CREDIT Research Paper

No. 00/6

Government Spending and Economic Growth in Tanzania, 1965-1996

by

Josaphat P. Kweka and Oliver Morrissey

Centre for Research in Economic Development and International Trade, University of Nottingham

The Centre for Research in Economic Development and International Trade is based in the School of Economics at the University of Nottingham. It aims to promote research in all aspects of economic development and international trade on both a long term and a short term basis. To this end, CREDIT organises seminar series on Development Economics, acts as a point for collaborative research with other UK and overseas institutions and publishes research papers on topics central to its interests. A list of CREDIT Research Papers is given on the final page of this publication.

Authors who wish to submit a paper for publication should send their manuscript to the Editor of the CREDIT Research Papers, Professor M F Bleaney, at:

Centre for Research in Economic Development and International Trade,
School of Economics,
University of Nottingham,
University Park,
Nottingham, NG7 2RD,
UNITED KINGDOM

Telephone (0115) 951 5620
Fax: (0115) 951 4159

CREDIT Research Papers are distributed free of charge to members of the Centre. Enquiries concerning copies of individual Research Papers or CREDIT membership should be addressed to the CREDIT Secretary at the above address.

CREDIT Research Paper

No. 00/6

Government Spending and Economic Growth in Tanzania, 1965-1996

by

Josaphat P. Kweka and Oliver Morrissey

Centre for Research in Economic Development and International Trade, University of Nottingham

The Authors
Oliver Morrissey and Josaphat Kweka are respectively Senior Lecturer and Research Student in the School of Economics, University of Nottingham.

Acknowledgements
This paper has evolved through many iterations and we are grateful to Neil Mcculloch and participants at the *DESG Annual Conference*, University of Reading, July 1999 for comments on an earlier draft (to which the current version now bears little resemblance). Participants at the *IESG Annual conference*, Gregynog, April 2000 provided comments on the current version. Detailed econometric results are available from the authors on request**.**

May 2000

Government Spending and Economic Growth in Tanzania, 1965-1996

by

Josaphat P. Kweka and Oliver Morrissey

Abstract

The objective of this paper is to investigate the impact of public expenditures on economic growth using time series data on Tanzania (for 32 years). We formulate a simple growth accounting model, adapting Ram (1986) in which total government expenditure is disaggregated into expenditure on (physical) investment, consumption spending and human capital investment. Increased productive expenditure (physical investment) appears to have a negative impact on growth. Consumption expenditure relates positively to growth, and in particular appears to be associated with increased private consumption. Expenditure on human capital investment was insignificant in the regressions, probably because any effects would have very long lags. The results confirm the view that public investment in Tanzania has not been productive, but counter the widely held view that government consumption spending is growth-reducing. We also find evidence that aid appears to have had a positive impact on growth, especially allowing for the reforms in the mid 1980s.

Outline

Appendix: Public Expenditure and Economic Performance in Tanzania

1. INTRODUCTION

The relationship between economic growth and government spending, or more generally the size of the public sector, is an important subject of analysis and debate. A central question is whether or not public sector spending increases the long run steady state growth rate of the economy. The general view is that public expenditure, notably on physical infrastructure or human capital, can be growth-enhancing although the financing of such expenditures can be growth-retarding (for example, because of disincentive effects associated with taxation). Government activity may directly or indirectly increase total output through its interaction with the private sector. Lin (1994) outlines some important ways in which government can increase growth. These include provision of pubic goods and infrastructure, social services and targeted intervention (such as export subsidies). The purpose of this paper is to examine the impact of government spending on economic growth in Tanzania.

The nature of the impact of public expenditure on growth will depend on its form. Following Barro (1990), expenditure on investment and 'productive' activities (in principle including State-owned production) should contribute positively to growth, whereas government consumption spending is anticipated to be growth-retarding. However, in empirical work it is difficult to determine which particular items of expenditure should be categorised as investment and which as consumption. While numerous studies have been conducted, no consistent evidence exists for a significant relationship between public spending and growth, in a positive or negative direction. Results and evidence differ by country/region, analytical method employed, and categorisation of public expenditures. In a very recent debate regarding the evidence for OECD countries, Folster and Henrekson (1999) argue that the relationship is negative whereas Agell *et al* (1999) respond that it is not significant. Furthermore, there is no agreement regarding the direction of causality between public spending and economic growth, implying a potential endogeneity problem in regression analysis (Folster and Henrekson, 1999). The actual relationship between public spending and growth is not well understood and there is a need for more empirical research (Grier and Tullock, 1989).

The relationship between government spending and growth is especially important for developing countries, most of which have experienced increasing levels of public expenditure over time (see Lindauer and Valenchik, 1992). This has tended to be associated with rising fiscal deficits, suggesting their limited ability to raise sufficient revenue to finance higher levels of expenditure. Rising deficits tend to have had an adverse effect on growth in OECD countries (Knellar *et al*, 1998). This paper is concerned with the composition of expenditures only and does not address means of financing (an appropriate subject for further research). We do not include any measure of government revenue in our regressions; as they are specified, the tax ratio would, in practice, measure the same thing as government expenditure (Hansson and Henrekson, 1994: 390).

In this paper we investigate the impact of public expenditures on economic growth using time series data for Tanzania. A brief survey of theory and empirical evidence is in Section 2. Our model, adapted from Ram (1986) is presented in Section 3. The empirical analysis and results are discussed in Section 4. Section 5 provides conclusions. An Appendix gives detail on the data used with an overview of trends of public expenditures and economic performance in Tanzania.

2. LITERATURE ON GOVERNMENT SPENDING AND GROWTH

Economic theory has shown how government spending may either be beneficial or detrimental to economic growth. In traditional Keynesian macroeconomics, many kinds of public expenditures, even of a recurrent nature, can contribute positively to economic growth, through multiplier effects on aggregate demand. On the other hand, government consumption may crowd out private investment, dampen economic stimulus in the short run and reduce capital accumulation in the long run. Strictly, crowding-out is due to fiscal deficits and the associated effect on interest rates (Diamond, 1989). Studies based on endogenous growth models distinguish between distortionary or non-distortionary taxation and between *productive* or *unproductive* expenditures. Expenditures are categorised as *productive* if they are included as arguments in private production functions, and *unproductive* if they are not (Barro and Sala-I-Martin, 1992). This categorisation implies that productive expenditures have a direct effect upon the rate of economic growth but unproductive expenditures have an indirect or no effect. The issue

of which expenditure items should be categorised as productive or unproductive is debatable and may be difficult to define *a priori*.

Empirical evidence on the government spending-growth relationship is diverse, mostly based on cross-section studies that often include a sample of both advanced and developing countries. The main conclusion in most of these studies is that government consumption spending has a negative impact on growth (Grier and Tullock, 1989; Barro, 1991; Easterly and Rebelo, 1993; Tanninen, 1999). Studies using a sample of only advanced (mostly OECD) countries obtain similar results. For instance, Hansson and Henrekson (1994) find that government consumption spending is growth-retarding but spending on education impacts positively on growth. Kneller *et al* (1998) find that productive spending has a positive, while non-productive spending has a negative impact on growth of OECD countries (1970-95). Ram (1986), using a sample of 115 countries, found government expenditure to have significant positive externality effects on growth particularly in the developing countries (LDC) sample, but total government spending had a negative effect on growth. Lin (1994) used a sample of 62 countries (1960-85) and found that non-productive spending had no effect on growth in the advanced countries but a positive impact in LDCs.

Other studies have investigated the impact of particular (functional) categories of public expenditure. For example, Devarajan *et al* (1993), using a sample of 14 OECD countries, found that spending on health, transport and communication have positive impacts (spending on education and defence did not have a positive impact). In the majority of studies, total government spending appears to have a negative effect on growth (Romer, 1990; Alexander, 1990; Folster and Henrekson, 1999).

Table 1 gives a summary of the main features of selected empirical studies. The empirical evidence is inconclusive; there is a general tendency for government consumption to be negatively associated with growth performance, although the evidence for these is weaker in studies of developing countries. This could be due to the diversity of samples in the various studies and problems regarding the quality of the data. Some miss-specification problems may arise due to omitted variables (discussed in Lin, 1994; Slemrod, 1995; Folster and Henrekson, 1999). Studies for LDCs provide mixed evidence. There is evidence that, unlike in the case of developed countries, consumption

Table 1: Summary of Selected Empirical Studies

Author	Sample	Explanatory variables	Main results
Landau (1983)	Panel (27 LDCs)	Categories of *G*	*GC* has a negative impact.
Kormendi and Meguire(1985)	Panel (N=47)	*GC*	*GC* insignificant.
Landau (1986)	Cross-section 65 LDCs (1960-80)	*G* and various functional types	*GC* and *GI* significantly negative. Education is insignificant.
Ram (1986)	115 countries (1960-80)	Private investment, *GC* and labour force growth rate	Externality effect of *G* is positive, especially in lower income countries. *G* has a negative impact.
Grier and Tullock (1989)	113 country panel (1951-80)	*GC*	*GC* significantly negative, but positive for Asian sub-sample.
Romer (1990)	Cross-section of 112 countries (1960-85)	*G*, *GC*, *GI* and human capital	*G* significant and negative but *GI* has a positive coefficient.
Alexander (1990)	Panel 13 OECD countries (1959-84)	*GC*, *GI* and deficits (growth rate of shares)	*GC* and inflation have negative impact on growth.
Barro (1991)	98 countries (1960-85)	*GC*	*GC* has a negative impact.
Chan and Gustafson (1991)	Time series on UK (1955-86)	*G* less transfers (levels), private consumption and relative prices of public goods	*G* a positive impact on private consumption.
Devarajan, *et al* (1993)	Panel 14 OECD (1970-90)	Functional types of *G* (health, education, transport, etc)	Health and infrastructure spending have positive impact, education and defence have negative impact.
Easterly and Rebello (1993)	Cross-section of 100 ADCs and LDCs (1970-88)	Government surplus, *GI*, *GC* and other types of expenditures and taxes, and human capital	*GI* has a negative impact on growth, *GC* a negative impact, but positive impact on private investment. Spending on infrastructure has positive impact on private investment.
Lin (1994)	62 country panel (1960-85)	*I* and *G* (growth rates), growth rate of labour force	Mixed results. *GC* insig. in ADCs, but significantly positive in LDCs.

