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# **The impact of economic policy shocks on the outcomes of the fiscal adjustment policies in Tanzania**

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## **Abstract**

*This paper examines the outcomes of the fiscal adjustment policies adopted, while the country was experiencing economic shocks between in different occasions in 1972-2000 period. Econometric models are used to determine the impact of economic shocks on gdp growth, public spending and on the fiscal positions. The estimation results revealed that economic policy shocks resulted in structural changes in output growth and public spending instability in Tanzania. Specifically, the policy shocks led to changes in macroeconomic conditions, which restricted effectiveness of fiscal adjustment policies in improving budget position. The results suggest that fiscal adjustment policies should not be undertaken when a number of economic policy changes are envisaged in an economy.*

## **1.0 Introduction**

Between 1972 and 2000, macroeconomic conditions in Tanzania were characterised by Persistent and large fiscal and current account deficit, as well as low output growth. In order to overcome the problem the government had in different occasions adopted stabilization policies. Although in the earlier adjustments epochs, the government acted alone, starting from 1986, the World Bank and IMF supported Tanzania in implementing stabilization policies as well as economic reforms. Fiscal adjustment policies were the main tools for achieving stabilization objectives. However, economic policy reforms and fiscal adjustment policies did not result in the improvement of the fiscal position in various occasions in the 1972-2000 period.

The experience of Tanzania in implementing fiscal adjustment policies contrasts that of other countries. Fiscal adjustment policies have been linked with output growth and the improvement of the fiscal balance in some developed countries (McDermott and Wescott 1996; Giavazzi and Pagano 1990a, 1990b, 1996; Alesina and Ardagna, 1995, 1998; Alesina and Perotti, 1995, 1997). However, in developing and transition economies, economic reforms together with fiscal adjustment policies have been associated with an initial temporal output decline followed by steady output growth, leading to improved fiscal balance (Pirtillä, 2001; Subramanian, 1997; Kouassy and Bohoun, 1994).

The aim of this paper is to examine the impact of economic policy shocks on the outcomes of fiscal adjustment policies in correcting the budget deficit in Tanzania. In contrast to previous studies on Tanzania that focused on specific fiscal adjustment periods, this study analyses the impact of adjustment policies in all adjustment episodes in the 1972 -2000 period. Specifically, the analysis focuses on examining the behaviour of public spending and output growth and their implications on fiscal positions in different adjustment periods using econometric methods.

An understanding of the outcomes of fiscal adjustments policies on the deficit contributes to the debates on the stabilization policies in developing countries, particularly in Sub Saharan Africa. The Tanzanian case is a typical example of Sub Saharan African economy.

The paper is organised as follows, after this introduction, Section Two describes exogenous events and economic policy changes in the 1972-2000 period in Tanzania. Section Three provides the review of literature on output growth and public spending as well as fiscal adjustment policies, followed by a Section Four on Framework of analysis and methods. Section Five provides econometric estimation results and discussion. The last section is conclusion.

## **2.0 Exogenous shocks and economic policy in Tanzania in the 1972-2000 period**

Tanzania adopted various economic policies in the 1977-2000 period. Among the policies adopted were fiscal adjustment policies. The policies were implemented while the economy was either experiencing exogenous economic or policy shocks or was in transition to market economy. The transition to market economy involved the adoption of stabilisation and structural adjustment policies. These had an impact on the output growth, public spending and tax revenue.

In 1972-73, Tanzania experienced the first world oil price shock. Furthermore, in the 1977-78 period, Tanzania encountered exogenous economic shock characterised by a temporary increase in the world market prices of coffee, cotton, tea, cashew nut and sisal. The increase resulted in a sudden increase in foreign exchange earnings for Tanzania. The country went to war with Uganda in the 1978-82 period. In the 1979-82 period, the country was hit by the second oil crisis followed by a drought in the 1983-84 period. Drought affected the production of exportable agricultural commodities and food crops leading to food and foreign exchange shortage.

The exogenous events had an impact on the tax base and public spending as well as fiscal position. In particular, while the oil shock and drought is associated with low tax revenue generation, a sudden rise in foreign exchange earnings is linked with an increase in tax revenue. An increase in foreign exchange earnings provided an opportunity for increased imports and the rise in revenue from import duties and sales taxes. It also resulted in an increase in manufacturing output because a large number of industries depend on imported inputs in Tanzania. The scarcity of foreign exchange earnings resulted in low capacity utilization in a number of manufacturing firms Mushi (1998). Low capacity utilization was also associated with firms' losses, low tax revenue and fiscal deficit.

