terms of Trade X International Trade*.

Table 3. Johansen Trace Test for Cointegration

Maximum rank	Eigenvalue	Trace Statistic	5% Critical Value
0	---	48.58	47.21
1	0.341	29.36	29.68
2	0.327	11.15	15.41

Table 4. Estimation Results from the Unrestricted Vector Error Correction Model^a

Variables	α	β
G	-0.695 (-3.077)	1 ---
Y	0.132 (1.086)	-1.854 (-16.701)
R/E	0.746 (2.426)	0.349 (2.356)
W	0.149 (0.634)	-0.175 (-22.297)
LM-statistic (12 lags) = 14.11 [0.59]		
Jarque-Bera statistic (with 8 degrees of freedom) = 16.94 [0.031]		

^a t-values are in parentheses, and p-values are in brackets.

Table 5. Estimation Result from the Restricted Vector Error-Correction Model ^a

Variables	α	β
G	-0.679 (-3.087)	1 --
Y	0.156 (1.459)	-1.881 (-16.571)
R/E	0.738 (2.431)	0.328 (2.168)
W	---	-0.173 (-21.549)
$\chi^2(1) = 0.465 [0.495]$		
LM-statistic (12 lags) = 14.512[0.560]		
Jarque-Bera statistic (with 8 degrees of freedom) = 16.833 [0.032]		

^a t-values are in parentheses, and p-values are in brackets.

Table 6. Specification Tests

Specification	AIC	SBIC	Is the variable significant?
Baseline ^a	-13.99	-11.91	---
Post-Apartheid	-14.04	-11.79	Yes
All-inclusive	-13.91	-11.66	No
Openness	-14.11	-11.86	No
Reducing lag to 1	-14.32	-12.89	---
1 lag and Post-Apartheid	-14.33	-12.73	Yes
1 lag and first difference of Population	-14.31	-12.72	Yes

^aThe Baseline model uses the level and a second-order lag of the endogenous variables (i.e., government spending G , income Y , tax share R/E , wage rate W), the exogenous variables (i.e. dummy variables *Oil Shock* and *War*), all of which are significant.

Table 7. Estimation Results of the Error Correction Model ^{a, b}

Error Correction	ΔG	ΔY	$\Delta (R/E)$	ΔW
α	-0.542 (-3.277)	0.125 (1.549)	0.525 (2.139)	---
ΔG_{t-1}	0.056 (0.308)	-0.001 (-0.01)	0.085 (0.319)	-0.081 (-0.383)
ΔY_{t-1}	-0.185 (-0.439)	0.275 (1.211)	0.809 (1.307)	0.063 (0.129)
$\Delta (R/E)_{t-1}$	-0.119 (-0.856)	0.016 (0.21)	-0.044 (-0.214)	-0.018 (-0.111)
ΔW_{t-1}	-0.328 (-2.337)	-0.214 (-2.832)	0.059 (0.287)	0.641 (3.945)
War dummy	0.104 (2.126)	-0.033 (-1.266)	-0.193 (-2.692)	0.037 (0.657)
Oil Shock dummy	0.106 (2.233)	0.02 (0.791)	-0.072 (-1.032)	0.089 (1.611)
Constant	0.057 (3.761)	0.026 (3.189)	-0.007 (-0.321)	0.028 (1.626)
Adjusted R ²	0.49	0.47	0.29	0.46
$\chi^2(1) = 0.25[0.62]$				
LM-statistic (12 lags) = 12.98[0.67]				
Jarque-Bera statistic (with 8 degrees of freedom) = 9.88 [0.27]				

^a t-values are in parentheses.

^b The cointegration vector for each equation is $v_{t-1} \equiv G_{t-1} - 1.90Y + 0.30(T/E)_{t-1} - 0.17W_{t-1} + 11.16$.