Table 1 (cont.)

Author	Sample	Explanatory variables	Results
Hsieh and Lai (1994)	Time series G7 (1885-1987)	*G* and private investment	No uniform causality.
Hansson and Henrekson (1994)	Cross-section of 14 industries for OECD countries (1970-87)	*G*, *GC*, *GI*, education, transfers, social security	Transfers and *G* have negative effect. Education spending positive, *GI* insignificant.
Devarajan *et al* (1996)	Cross-section 43 LDCs (1970-90)	*GC*, *GI* and functional categories	*GC* positive, *GI* negative in LDCs, reverse for ADCs.
Ghali (1998)	Time series, 10 OECD countries (1970:1-1994:3)	*G*, *I*, exports and imports	*G* Granger-causes growth, directly for most countries.
Kneller *et al* (1998)	Panel of 22 OECD countries (1970-95)	*GI*, *GC* other types of expenditures; *I*, types of taxes	*GI* enhances growth, *GC* does not
Dunne and Nikolaidou (1999)	Time series on Greece (1960-96)	Military expenditure, defence, *GC*	Military/defence expenditure have a negative effect; *GC* does not affect growth.
Batchelor *et al* (1999)	Time series on S. Africa (1964-95)	military and non-military expenditures	Military spending has positive externality, negative size effect
Tanninen (1999)	52 country panel (1970-92)	*I*, categories of *G*, income inequality	*GC* has negative impact. Spending on public goods is growth retarding for large *G* but not for small *G*; social security spending is positive.
Fölster and Henrekson (1999)	23 OECD (1970-95) countries	*G* and taxes	*G* a significant negative impact

Notes:
Explanatory variables measured as shares of GDP unless otherwise indicated: *G* is total government expenditure, *GC* consumption/non-productive; *GI* investment/productive, *I* total investment. Hansson and Henrekson (1994) examine impact on total factor productivity; ADCs are Advanced or rich countries; LDCs are developing countries. Most studies include other variables not listed, such as private investment, foreign aid or measures of human capital (e.g. schooling/education or health variables).

spending may be growth enhancing and investment spending growth retarding (Devarajan *et al*, 1996). However, Landau (1983), using data on 27 LDCs, found that consumption spending has a negative effect on growth. A similar result was found using a sample of 65 LDCs (Landau, 1986), and government investment spending also seemed to have a negative impact. Evidence based on time series analysis is rare, and mainly addresses causality between government spending and growth. Hsieh and Lai (1994) used data on G7 countries (1885-1987) and found no evidence of causality, but government expenditure had a marginal effect on growth. On the other hand, Ghali (1998), using data for 10 OECD countries, found evidence that government size (measured as government consumption spending) Granger-causes growth in most countries. Chan and Gustafson (1991) found that government expenditure has a positive impact on private consumption in the UK.

Most of the empirical studies are cross-section, and specific country case studies are rare. Time series analysis for specific countries can avoid some of the econometric and sampling problems. Specifically, cross-section analysis assumes the coefficients are the same for all countries in the sample (econometric techniques exist to address this problem, but they are imperfect) whereas time series analysis can address country-specific features. This may go same way to explain the variety of results reported in Table 1, especially why variables so often appear insignificant. A time series country study is potentially more informative, although the findings cannot be generalised to other countries.

In this study we use cointegration techniques to investigate evidence for Tanzania. Previous studies on Tanzania have mostly focused on the pattern and growth of public spending (Semboja, 1994) and the implications of deficit financing (Mpatila, 1985; Kilindo, 1992; Makaranga, 1992), private investment (Moshi and Kilindo, 1994) or taxation (Osoro, 1993) for growth. There are reasons to believe that in poor countries such as Tanzania, where expenditure levels are low, public spending is more likely to be beneficial for growth (Folster and Henrekson, 1999: 342). Counteracting this are the tendencies for tax collection to be more inefficient and unproductive government interventions to be more prevalent in poor countries (Slemrod, 1995). These considerations imply the need for caution in combining rich and poor countries in cross

section studies. Even in the context of a single-country time series study, the link between expenditures and growth will be complex.

3. THEORETICAL MODEL

We follow the model of Ram (1986), which forms a basis for empirical models of government expenditure and growth. Denoting the private sector *D* and public sector *G*, with capital (*K*) and labour (*L*) allocated between both such that $K = K_D + K_G$, and $L = L_D + L_G$. To capture externalities associated with the public sector, *G* enters the production function of the private sector *D*:

$$D = D(K_D, L_D, G) \tag{1}$$

$$G = G(K_G, L_G) \tag{2}$$

We assume a constant productivity differential between labour in both sectors:

$$G_L / D_L = 1 + \delta \tag{3}$$

Where $\delta > 0$ implies lower productivity in the public sector (the reverse would be the case if $\delta < 0$) and we assume $\delta \neq 0$.

Totally differentiating (1) and (2), given that national income $Y = D + G$, gives

$$dY = D_K dK_D + G_K dK_G + D_L dL_D + G_L dL_G + D_G dG \tag{4}$$

Where D_K and G_K are marginal products of factor *K* in sector *D* and *G* respectively, similarly D_L and G_L for factor *L*. Further, D_G is the marginal externality effect of public on private sector. From (3) we can write:

$$G_L = (1 + \delta) D_L \tag{5}$$

We diverge slightly from Ram (1986) because, although we will avail of the identity $L = L_D + L_G$, we will treat capital as distinct in each sector.[1] Substituting (5) into (4) and rearranging:

$$dY = D_K dK_D + G_K dK_G + D_L\left(dL_D + dL_G\right) + \delta D_L dL_G + D_G dG \tag{6}$$

Using (5) we can write:

$$dG = G_K dK_G + (1+\delta) D_L dL_G$$

which implies:

$$\frac{dG}{1+\delta} - \frac{G_K}{1+\delta} dK_G = D_L dL_G \tag{7}$$

Substituting (7) into (6) and collecting terms:

$$dY = D_K dK_D + \left(1 - \frac{\delta}{1+\delta}\right) G_K dK_G + D_L dL + \left[D_G + \frac{\delta}{1+\delta}\right] dG \tag{8}$$

We assume the existence of a linear relationship between the marginal product of labour in each sector and the average output per unit labour in the economy, i.e. $D_L = \beta\left(Y/L\right)$. Letting $dK_D = I_P$ (private sector investment), and $dK_G = I_G$ (public sector physical investment), we can substitute into (8), dividing through by *Y*:

$$\frac{dY}{Y} = \alpha \frac{I_P}{Y} + \gamma \frac{I_G}{Y} + \beta \frac{dL}{L} + \left[D_G + \frac{\delta}{1+\delta}\right]\left(dG/G\right)\left(G/Y\right) \tag{9}$$

Where, $\alpha = D_K$, and $\gamma = \left(1 - \frac{\delta}{1+\delta}\right) G_K$.

1 Furthermore, and for this reason, we do not have to assume a constant productivity differential between capital in each sector (as we do for labour).

Equation (9) corresponds to Ram (1986) equation (7) except that we keep I_P and I_G distinct. Thus, equation (9) forms our basic model for regression estimation. For ease of comparison with other studies, we will also estimate (9) with $\left(G/Y\right)$ as the variable rather than $\left(dG/G\right)\left(G/Y\right)$. We can also estimate with $I = I_P + I_G$, in effect testing the restriction $\alpha = \gamma$ (which would imply $D_K = G_K$, and $\delta = 0$).[2]

We do not have time series data on $\left(dL/L\right)$ and use public investment in human capital (*Hg*) as a proxy.[3] This may appear unreasonable but the motivation is twofold. First, we wish to investigate if *Hg* has an independent impact on growth, as growth theory predicts (Romer, 1990; Barro, 1990, 1991; Easterly and Rebelo, 1993). Second, *Hg* may capture the changing quality of the labour force, and as such may be preferable to $\left(dL/L\right)$.

We will estimate two variants of (9):

$$g = a_0 + a_1(\frac{Ip}{Y}) + a_2(\frac{Ig}{Y}) + a_3(\frac{Hg}{Y}) + a_4(\frac{dCg}{Cg})(\frac{Cg}{Y}) + \mu \qquad (10)$$

$$g = b_0 + b_1(\frac{Ip}{Y}) + b_2(\frac{Ig}{Y}) + b_3(\frac{Hg}{Y}) + b_4(\frac{Cg}{Y}) + \mu \qquad (11)$$

Where: *Cg* = government consumption spending

Ig = government investment spending

Hg = government human capital investment spending

Ip = private investment

g = $\frac{dY}{Y}$ or ΔY, measured as $\left(\ln Y_t - \ln Y_{t-1}\right)$

2 These results are not reported. It is clear from the results reported below that the coefficients on public and private investment are quite different, hence it would be wrong to combine them into one variable.

3 We did run regressions with population growth as a proxy for labour force growth. The coefficient on population growth was insignificant but otherwise the results were similar to those reported below.

4. RESULTS

A general difficulty with the type of model developed above is that many of the explanatory variables are in fact components of GDP. We address this problem in two ways. First, in estimating the impact on GDP growth, the explanatory variables are measured as shares of GDP[4]. Second, we follow the practice of estimating the effects of government expenditure on growth indirectly through effects on private investment or private consumption. [5] Given that the correlation of private consumption with GDP is very high (0.75) compared with private investments (0.2), we estimate the determinants of growth for private consumption (*PC*) only. Few studies investigate the impact of government spending on private consumption. An exception is Chan and Gustafson (1991) in which government spending was found to have a significant but positive effect on private consumption in the UK. However, their study was concerned with effects of total government spending on private consumption rather than components of government spending on growth.

We use time series data on Tanzania for a 31-year period (1965 – 1996). Private investment (*Ip*) is proxied by private capital formation, while government investment spending (*Ig*) is proxied by government total capital/development expenditure. Government consumption expenditure (*Cg*) is measured by government recurrent expenditure less expenditure on health and education. Expenditure on human capital (*Hg*) is thus measured by the total of Health and Education spending (current and capital).[6] All variables are measured in real terms, deflated using the consumer price index - CPI (*1985=100*). The data are reported in the Appendix.

---

4 Expressing the variables as shares of GDP also allows one to control for the effects of financing government expenditure and level effects (Devarajan *et al*, 1996: 322).

5 Barro (1991), Easterly and Rebelo (1993), Ghali (1998) estimate the effect of government expenditures on growth indirectly through private investment. Private consumption can be used as a measure of economic growth as the correlation of output and other variables can be modeled from the production or utility side of the household (Barro and Sala-I-Martin, 1992: 655). Barro (1990: 124) noted that although an increase in government consumption spending is growth retarding it can enhance the utility of individuals while government expenditure might increase economic welfare of households even if it decreases the growth of per capita GDP (Landau, 1983: 790).

A brief comment on notation is in order. We will estimate two versions of (9) and (10) using the same set of explanatory variables as given in the previous paragraph, and we use the same notation for these variables throughout. The first set of estimates relate to GDP growth (D*Y*), in which case explanatory variables are measured as their share of GDP. The second set of estimates relates to *PC* growth, in which case explanatory variables are measured in their levels. In (10) we have the particular form of *Cg* in notation as $dCg_t = (Cg_t - Cg_{t-1})/Y_t$ and the first difference will be $\Delta dCg_t = dCg_t - dCg_{t-1} = [(Cg_t - Cg_{t-1})/Y_t] - [(Cg_{t-1} - Cg_{t-2})/Y_{t-1}]$. In (11) we have what Cg_t as notation for Cg_t/Y_t which in first difference is $\Delta Cg_t = [Cg_t/Y_t] - [Cg_{t-1}/Y_{t-1}]$. This specific distinction should be kept in mind; as we will see, the econometric evidence is inconclusive regarding which specification is to be preferred (we note that the correlation coefficient between *Cg* and *dCg* is 0.85).

As our time series is relatively short, and the quality of the data is less than ideal, we eschew the Johansen (1988) approach to cointegration. Instead we adopt the more simple (and in most respects more transparent) Engle and Granger (1987) approach (which is appropriate as we are estimating a single equation derived directly from the model).[7] Consequently, we first test for the order of integration of the individual series by conducting unit root tests for stationarity. Following Engle and Granger (1987) a non-stationary series *X* is said to be integrated of order *d* if it can be made stationary by differencing it *d* times; expressed as *X~I(d).* We employ the standard Dicker-Fuller (DF) test on each variable, extended to allow for AR(*n*) process, yielding the augmented DF (ADF) test. Given the limitation of our small sample size and the low power of the tests, we limit our ADF test to the simplest possible form. For most of the variables it amounts to the simple DF test for an AR(1) process.

Table 2 reports the results of the unit root tests. All variables, with one exception, are found to be I(1). In particular, D*Y* is I(1) so we can proceed to estimate a cointegrating regression. The exception is *dCg* (measured relative to GDP), which appears to be I(0).

---

6 The data did not permit us to separate recurrent and capital components of health and education spending in all years, consequently there is some double counting. However, by far the greater share of *Hg* is recurrent spending, and the development spending on health and education is a relatively low proportion of *Ig*.

7 We did attempt to estimate the model using the Johansen approach. For some specifications the results, although weak, were consistent with those reported here. In other cases we did not get significant results.

Table 2: Unit root (ADF) test for Stationarity

(a) Unit root test (data in levels)

Variable	t-ADF in levels	t-ADF in First Difference	Number of lags
$g = DY$	-2.93	-6.17***	0
Ip	-1.46	-4.98***	0
Ig	-3.22	-5.39***	0
Hg	-2.36	-6.71***	0
Cg	-3.16	-6.40***	0
I	-2.53	-5.32***	0
PC	-1.77	-4.21***	0

Notes:
All variables are measured in log of levels except growth (*g*) and *dCg* which is the log of the ratio of *dCg* to GDP (*Y*). All variables are as defined in the text, with *I* = *Ig* + *Ip* and *PC* = private consumption.
Critical values are –3.58 and 4.32, and *** indicates significant at 1% level.

(b) Unit root test (for variables as shares of GDP)

VARIABLE	t-ADF in levels	t-ADF in First Difference	Number of lags
Ip	-2.00	-5.62***	0
Ig	-1.83	-5.65***	0
Hg	-1.42	-7.01***	0
Cg	-2.63	-7.76***	0
dCg	-6.24***	-10.24***	0
I	-3.25	-5.87***	0

Notes:
For convenience we use the same notation as in panel (a) but note that here the variables are measured as log of the ratio to GDP (*Y*). In all of the growth in *Y* regressions, variables are measured as shares of GDP; in the growth regressions for *PC* all variables are measured in levels. Although the notation used is the same, the measure will be clear from the context.
Critical values are –2.97 and 3.68, for which *** indicates significant at 1% level.

In principle, this implies that the variable should be included only in the short-run (ECM) regression, but excluded from the long-run regression. However, the specification derived from the model, equation (10), implies that *dCg* should be included in the long-run regression. Given the limitations of our data and the low power of the tests, we report results for both cases. Thus, we assume for purposes of the long-run regression for (10) that *dCg* is in fact I(1) and include that variable. We then include its first difference in the associated ECM. In the case where we accept that *dCg* is I(0), the long-run regression is (9). We then estimate ECM regressions with *dCg* and alternatively with first difference of *Cg*.

In the context of cointegration theory, these results are somewhat surprising. In principle, one would expect GDP growth and components of GDP measured as shares of GDP to be bounded (often within a fairly narrow range). Consequently, one would expect the variables to be I(0). A plausible explanation is that we find the variables to be I(1) because we have only a relatively short time series, i.e. within the data window we are examining the series appear non-stationary. It may be true that alternative unit root tests would provide a different result (specifically, if we reversed the test it is likely that we would be unable to reject the null that the series are non-stationary). Nevertheless, subject to the caveat of data limitations, we proceed on the basis of the results in Table 2. Having established that the variables of concern are of the same order of integration, we then run an OLS regression of the variables on levels and test for cointegration by testing that the residual is *I*(0). This is the long-run dynamic equation. Existence of cointegration allows for analysis of the short-run dynamic model that identifies adjustment to the long run equilibrium relationship through the Error Correction Model (ECM) representation[8].

The Long-run Relationship

Results for the two variants of equations (10) and (11) are reported in Table 3. In the

[8] The ECM has several advantages. First, it incorporates both the short and long run effects, i.e. the long run equilibrium is incorporated in the model. Second, all terms in the ECM model are stationary so standard regression techniques with their associated statistical inferences are valid given the existence of cointegration. Third, the ECM is bound to cointegrate in that if the series are cointegrated then there must exist an ECM; and conversely an ECM generates cointegrated series (Engle and Granger, 1987).

regression for GDP growth specification (10) with *dCg* is preferred: the null hypothesis of no cointegration can be rejected (narrowly) and the positive coefficient on *dCg* is significant. Private investment is the only other significant variable (and then only at the ten percent level). The null hypothesis of no cointegration cannot be rejected for specification (11) and private investment is the only significant variable. In the regression for private consumption (*PC*) the results are more encouraging, although the specification preferences are reversed. Private investment is consistently positive and significant, while government investment appears to be negative and significant (albeit less consistently so).[9]

Government consumption spending appears to have a significant and positive impact on *PC* and a comparison of (10) and (11) sheds some light on the nature of this relationship. In regard to (10), the trend is highly significant but *dCg* is insignificant. As the latter is a measure of how *Cg* changes (relative to GDP), it appears that the trend is picking up any effect on the level of *PC*. When we include instead the level of *Cg* in (11), this is highly significant but the trend is insignificant. Thus, in respect of *PC*, it appears to be the level of *Cg* that is important in the long-run relationship. We cannot draw the same conclusion in respect of GDP growth, where it is the change in the share of *Cg* that appears to be important in the long-run relationship.

We experimented with alternative long run growth models in two specifications not using decompositions of government spending, one with total government expenditure *(G)* and the second with foreign aid (*F*), both measured as log of share of GDP. As aid may be highly correlated with total expenditures, we did not include both together in the same regression.[10] We found no evidence of cointegration in these two specifications. This

---

[9] We tested for endogeneity between investment spending and growth using the Hausman specification test by regressing *Ig* on all the explanatory variables and included both the fitted values and residuals as additional explanatory variables in the basic regression. The *t*-test on the residual suggested no evidence of endogeneity.

[10] The correlation coefficient between *G* and *F* is 0.85, and aid appears to be a determinant of *G*:

G =	0.86 +	0.10F –	0.01F(-1) –	0.04F(-2)
	(0.85)	(2.01)	(-0.10)	(-0.81)

suggests that our data does not support joint movement of total government expenditure or aid with growth in the long run[11]. In effect, this suggests that disaggregating *G* allows for a better specification.