Table 8. Granger Causality Test Results

Null	F-Statistic	p-value
Y does not Granger-cause G	4.99	0.026
(R/E) does not Granger-cause G	0.20	0.655
W does not Granger-cause G	1.22	0.270
G does not Granger-cause Y	2.26	0.133
(R/E) does not Granger-cause Y	2.26	0.132
W does not Granger-cause Y	9.07	0.003

Figure 1. Real Government Revenue and Spending per Capita, 1960-2007

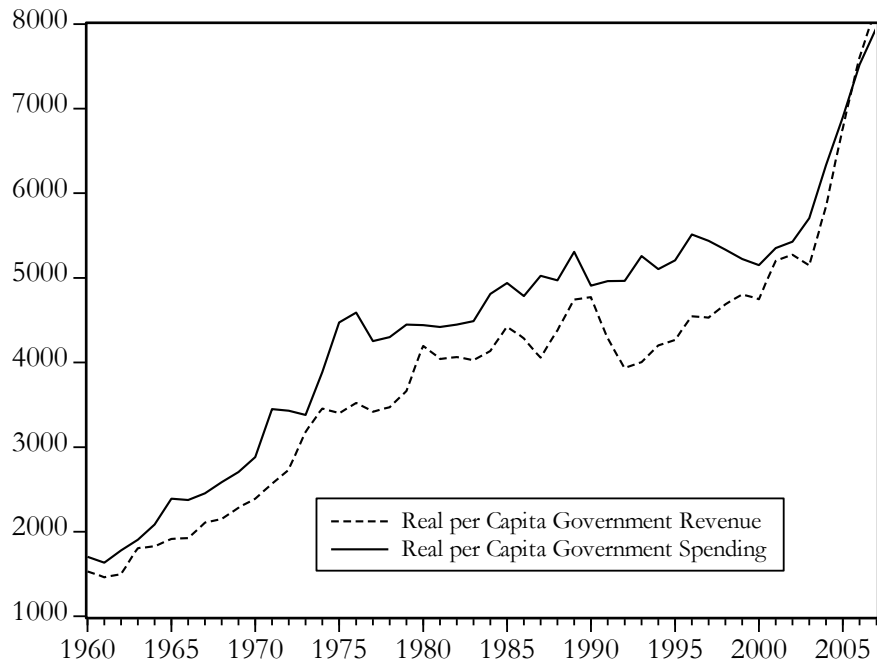


Figure 2. Government Spending and Revenues as Percent of GDP, 1960-2007

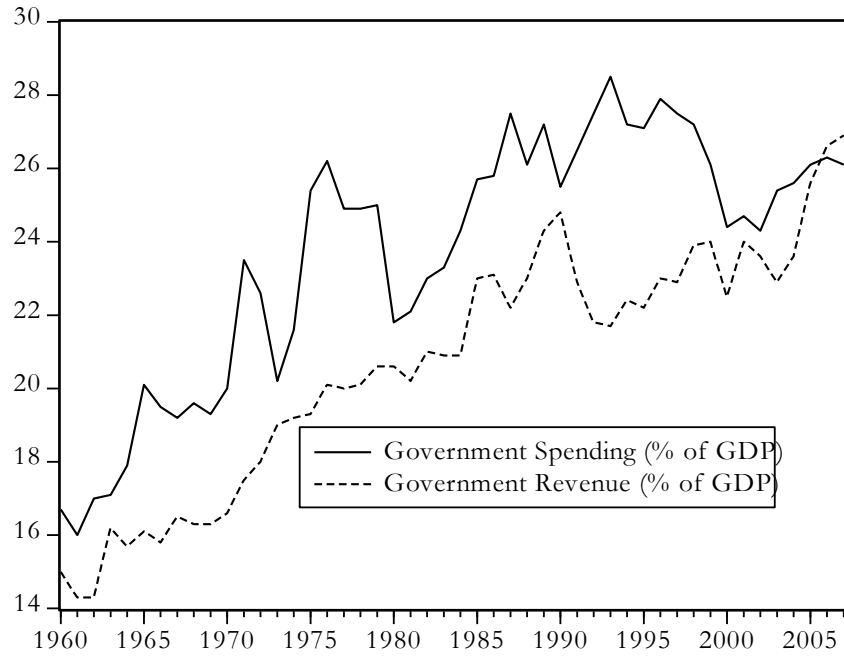


Figure 3. Real GDP per Capita, 1960-2007

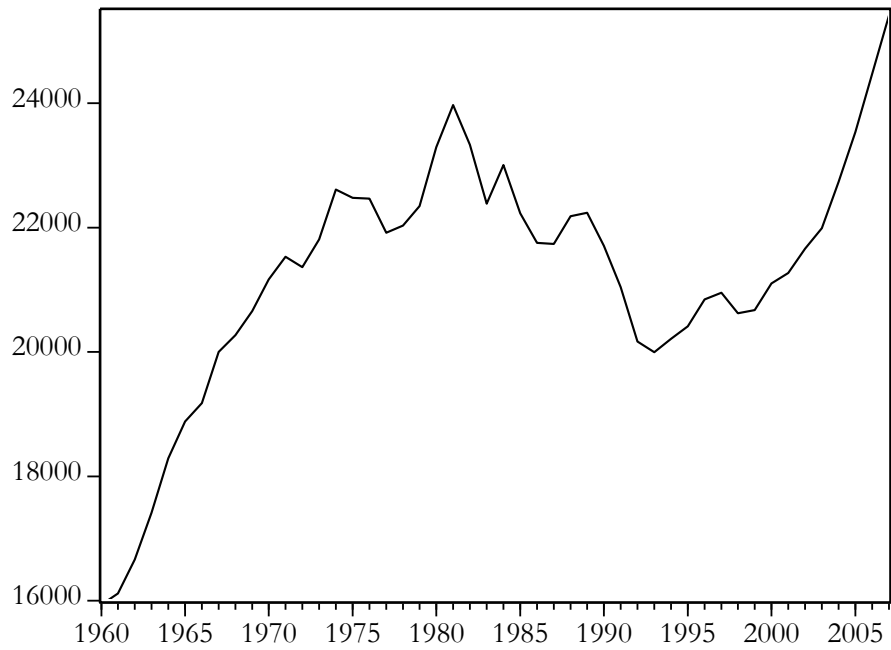


Figure 4. Wage Rate (Unit Labor Cost), 1960-2007

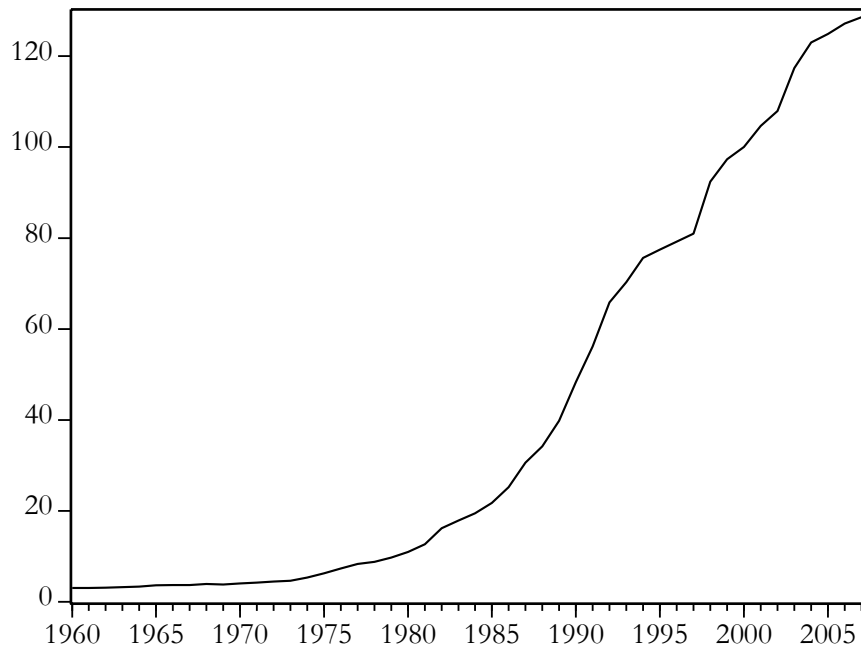


Figure 5. Population in Millions (logarithmic scale)