Table 3: Long-run estimates and Engle-Granger Cointegration Tests

Variables	*Dependent variable*			
	DY		*PC*	
	6	7	6	7
Constant	-0.86 (-1.33)	-2.33 (1.59)	3.77 (4.82)***	-1.26 (-0.92)
Ip	1.05 (1.88)*	1.31 (2.17)**	0.29 (4.22)***	0.25 (4.75)***
Ig	-0.44 (-0.67)	-0.79 (-0.91)	-0.18 (-1.88)*	-0.20 (-2.89)**
Cg	--	1.54 (0.96)	--	0.70 (4.00)***
Hg	0.40 (0.39)	0.75 (0.67)	0.20 (1.51)	0.07 (0.65)
dCg	2.41 (1.95)**	--	1.63 (0.79)	--
Trend	0.00 (1.18)	0.00 (0.95)	0.02 (7.36)***	-0.00 (-0.30)
RESD[a]	-3.92 (3.84)	-3.71 (3.84)	-3.76 (3.84)	-4.36 (3.84)

Notes: All variables in the GDP growth (DY) regressions are measured as shares of GDP and expressed in logs. Note that *dCg* can therefore be interpreted as the change (growth) in *Cg* relative to GDP. Regressors for *PC* are expressed in log of levels (not shares of GDP).

--, indicates variable not included in specification.

*, **, *** indicates (except for RESD) significant at 10, 5 and 1 percent levels respectively.

[a] Engle and Granger (ADF) cointegration test, where the null hypothesis is 'no cointegration'. The critical level at 5% is shown; 4.10 is the critical level at 1% (applies for the final column).

11 Data on foreign aid is from the *International Financial Statistics Yearbook* (1993 and 1997). Foreign aid is defined in the limited sense as 'grants received by government' as one of the means with which to finance the fiscal deficit.

Short-run Relationships

The results for the corresponding short-run ECMs are shown in Tables 4-6. Table 4 presents the results for GDP growth (first difference) with the assumption that *dCg* is I(0) hence included without differencing. As was the case in Table 3, the results suggest a slight preference for specification (10). Just over half of the variance is explained and the ECM term is significant, suggesting that two-thirds of the adjustment to long-run equilibrium takes place in one period. Although *Ig* is significantly negative, *dCg* is significantly positive; the positive impact of *Ip* is not significant. The results for specification (11) are quite different; only private investment and spending on human capital are (slightly) significant. Considering Tables 3 and 4 together, the strongest conclusion is that *dCg* has a positive impact on growth whereas *Ig* has a negative impact.

Table 5 presents the alternative ECM for GDP growth with the assumption that *dCg* is I(1) hence included as D*dCg*, hence we only present results for specification (10). Two 'parsimonious' models are reported as the coefficient on *Ig* is particularly sensitive to specification. Over half of the variance is explained and the ECM term is significant. As for Table 4, *Ig* is significantly negative, but not consistently so, while D*dCg* is significantly positive; the positive impact of *Ip* is generally significant. The results in Tables 3-5 support the conclusion that *dCg* and *Ip* have a positive impact on growth whereas *Ig* has a negative impact.

Table 4: Short run Dynamic (ECM) Regressions for GDP Growth

Variables	Dependent Variable = $\Delta\Delta Y$			
	(10)		(11)	
	Full	*Parsimonious*	*Full*	*Parsimonious*
Constant	-0.01 (-0.39)	-0.01 (-0.83)	0.00 (0.04)	0.00 (0.17)
ΔIp_t	-0.04 (-0.05)		0.02 (0.02)	
ΔIp_{t-1}	1.55 (1.89)*	0.79 (1.18)	1.53 (1.60)	1.38 (1.70)*
ΔIg_t	-1.21 (-1.99)*	-0.91 (-2.04)**	-0.87 (-1.27)	-0.75 (-1.36)
ΔIg_{t-1}	-0.79 (-0.99)		-0.74 (-0.77)	-0.41 (-0.73)
ΔCg_t	--		0.72 (0.43)	
ΔCg_{t-1}	--		0.26 (0.15)	
dCg_t	3.04 (2.31)**	3.55 (3.23)**	--	--
dCg_{t-1}	-0.48 (-0.38)		--	--
ΔHg_t	1.15 (1.08)		1.88 (1.58)	1.69 (1.88)*
ΔHg_{t-1}	0.47 (0.42)		0.53 (0.40)	
ΔHg_{t-2}	-1.25 (-1.28		-1.17 (-1.04)	-1.31 (-1.40)
$RESD_{t-1}$	-0.68 (-3.33)***	-0.67 (-3.87)***	-0.60 (-2.83)**	-0.58 (-3.17)***
Adj.R^2	0.60	0.53	0.50	0.49

Notes: Variables as previously defined, all in first difference except *dCg* as this was found to be I(0) in Table 2. Notation $\Delta\Delta Y$ is to indicate that this is first difference of growth. RESD is the ECM term. None of the diagnostic tests revealed evidence of misspecification, and the F-test for joint significance passed at the 5% level in all cases. The one exception is that when ΔHg_{t-2} was included the test for normality was rejected; when ΔHg_{t-2} was omitted, normality was accepted.

*, **, ***; and --, - are as defined in Table 3 above.

Table 5: Alternative ECM Regressions for GDP Growth

Variables	Dependent Variable = $\Delta\Delta Y$		
	(10)		(10)
	Full	*Parsimonious*	*Parsimonious*
Constant	0.001 (0.04)	0.001 (0.04)	0.001 (0.06)
ΔIp_t	0.12 (0.16)		
ΔIp_{t-1}	1.74 (2.18)**	1.59 (2.14)**	1.32 (1.92)*
ΔIg_t	-1.23 (-2.07)*	-1.15 (-2.15)**	-0.76 (-1.68)
ΔIg_{t-1}	-0.89 (-1.12)	-0.95 (-1.28)	
ΔdCg_t	2.58 (2.62)**	2.72 (2.93)**	2.86 (3.11)***
ΔdCg_{t-1}	1.57 (1.53)	1.86 (2.09)**	1.67 (1.89)*
ΔHg_t	1.43 (1.36)	1.35 (1.35)	
ΔHg_{t-1}	0.65 (0.60)	0.93 (0.97)	0.07 (0.09)
ΔHg_{t-2}	-0.73 (-0.69)		
$RESD_{t-1}$	-0.58 (-3.07)***	-0.59 (-3.27)***	-0.50 (-2.94)***
Adj.R^2	0.62	0.61	0.56

Notes: As for Table 4 except here we use the first difference ΔdCg assuming that dCg is actually I(1). None of the diagnostic tests revealed evidence of misspecification, and the F-test for joint significance passed at the 5% level in all cases. The one exception is that when ΔHg_{t-2} was included the test for normality was rejected; when ΔHg_{t-2} was omitted, normality was accepted.

The ECM results for growth of private consumption are in Table 6. Given that, in effect, *dCg* and D*Cg* are almost identical when measured in levels (correlation coefficient = 0.99) as is appropriate for *PC* regressions, rather than as shares of GDP, it is not surprising that (10) and (11) give very similar results.[12] Growth in government investment expenditure has a consistently negative and significant impact on D*PC*; growth in government consumption spending (however measured) has a consistently positive and significant impact. Private investment and human capital expenditure appear to be insignificant. The adjustment term is significant and implies that between a third and a half of short-run deviations from long-run equilibrium are eliminated within one period. There was a sudden increase in *PC* in 1987, and the impulse dummy (*i87* = 1 in 1987, 0 otherwise) is positive and highly significant.[13]

The broad conclusion is similar to that for economic growth. The results suggest that however growth is measured, and using alternative measures of government consumption, public consumption spending impacts positively on growth whereas public investment impacts negatively on growth. These are the only variables that have consistent and significant coefficient estimates.[14] It appears that a significant share of government consumption spending impacts directly on private consumption, and presumably through this on growth. This may simply reflect the fact that a large proportion of *Cg* goes on wages. Alternatively, it may be a measurement problem where

12 Almost identical results were obtained using D*dCg* (which has a correlation coefficient of 0.79 with both *dCg* and D*Cg*).

13 The RESET test was accepted only when *i87* is included. We also tried including various instability measures (constructed as the residual of the unit root regression expressed as a proportion of the value of the variable). Instability in *Cg* was the only such measure significant in the short-run. As expected, the effect of instability is negative. The model was robust to the inclusion of that instability variable.

14 We also experimented by combining *Hg* and *Ig* into one 'investment variable' but the general results were unaltered; the coefficient was negative and similar in value to that on *Ig*. The variable was I(0). For GDP growth, specification (10) was preferred in the long-run model and the coefficient was negative (but significant at only the 10% level); (10) was also the preferred form of the ECM, and again the coefficient was negative and significant. For *PC* (11) was the preferred specification and the coefficient was negative and significant in both long and short-run.

the aggregation of non-productive (consumption) expenditures includes substantial productive (investment) expenditures. The apparently negative impact of investment expenditures may also be due to measurement inaccuracies. Another interpretation, perhaps the most plausible, is that public investment has been inefficient and unproductive.

Table 6: Short run Dynamic (ECM) Regressions for PC Growth

Variables	Dependent Variable = D*PC*			
	(10)		(11)	
	Full	*Parsimonious*	*Full*	*Parsimonious*
Constant	-0.01 (-0.69)	-0.01 (-0.68)	-0.01 (-0.75)	-0.01 (-0.48)
D*Ip*$_t$	-0.03 (-0.46)		-0.04 (-0.64)	
D*Ip*$_{t-1}$	0.09 (1.60)	0.09 (1.74)*	0.08 (1.23)	0.08 (1.47)
D*Ig*$_t$	-0.08 (1.73)*	-0.07 (-2.00)**	-0.11 (-2.00)**	-0.09 (-2.26)**
D*Ig*$_{t-1}$	-0.05 (-0.86)		-0.06 (-0.88)	
D*Cg* $_t$	--	--	0.44 (3.84)***	0.42 (4.18)***
D*Cg*$_{t-1}$	--	--	0.08 (0.78)	
dCg$_t$	3.67 (2.78)**	4.01 (3.62)***	--	--
dCg$_{t-1}$	1.61 (1.24)	1.68 (1.70)*	--	--
D*Hg*$_t$	0.06 (0.77)		0.05 (0.65)	
D*Hg*$_{t-1}$	0.07 (0.87)		0.09 (1.19)	
i87	0.45 (4.74)***	0.40 (5.55)***	0.45 (4.66)***	0.40 (5.31)***
RESD$_{t-1}$	-0.34 (-2.97)**	-0.33 (3.20)***	-0.49 (-2.95)**	-0.48 (-3.14)***
Adj.R^2	0.82	0.81	0.82	0.79

Notes: As for Table 4, except variables measured as log first difference in levels, and *i87* is an impulse dummy for 1987 (as discussed in text). None of the diagnostic tests revealed evidence of misspecification, and the F-test for joint significance passed at the 5% level in all cases. Specification (10) was also tested using D*dCg* but the results were almost identical.

As noted above, when total government expenditure *(G)* and foreign aid (*F*) were alternatively included in the growth regression, we could not reject the null of no cointegration. For each of the two we therefore formulated a short run model (without the adjustment term) to examine the contemporaneous relationships and the results are summarised in Table 7. Total government expenditure does not have a significant impact on growth. This is to be expected as our earlier results confirm the need to try and decompose government spending. In the aid regression the coefficient on the growth of aid (D*F*) is significant and positive; export growth appears to have a positive impact, albeit only significant at the 10% level when lagged two periods. The structural break in the mid-1980's (*s85* = 1 for each year after 1985 inclusive, 0 otherwise) is significant and positive only in the regression with aid. This suggests that the positive growth effect of policy reforms in the mid-1980's was associated with enhanced effectiveness of aid. Private investment has a slightly significant negative coefficient, suggesting that the private sector was not the source of improved growth after the mid-80s.

These results have interesting implications for the current debate on aid effectiveness (see Hansen and Tarp, 2000). The 'aid ineffectiveness' view, as propounded by the World Bank (1998) suggests that aid does not have a positive impact on growth unless appropriate policies are in place. Although our results, given the step dummy, could be interpreted as supporting this, Tanzania is unlikely to meet the Bank's definition of 'good policy and institutions' and our more significant result is that aid appears positively related to growth. Another argument in World Bank (1998) is that a reason for aid ineffectiveness is that governments divert aid from investment to consumption uses (for a discussion see McGillivray and Morrissey, 2000), and the latter are assumed to have a negative or negligible impact on growth. This does not appear to be the case for Tanzania. We found that aid does appear to be a determinant of government spending, but it is the consumption component of this that appears to have contributed to growth. Our results are far from conclusive. However, we can say that they challenge simple generalisations about the impact of aid and types of government spending on growth.

Table 7: Aid, Total Spending and Short-run Growth

Variables	Dependent variable = D*Y*	
Constant	0.03 (1.09)	-0.01 (-0.56)
DIp_t	-	-1.24 (-1.94)*
DIp_{t-2}	0.46 (0.48)	-
DX_t	1.73 (1.03)	-
DX_{t-2}	3.25 (2.19)**	1.93 (1.84)*
DG_t	-2.46 (-1.62)	--
DG_{t-2}	-2.01 (-1.01)	--
DF_{t-1}	--	0.70 (3.49)***
s21	0.00 (0.02)	0.08 (2.72)**
Adj.R^2	0.38	0.54

Notes: Significance levels as in Table 3. Various lags were tried, and the most significant are reported. Exports (*X*), *G* and *F* are all measured as shares of GDP. None of the diagnostic tests suggested misspecification.

Direction of Causality between Expenditures and Growth

The above estimation and analysis assumes that all the regressors are exogenously determined, in that government spending determines economic growth (real GDP). In practice however, GDP may in turn determine government expenditures. In this respect, government expenditure is endogenous. This can lead to simultaneity bias when the error

term is correlated with one or more of the explanatory variables. Most empirical studies admit the simultaneity problem in measuring the impact of government spending on growth, but few of them account for it. We test for Granger causality as suggested by Charemza and Dreadman (1997), by estimating an unrestricted equation with lags of particular variables formulated individually and then test the joint significance of each variable. We can write two equations with *y* and *x* as dependent and their respective *j* lags as independent variables as follows:

$$y_t = A_o D_o + \sum_{j=1}^{k} \alpha_j y_{t-j} + \sum_{j=1}^{k} \beta_j x_{t-j} + \varepsilon_t \qquad (12)$$

$$x_t = A_1 D_1 + \sum_{i=1}^{k} \alpha_i x_{t-i} + \sum_{i=1}^{k} \beta_i y_{t-i} + u_t \qquad (13)$$

Where *D's* denotes the deterministic (non-stochastic) variables, i.e. constant and time trend, the α's, β's and *A*'s are parameter estimates; u_t and ε_t are respective error terms with all standard assumptions. In the above framework, *x* does not Granger cause *y* if β_j = 0 for all *j* in equation (12). Similarly for equation (13), *y* does not Granger cause *x* if β_i = 0 for all *i*. If both α and β parameters are not significantly different from zero, causality is indeterminate. In this case, a sufficient condition for *x* not Granger causing *y* in (12) is for α_j and β_j to be significantly different from zero respectively, *ceteris paribus*, with a corresponding interpretation for (13).

In general we found no evidence of causality between expenditure (categories) and GDP (Table 8). The one exception to this is that growth appears to have a causal influence on expenditure on human capital. As this variable was not significant in our regressions we conclude that estimation of our basic model does not suffer from simultaneity bias.[15]

15 In unreported regressions we found no evidence of causality between public investment expenditure and private investment. However, we found some evidence that total public expenditure Granger causes private consumption. We attempted to re-estimate the regressions using instrumental variables but the results were weak and generally insignificant

Table 8: Granger Causality Regression Results

Variables	DY				*Ig*	*Hg*	*dCg*	*Cg*
Constant	0.05 (0.13)	0.54 (0.95)	-0.01 (-0.13)	-0.68 (-0.63)	0.35 (2.58)**	0.26 (2.56)**	0.01 (1.16)	0.25 (1.71)*
DY_{t-1}	0.57 (2.77)**	0.53 (2.63)**	0.55 (2.50)**	0.53 (2.58)	-0.01 (-0.15)	0.02 (0.68)	0.05 (1.36)	-0.02 (-0.67)
DY_{t-2}	-0.09 (-0.44)	-0.04 (-0.19)	-0.02 (-0.09)	-0.03 (-0.12)	0.06 (0.80)	0.08 (2.17)**	0.02 (0.59)	0.01 (0.23)
Ig_{t-1}	0.40 (0.60)				0.39 (1.70)*			
Ig_{t-2}	-0.49 (-0.66)				0.20 (0.77)			
Hg_{t-1}		-0.25 (-0.27)				0.22 (1.31)		
Hg_{t-2}		-0.47 (-0.51)				0.46 (2.75)**		
dCg_{t-1}			0.01 (0.01)				-0.43 (-1.9)*	
dCg_{t-2}			-0.59 (-0.40)				-0.16 (-0.72)	
Cg_{t-1}				0.55 (0.37)				0.40 (2.4)**
Cg_{t-2}				0.26 (0.17)				0.21 (0.95)
R^2	0.33	0.35	0.33	0.33	0.66	0.79	0.17	0.63
FAR	0.79	1.09	0.06	0.13	4.67*	3.46*	0.39	0.13
χ^2NOR	13.02*	12.76**	14.9*	8.12*	3.17	8.15*	2.26	0.90

Notes: Significance levels as in previous Tables. Variables measured as shares of GDP

5. CONCLUSIONS

The objective of this paper was to investigate the impact of public expenditures on economic growth using a sample of time series data on Tanzania (for 32 years). The theoretical foundation of the study is Barro (1990) building on the model of Ram (1986). The results are fairly consistent if somewhat surprising. On the one hand, we found that increases in productive (investment) expenditure were associated with lower levels of growth, and this result was robust when modelled indirectly through its impact on private consumption. These findings are consistent with Diamond (1989) and Devarajan *et al* (1996). The negative relationship suggests the inefficiency of public investments in Tanzania. Unfavourable macroeconomic conditions may have undermined the productivity of investment. On the other hand, public consumption expenditure tended to be associated with higher levels of private consumption and of growth of real GDP. We found no evidence for any impact of public expenditure on human capital on growth, similar to Devarajan *et al* (1996), and weak evidence that private investment contributes to growth.

As with other empirical studies, it is difficult to draw firm conclusions regarding the impact of government spending on growth. There are obvious problems with data inconsistency, classification of expenditure categories, and omitted factors affecting the growth process. Intuitively, *productivity* of different types of expenditures may be judged both on how they positively enhance private investments and to what extent they impact on private incomes and consumption. Although some expenditure may be regarded as unproductive in theory, in practice they may affect individual incomes hence national income. Thus the widespread recommendation to increase public investment's share of

the budget in developing countries could, in this context, be misleading. It is the productivity, not level, of investment that is clearly important. Furthermore, the pay-off from some expenditure categories to national income may take a long time (we would expect this to apply in particular to expenditures on human capital).

This study is only a first step in addressing the issue for Tanzania, but reveals the difficulty in resolving what is essentially an empirical question. The findings highlight three issues. First, it should not be presumed that public investment is growth-promoting. In Tanzania it has not been, and if there are complementarities between public and private investment, this may also explain why private investment appears to have had such a limited, even negative, impact on growth. Second, and conversely, government consumption may be beneficial for growth, largely because it contributes to private incomes and consumption. This may be a far from ideal situation, as efficient public investment would be expected to have a more beneficial impact on growth than consumption spending. Nevertheless, in countries with low levels of income government consumption spending may have more beneficial effects that commonly acknowledged. Third, and following, concerns about whether aid is allocated to investment may be exaggerated. Aid may have an important role in supporting consumption, although again one would prefer to see more being allocated to expenditures that are productive in the long-run.

.

IMF Working Paper No. 89/45, Washington DC: IMF.

Dunne, P., and E. Nikolaidou (1999), 'Military Expenditure and Economic Growth: A Demand and Supply Model for Greece, 1960-1996', *Discussion Paper Series in Economics*, No. 62. Middlesex University Business School.

Applied Economics, 31, 975-987.

Granger, C. (1990), 'Introduction' in C. Granger (ed), *Modelling Economic Series*, Advanced Texts in Econometrics, Oxford University Press.

Grier, K. and G. Tullock (1989), 'An Empirical Analysis of cross-National Economic *Journal of Monetary Economics*, 24, 259-276.

Grossman, P. (1983), 'Government and Economic Growth. A non-linear Relationship', *Public Choice*, 56, 193-200.

Hansen, H. and F. Tarp (2000), 'Aid Effectiveness Disputed', *Journal of International Development*, 12:3, 375-398.

Hansson, P., and M. Henrekson (1994), 'A New Framework for Testing the Effect of Government Spending on Growth and Productivity', *Public Choice*, 81, 381-401.

Hsieh, E. and K. Lai (1994), 'Government Spending and Economic Growth: The G-7 *Applied Economics* 26, 535-542.

Johansen, S. (1988) 'Statistical Analysis of Cointegration Vectors', *Journal of Economic Dynamics and Control* 12, 231-54

Kilindo, A. (1992), *Inflationary Finance and the Dynamics of Inflation in Tanzania*, Unpublished PhD. Thesis, University of Dar es Salaam.

Kormendi, R. and P. Meguire (1985), 'Macroeconomic Determinants of Growth: Cross country evidence', *Journal of Monetary Economics*, 16, 141-164.

Kneller, R., M. Bleaney and N. Gemmel (1998), "Growth, Public Policy and the Government Budget Constraint: Evidence from OECD Countries", *Discussion Papers in Economics 98/14*, University of Nottingham.

Landau, D. (1983), 'Government Expenditure and Economic Growth: A Cross-Country Study', *Southern Economic Journal*, 49(3), 783-92.

Landau, D. (1986), 'Government and Economic Growth in the Less Developed Countries: An Empirical Study for 1960-1980', *Economic Development and Cultural Change*, 35, 35-75.

Lin, S. (1994), 'Government Spending and Economic Growth', *Applied Economics*, 26, 83-94.

Lindauer, D. and A. Valenchik, (1992), 'Government Spending in Developing Countries: Trends, Causes and Determinants', *World Bank Research Observer*, 7(1) 59-78.

McGillivray, M. and O. Morrissey (2000), 'Aid Fungibility in *Assessing Aid*: Red Herring or True Concern?', *Journal of International Development*, 12:3, 413-428.

Makaranga, A. (1994), *Deficit Financing and Capital Formation in Tanzania*, MA Dissertation (Unpublished) University of Dar es Salaam.

Moshi, H. and A. Kilindo (1994), 'The Impact of Government Policy on Macroeconomic Variables: The case of Private Investment in Tanzania', Paper submitted to the AERC, Nairobi, Kenya, December.

Mpatila, F. (1985), *Impact of Inflation on Domestic Savings: The case of Tanzania*, MA Thesis, University of Dar es Salaam.

Osoro, N.E (1994), "Public Spending, Taxation and Deficit: what is the Tanzanian *AERC Research Paper*, Nairobi, Kenya.

Ram, R. (1986), 'Government Size and Economic Growth: A new Framework and some Empirical Evidence from Cross-section and Time Series Data', *American Economic Review*, 76, 191-203.

Romer, P. (1990), 'Human Capital and Growth: Theory and Evidence', *Carnegie-Rochester Conference Series on Public Policy* 32 (1990) 251-286.

Semboja, J. (1994), 'Trends in Government Recurrent Expenditure and Lessons for the Msambichaka and H. Moshi, *Development Challenges and Strategies for Tanzania, An agenda for the 21st century;* Economic Research Bureau, University of Dar es Salaam.

Singh, B. and B. Sanhi (1984), 'Causality Between Public Expenditures and National *Review of Economics and Statistics* 630-644.

Slemrod, J. (1995), 'What do cross-country studies teach about government involvement, prosperity, and economic growth?', *Brookings Papers on Economic Activity*, 2, 373-431.

Tanninen, H. (1999), 'Income Inequality, Government Expenditures and Growth', *Applied Economics* 31, 1109-1117.

World Bank (1998), *Assessing Aid: What Works, What Doesn't, and Why*, Washington, DC: Oxford University Press for the World Bank.

DATA APPENDIX
PUBLIC EXPENDITURE AND ECONOMIC PERFORMANCE IN TANZANIA

The size and role of the public sector in the economy has changed over time. Until the mid-80's, the public sector was dominant as parastatals were involved in direct production and commercial activities. The government determined prices, allocation of resources and output levels. From 1985, the private sector and market were promoted by economic reforms. The major economic trends and their implications for public expenditure can be categorised into two; policy developments (from socialist command economy to free market economy) and specific non-policy events (such as 1978/9 war, draught and oil crises) most of which led to the growth of government expenditures.

Table A1 shows trends in public expenditures and investment in four periods: pre-crisis (until 1979), crisis (1980-85), reform (1986-92) and post-reform (1993-96). The level of government spending has been on the increase albeit at a slower rate recently. Recurrent expenditure constitutes an increasingly and disproportionately large share of total spending, especially in the reform and post reform period (over 80%) compared to that on development/investment expenditure. Development expenditure is highly foreign (donor) driven, and servicing of foreign debt absorbs an increasing share of recurrent revenue.

In general, expenditure has grown faster than revenue. Trends in the composition of different types of taxes show that the government relied more on international trade taxes to generate revenue during periods when the economy performed relatively better (pre-crisis and post reform period). During crisis periods sales tax was a more reliable source of revenue, perhaps because the crises were associated with import compression (and/or increased tariff avoidance and evasion). In the most recent period, trade taxes are the major source of tax revenue (over 30%). The share of income tax to total tax revenue is almost stable at 28% on average and that of other taxes fluctuates between 10% and 18%. The tax GDP ratio stood at 20% on average in pre-reform periods but declined slightly to about 15% in reform and post reform periods. Total tax revenue is about 60% of total expenditure on average.

Table A1: Trends of Public Expenditures in Tanzania (period annual averages)

Period	Pre-CRISIS (1965 - 1979)	CRISIS (1980 -85)	REFORM (1986 - 92)	Post REFORM* (1993 - 1997)
Total Expenditure (TShs. billions)	5.08	23.06	165.28	207.69
Total expenditure annual growth (%)	19.4	15.1	40.2	-10.9
Recurrent Expenditure (% total *G*).	68.0	74.9	81.6	86.9
Recurrent exp. annual growth (%)	17.8	20.1	39.3	23.5
Public Investment (% total *I*)	40.7	48.0	45.7	24.2
Public Investment annual growth (%)	25.2	11.2	55.0	2.7
Private Investment (% total *I*)	59.3	52.0	54.3	75.8
Private Investment annual growth (%)	14.6	20.4	224.4	19.1

* computed from the *Revised National Accounts of Tanzania (1986/7 - 1996/7)*
Source: Bureau of statistics (relevant years) Economic Surveys; National Accounts of Tanzania (various).

The share of public investment in total investment has been declining from over 45% before reform to about 25% after reforms, consistent with the retreat of government from production/commercial activities. Indicators of economic performance over the same periods are summarised in Table A2. Economic performance had been very impressive in the pre-crisis years of the early 1960s to the late 1970s, before the crisis (1980-85) set in which provided the basis for comprehensive reforms since the mid 1980s. Growth of GDP in the post reform period has not been as impressive as in the reform period mainly on account of unfortunate weather conditions**.** In 1997, GDP growth rate was 3.5%, compared to 4.2% in 1996. From mid 1990s, GDP per capita growth averaged 1.3% compared to negative rates throughout early 1990s.

Table A2: Selected Macroeconomic Performance Indicators (1986 - 1996).

INDICATOR	Pre-crisis (1970-79)	Crisis (1980-85)	Reform (1986-92)	Post-reform (1993-97)
*Real GDP growth rate	5.9	1.1	3.6	2.4
*Total Investment %GDP	20.1	14.3	22.4	21.4
Private Investment %GDP	16.2	9.5	*na*	19.9
*Domestic Saving %GDP	15.2	10.5	*na*	4.8
*Fiscal Deficit %GDP	10.7	11.5	*na*	6.6
*Current Account balance %GDP	0.7	-5.8	-29.6	-23.0
*% annual growth of real Exports	0.1	-10.4	7.8	18.6
*Export/Import ratio	0.8	0.4	0.3	0.5
Total External Debt (US$ bill.)	*na*	*na*	7.2	7.2
Inflation	14.0	31.0	26.5	18.7
RER (1966=100) TShs./$	70.7	45.8	106.3	392.5

* Information for 1986-1997 computed from the *Revised National Accounts of Tanzania*.

na not available.

Sources: ESRF (1998), *Quarterly Economic Reviews*; Bureau of Statistics (1995); Economic Surveys - (various years).

Classifying Government Expenditures

Government expenditures are usually allocated according to economic or functional classifications. The economic classification is the more aggregated form and usually identifies two types: capital (sometimes called investment or development) and recurrent expenditure. Capital/investment expenditure is mainly used for procurement of capital/intermediate goods and related government investment activities. As the name suggests, recurrent expenditure includes spending on recurrent expenses (or government services) that are incurred each year, e.g. wages and salaries, administration, transfers, debt repayments and welfare services.

Functional classifications comprise detailed categorisation of expenditures into different social and economic sectors or functions. Each of the functional categories usually has both a capital and recurrent component, and these are summed together to obtain the aggregate economic classification. Unfortunately, full details for the recurrent/capital decomposition by function were not available for all the years in our sample (especially for education and health category). Consequently, we have to make some assumptions and there is a small element of double counting in some years. A further detailed itemisation of expenditure into *votes* and *sub-votes* is also made but not utilised in our classification. The general structure of expenditure categorisation by functions is shown in Appendix Table A3

Appendix Table B reports the raw data on which our estimations are based. The IMF source for aid data appears to understate the true value of aid relative to GDP, but is used as a consistent source covering the full period. It is evident that private investment was at relatively high levels and exceeded public investment until 1976. From 1977 until about 1986 private investment was quite low, and frequently less than public investment, but recovered throughout the 1990s, when public investment appeared to collapse (perhaps reflecting the effects of adjustment programmes). Government consumption spending followed a different trend, tending to peak in the 1980s, whereas spending on human capital fell from about seven per cent of GDP in the 1970s to about three per cent in the 1980s and early 1990s, falling even further at the end of the sample.

Table A3: Functional Classification of Central Government Expenditure in Tanzania

1. GENERAL PUBLIC SERVICES
    1.1. General Administration
    1.2. External Affairs
    1.3. Public Order and Safety
2. DEFENCE
3. EDUCATION
4. HEALTH
5. SOCIAL SECURITY AND WELFARE SERVICES
6. HOUSING AND COMMUNITY AMENITIES
    6.1. Housing
    6.2. Community Development
    6.3. Sanitary Services
7. OTHER COMMUNITY AND SOCIAL SERVICES
8. ECONOMIC SERVICES
    8.1. General Administration
    8.2. Agriculture, Forestry, Hunting and Fishing
    8.3. Mining, Manufacturing, and Construction
    8.4. Water Supply and Electricity
    8.5. Roads and Bridges
    8.6. Inland and Coastal Waterways
    8.7. Other Transport and Communication
    8.8. Other Economic Services (Tourism)
9. OTHER SERVICES
    9.1. Public Debt
    9.2. Financial and Capital Subscription
    9.3. Pensions and Gratuities

Source: Economic surveys (various issues)

Appendix Table B: Basic data

Year	*Real Y*	*dY*	*Real PC*	*Ip/Y*	*Ig/Y*	*Cg/Y*	*dCg/Y*	*Hg/Y*	*X/Y*	*F/Y*
1965	145153.7	6613.6	873.8	11.3	3.7	11.2	0.2	3.3	22.8	0.2
1966	151767.2	-10555.7	1138.8	12.9	4.2	10.8	-0.7	3.1	25.3	0.2
1967	141211.5	-10414.2	1004.8	14.8	4.7	10.8	-0.5	3.7	22.7	0.1
1968	130797.3	-12640.2	942.5	15.0	5.8	11.2	1.1	3.9	21.8	0.0
1969	118157.1	8367.0	832.7	13.3	7.4	13.5	-0.2	4.9	21.7	0.1
1970	126524.1	2711.7	882.2	20.5	9.0	12.5	0.5	5.3	20.2	0.1
1971	129235.8	7508.3	886.2	24.4	9.0	12.7	2.4	5.5	20.3	0.4
1972	136744.2	8521.9	957.4	19.8	8.6	14.3	1.5	5.6	20.4	2.5
1973	145266.1	3377.0	1028.5	19.2	12.5	14.9	2.9	6.4	19.7	3.0
1974	148643.1	-8856.4	1119.3	20.3	13.9	17.4	-5.3	7.4	17.9	2.4
1975	139786.8	19353.5	1042.0	19.5	11.8	12.9	2.4	6.7	14.5	2.5
1976	159140.3	18740.2	1057.6	14.6	11.9	13.4	0.4	6.6	17.8	2.7
1977	177880.5	149.4	1107.8	9.5	11.5	12.4	6.7	6.9	15.6	2.5
1978	178029.9	-1460.5	1292.9	10.5	14.7	19.1	-0.2	6.7	11.4	3.5
1979	176569.3	-19236.5	1240.7	11.5	14.3	19.0	-2.9	6.5	12.2	2.8
1980	157332.8	-11369.7	1213.5	8.9	11.3	18.1	0.8	6.0	11.3	2.7
1981	145963.1	-11709.0	1041.7	9.9	10.6	20.3	-5.5	6.6	9.8	1.9
1982	134254.1	-6311.8	1006.6	8.3	8.8	16.1	3.5	3.1	7.3	1.8
1983	127942.3	-8752.2	961.2	5.7	8.1	20.6	-1.5	5.2	6.1	1.8
1984	119190.1	-7190.1	858.9	8.3	7.4	20.5	-0.7	3.5	6.9	1.6
1985	112000.0	-183.8	840.4	9.0	5.2	21.1	2.5	3.4	5.5	0.9
1986	111816.2	6689.6	891.4	11.7	10.2	23.6	3.8	3.7	7.5	2.1
1987	118505.8	44133.8	1565.2	20.3	8.5	25.9	4.6	3.6	9.7	7.8
1988	162639.5	36681.8	1842.7	15.5	4.3	22.2	-0.4	3.0	9.2	5.7
1989	199321.4	17185.0	1841.6	10.5	2.9	17.7	2.3	2.7	9.3	4.9
1990	216506.3	44679.1	1694.8	19.7	5.2	18.4	-0.3	3.3	9.0	3.1
1991	261185.4	8633.4	2026.5	16.6	3.0	15.0	2.2	3.0	7.0	3.0
1992	269818.8	1526.6	2020.8	16.3	4.7	16.7	-0.6	3.2	9.0	4.3
1993	271345.4	268.2	1916.7	16.1	4.3	16.0	-2.2	3.5	10.5	6.2
1994	271613.6	3323.8	2282.6	15.4	2.2	13.7	0.5	3.1	11.5	2.5
1995	274937.4	11596.0	2305.5	14.7	1.0	14.1	3.4	1.5	12.9	1.0
1996	286533.4	*na*	2368.1	11.7	3.4	16.8	*na*	1.8	12.1	2.2

Note: *na* = not applicable

Sources: Government of Tanzania (GOT), (various years), *Economic Survey*, Dar es Salaam; Bank of Tanzania (various issues/years), *Quarterly Economic Bulletins*, Dar es Salaam; IMF (1998/9) International Financial Statistics Year Book.

CREDIT PAPERS

98/1 **Norman Gemmell and Mark McGillivray,** "Aid and Tax Instability and the Government Budget Constraint in Developing Countries"

98/2 **Susana Franco-Rodriguez, Mark McGillivray and Oliver Morrissey,** "Aid and the Public Sector in Pakistan: Evidence with Endogenous Aid"

98/3 **Norman Gemmell, Tim Lloyd and Marina Mathew,** "Dynamic Sectoral Linkages and Structural Change in a Developing Economy"

98/4 **Andrew McKay, Oliver Morrissey and Charlotte Vaillant,** "Aggregate Export and Food Crop Supply Response in Tanzania"

98/5 **Louise Grenier, Andrew McKay and Oliver Morrissey,** "Determinants of Exports and Investment of Manufacturing Firms in Tanzania"

98/6 **P.J. Lloyd,** "A Generalisation of the Stolper-Samuelson Theorem with Diversified Households: A Tale of Two Matrices"

98/7 **P.J. Lloyd,** "Globalisation, International Factor Movements and Market

98/8 **Ramesh Durbarry, Norman Gemmell and David Greenaway,** "New Evidence on the Impact of Foreign Aid on Economic Growth"

98/9 **Michael Bleaney and David Greenaway,** "External Disturbances and Macroeconomic Performance in Sub-Saharan Africa"

98/10 **Tim Lloyd, Mark McGillivray, Oliver Morrissey and Robert Osei,** "Investigating the Relationship Between Aid and Trade Flows"

98/11 **A.K.M. Azhar, R.J.R. Eliott and C.R. Milner,** "Analysing Changes in Trade Patterns: A New Geometric Approach"

98/12 **Oliver Morrissey and Nicodemus Rudaheranwa,** "Ugandan Trade Policy and Export Performance in the 1990s"

98/13 **Chris Milner, Oliver Morrissey and Nicodemus Rudaheranwa,** "Protection, Trade Policy and Transport Costs: Effective Taxation of Ugandan Exporters"

99/1 **Ewen Cummins,** "Hey and Orme go to Gara Godo: Household Risk Preferences"

99/2 **Louise Grenier, Andrew McKay and Oliver Morrissey,** "Competition and Business Confidence in Manufacturing Enterprises in Tanzania"

99/3 **Robert Lensink and Oliver Morrissey,** "Uncertainty of Aid Inflows and the Aid-Growth Relationship"

99/4 **Michael Bleaney and David Fielding,** "Exchange Rate Regimes, Inflation and Output Volatility in Developing Countries"

99/5 **Indraneel Dasgupta,** "Women's Employment, Intra-Household Bargaining and Distribution: A Two-Sector Analysis"

99/6 **Robert Lensink and Howard White,** "Is there an Aid Laffer Curve?"

99/7 **David Fielding,** "Income Inequality and Economic Development: A Structural

99/8 **Christophe Muller,** "The Spatial Association of Price Indices and Living

99/9 **Christophe Muller,** "The Measurement of Poverty with Geographical and Intertemporal Price Dispersion"

99/10 **Henrik Hansen and Finn Tarp,** "Aid Effectiveness Disputed"
99/11 **Christophe Muller,** "Censored Quantile Regressions of Poverty in Rwands"
99/12 **Michael Bleaney, Paul Mizen and Lesedi Senatla,** "Portfolio Capital Flows to Emerging Markets"
99/13 **Christophe Muller,** "The Relative Prevalence of Diseases in a Population if Ill

00/1 **Robert Lensink,** "Does Financial Development Mitigate Negative Effects of Policy Uncertainty on Economic Growth?"
00/2 **Oliver Morrissey,** "Investment and Competition Policy in Developing Countries: Implications of and for the WTO"
00/3 **Jo-Ann Crawford and Sam Laird,** "Regional Trade Agreements and the

00/4 **Sam Laird,** "Multilateral Market Access Negotiations in Goods and Services"
00/5 **Sam Laird,** "The WTO Agenda and the Developing Countries"
00/6 **Josaphat P. Kweka and Oliver Morrissey,** "Government Spending and Economic Growth in Tanzania, 1965-1996"

DEPARTMENT OF ECONOMICS DISCUSSION PAPERS

In addition to the CREDIT series of research papers the Department of Economics produces a discussion paper series dealing with more general aspects of economics. Below is a list of recent titles published in this series.

97/1 **David Fielding,** "The Social and Economic Determinants of Voter Behaviour: Evidence from the 1992 General Election in Scotland".

97/2 **David Fielding and Paul Mizen,** "Currency and Banking Crises with Endogenous Government Behavior".

97/3 **Rod Falvey,** "Trade Policy and Growth Theory: Recent Advances".

97/4 **Mark A. Roberts, Karsten Staehr and Torben Tranaes,** "Two-Stage Bargaining and Minimum Wages in a Dual Labour Market".

97/5 **Paul Mizen,** "The Declaration of Independence: Can a Central Bank Credibly Commit Itself to Low Inflation?"

97/6 **Stephen J. Leybourne and Paul Mizen,** "Disinflation and Central Bank Independence in Australia, Canada and New Zealand: Evidence from Smooth Transition Analysis".

97/7 **P. Newbold, A.J. Rayner, N. Kellard and C. Ennew,** "Long-Run Price Behaviour of Wheat and Maize: Trend Stationarity or Difference-Stationarity?"

97/8 **P. Newbold, A.J. Rayner, N. Kellard and C. Ennew,** "Is the Dollar/ECU Exchange A Random Walk?"

97/9 **T.A. Lloyd and A.J. Rayner,** "A Cointegration Analysis of Price Relationships on the World Wheat Market"

97/10 **Steven J. Humphrey,** "A Note on Alternative Explanations of Cyclical Choices"

97/11 **Walter Bossert,** "Welfarism and Information Invariance"

97/12 **Charles Blackorby, Walter Bossert and David Donaldson,** "Rationalizable Solutions to Pure Population Problems"

97/13 **Mark A. Roberts,** "Central and Two-Stage Wage Setting and Minimum Wages in a Model With Imperfect Competition and Multiple Technological Equilibria"

97/14 **Mark A. Roberts,** "The Implausability of Cycles in the Diamond Overlapping Generations Model"

97/15 **Michael Bleaney,** "The Dynamics of Money and Prices Under Alternative Exchange Rate Regimes: An Empirical Investigation"

97/16 **Emmanuel Petrakis and Joanna Poyago-Theotoky,** "Environmental Impact of Technology Policy: R&D Subsidies Versus R&D Cooperation"

97/17 **Charles Blackorby, Walter Bossert and David Donaldson,** "Price-Independent Welfare Prescriptions and Population Size"

97/18 **Prasanta K. Pattanaik and Yongsheng Xu,** "On Diversity and Freedom of Choice"

97/19 **Wulf Gaertner and Yongsheng Xu,** "On the Structure of Choice Under Different External References"

98/1 **David Fielding,** "Social and Economic Determinants of English Voter Choice in the 1997 General Election"

98/2 **Darrin L. Baines, Nicola Cooper and David K. Whynes,** "General Practitioners' Views on Current Changes in the UK Health Service"

98/3 **Prasanta K. Pattanaik and Yongsheng Xu,** "On Ranking Opportunity Sets in Economic Environments"

98/4 **David Fielding and Paul Mizen,** "Panel Data Evidence on the Relationship Between Relative Price Variability and Inflation in Europe"

98/5 **John Creedy and Norman Gemmell,** "The Built-In Flexibility of Taxation: Some Basic Analytics"

98/6 **Walter Bossert,** "Opportunity Sets and the Measurement of Information"

98/7 **Walter Bossert and Hans Peters,** "Multi-Attribute Decision-Making in Individual and Social Choice"

98/8 **Walter Bossert and Hans Peters,** "Minimax Regret and Efficient Bargaining under Uncertainty"

98/9 **Michael F. Bleaney and Stephen J. Leybourne**, "Real Exchange Rate Dynamics under the Current Float: A Re-Examination"

98/10 **Norman Gemmell, Oliver Morrissey and Abuzer Pinar,** "Taxation, Fiscal Illusion and the Demand for Government Expenditures in the UK: A Time-Series Analysis"

98/11 **Matt Ayres,** "Extensive Games of Imperfect Recall and Mind Perfection"

98/12 **Walter Bossert, Prasanta K. Pattanaik and Yongsheng Xu,** "Choice Under Complete Uncertainty: Axiomatic Characterizations of Some Decision Rules"

98/13 **T. A. Lloyd, C. W. Morgan and A. J. Rayner,** "Policy Intervention and Supply Response: the Potato Marketing Board in Retrospect"

98/14 **Richard Kneller, Michael Bleaney and Norman Gemmell,** "Growth, Public Policy and the Government Budget Constraint: Evidence from OECD Countries"

98/15 **Charles Blackorby, Walter Bossert and David Donaldson,** "The Value of Limited Altruism"

98/16 **Steven J. Humphrey,** "The Common Consequence Effect: Testing a Unified Explanation of Recent Mixed Evidence"

98/17 **Steven J. Humphrey,** "Non-Transitive Choice: Event-Splitting Effects or

98/18 **Richard Disney and Amanda Gosling,** "Does It Pay to Work in the Public

98/19 **Norman Gemmell, Oliver Morrissey and Abuzer Pinar,** "Fiscal Illusion and the Demand for Local Government Expenditures in England and Wales"

98/20 **Richard Disney,** "Crises in Public Pension Programmes in OECD: What Are the Reform Options?"

98/21 **Gwendolyn C. Morrison,** "The Endowment Effect and Expected Utility"

98/22 **G.C. Morrisson, A. Neilson and M. Malek,** "Improving the Sensitivity of the Time Trade-Off Method: Results of an Experiment Using Chained TTO Questions"

99/1 **Indraneel Dasgupta,** "Stochastic Production and the Law of Supply"

99/2 **Walter Bossert,** "Intersection Quasi-Orderings: An Alternative Proof"

99/3 **Charles Blackorby, Walter Bossert and David Donaldson,** "Rationalizable Variable-Population Choice Functions"

99/17 **Indraneel Dasgupta, Subodh Kumar and Prasanta K. Pattanaik,** "Consistent Choice and Falsifiability of the Maximization Hypothesis"

99/18 **David Fielding and Paul Mizen,** "Relative Price Variability and Inflation in

99/19 **Emmanuel Petrakis and Joanna Poyago-Theotoky,** "Technology Policy in an Oligopoly with Spillovers and Pollution"

99/20 **Indraneel Dasgupta,** "Wage Subsidy, Cash Transfer and Individual Welfare in a Cournot Model of the Household"

99/21 **Walter Bossert and Hans Peters,** "Efficient Solutions to Bargaining Problems with Uncertain Disagreement Points"

99/22 **Yongsheng Xu,** "Measuring the Standard of Living – An Axiomatic

99/23 **Yongsheng Xu,** "No-Envy and Equality of Economic Opportunity"

99/24 **M. Conyon, S. Girma, S. Thompson and P. Wright,** "The Impact of Mergers and Acquisitions on Profits and Employee Remuneration in the United Kingdom"

99/25 **Robert Breunig and Indraneel Dasgupta,** "Towards an Explanation of the Cash-Out Puzzle in the US Food Stamps Program"

99/26 **John Creedy and Norman Gemmell,** "The Built-In Flexibility of Consumption Taxes"

99/37 **Tae-Hwan Kim, Stephen J. Leybourne and Paul Newbold,** "Spurious Rejections by Perron Tests in the Presence of a Misplaced or Second Break Under the Null"

00/1 **Tae-Hwan Kim and Christophe Muller,** "Two-Stage Quantile Regression"

00/2 **Spiros Bougheas, Panicos O. Demetrides and Edgar L.W. Morgenroth,** "International Aspects of Public Infrastructure Investment"

00/3 **Michael Bleaney,** "Inflation as Taxation: Theory and Evidence"

Members of the Centre

Director

Oliver Morrissey - aid policy, trade and agriculture

Research Fellows (Internal)

Adam Blake – CGE models of low-income countries
Mike Bleaney - growth, international macroeconomics
Indraneel Dasgupta – development theory
Norman Gemmell – growth and public sector issues
Ken Ingersent - agricultural trade
Tim Lloyd – agricultural commodity markets
Andrew McKay - poverty, peasant households, agriculture
Chris Milner - trade and development
Wyn Morgan - futures markets, commodity markets
Christophe Muller – poverty, household panel econometrics
Tony Rayner - agricultural policy and trade

Research Fellows (External)

V.N. Balasubramanyam (*University of Lancaster*) – foreign direct investment and multinationals
David Fielding *(Leicester University)* - investment, monetary and fiscal policy
Göte Hansson (*Lund University*) – trade, Ethiopian development
Robert Lensink *(University of Groningen)* – aid, investment, macroeconomics
Scott McDonald *(Sheffield University)* – CGE modelling, agriculture
Mark McGillivray *(RMIT University)* - aid allocation, human development
Jay Menon *(ADB, Manila)* - trade and exchange rates
Doug Nelson *(Tulane University)* - political economy of trade
David Sapsford (*University of Lancaster*) - commodity prices
Finn Tarp *(University of Copenhagen)* – aid, CGE modelling
Howard White *(IDS)* - aid, poverty