The incidences of drought and war were associated with an increase in public spending as well in Tanzania. Drought necessitated the government to import food and distribute it in different areas hit by famine in the 1983-84 period. In addition, participation in the Ugandan war meant that the Tanzanian government spent large sums of money on purchasing the war hardware and keeping the army in Uganda in the 1978-82 period.

Apart from exogenous events, policy changes also had an impact on public spending and output growth in Tanzania. The country adopted fiscal adjustment policies in the 1980-82 and the 1983-85 periods. The policies adopted in the 1980-82 period, focused in increasing tax revenue and reducing public spending. However, in the 1983-85 period, the policies emphasised increase in taxes, cut in public spending and the use of market mechanism in allocating resources in the economy. Nonetheless, the policies had little impact on correcting the fiscal deficit.

The policy reforms that marked the change of the economic regime from controlled socialist economy to liberal market economy were introduced in 1986. The policy reforms aimed at removing distortions in the allocation of resources and inefficiencies in the economy. They were designed to enhance output growth through the market mechanism and increased private sector involvement in economic activities. The reforms also resulted in the development of markets for products and resources.

The government also introduced the banking and financial institution reforms in 1992. The reforms aimed to enhance efficiency in mobilisation and allocation of resources. Other policy changes included the introduction of market determined exchange rates in 1994. Reforms since 1992 also focused on reducing the government size by retrenching redundant staff in civil services including commercialising and privatising public enterprises. The reforms had an impact on the level of economic activities, tax revenue generation and fiscal deficit. This was revealed by persistent fiscal deficit.

Fiscal adjustment policies were meant to overcome government deficit by cutting public spending and increasing tax revenue. In addition, the government adopted tax policy reforms and adopted multiparty democracy in 1992. Multiparty democracy not only enhanced democracy but also allowed individuals to participate in economic activities, in which they had not engaged previously. The activities include small scale mining activities and petty businesses.

The government also adopted fixed fiscal policy rule in the 1996-2000 period, as an attempt to correct budget deficit Mbele (2001). The new policy measures involved a budget system in which public spending matched government revenue on monthly basis. This was facilitated by the introduction of cash budget management system and debt management policies. The outcome of such policy measures was a reduction in government spending in the 1996-2000 period.

Overall exogenous events and economic policy regime changes had an influence on output growth, public spending and tax revenue. In particular, despite the entire efforts fiscal deficit persisted. In this respect, economic shocks are deemed to have influenced the outcome of fiscal adjustment policies in correcting budget deficit in Tanzania.

### **3.0 Literature review on stability of output growth, public spending and fiscal adjustment policies**

This section reviews the literature on the impact of exogenous events and economic policy shocks on output growth and public spending and their implications on the fiscal position. It also reviews the literature on the stability of output growth and econometric methods used in testing structural parameter changes.

#### **3.1 Output growth and public spending**

Normally, output growth level provides governments with an opportunity to determine public spending levels consistent with macroeconomic condition of a particular country. The experience of Latin American and OECD countries as well as Tanzania highlights difficulties in overcoming the fiscal deficit because of low or gdp growth fluctuation (Treasury, 2002; Gavin and Perotti, 1997; Osoro, 1997). In particular, fluctuating gdp growth results in unrealistic fiscal policy targets because the governments cannot foresee the implications of output volatility on tax revenue and public spending.

Osoro (1997) identified that low gdp growth affected the public spending level in Tanzania. He argued that low output was associated with the fluctuating government revenue and fiscal deficit. Thus, output volatility affects fiscal positions. The negative effect of output fluctuations suggests that macroeconomic stability is important for improving fiscal position.

The finding is similar to that from the study in Latin America Gavin and Perotti (1997). In the study, it was found that low output growth was associated with the pro-cyclical policies the governments had pursued. Governments pursued such policies because they faced liquidity constraints Gavin and Perotti (1997). Unreliable economic policies pursued by governments were considered inappropriate by the institutions in the world financial markets. This restricted governments' accessibility to funds and led to the financial constraints and macroeconomic instability.

Furthermore, Pirtillä (2001) and Subramanian (1997) highlight that stabilization resulted in output decline and unemployment in countries pursuing policy reforms. Specifically, policy reforms are associated with the closure of public enterprises and reallocation of investments that led to a fall in output growth and unemployment. Tanzania has also experienced the closure of loss making public enterprises and privatisation of some of them. In addition, a number of privatised firms did not start

production because of obsolete technology or lack of capital after privatization Guardian (2004). The privatisation process was also slow in the 1992-2000 period.

Experience of transition economies as well as Egypt which adopted fiscal adjustment policies, shows that the governments that formulated credible policies, had overcome fiscal deficit in the short period. Such a situation averted the need for continuous tight fiscal policy, since the decline in output lasted for a short period only and thereafter it increased (Fischer and Sahay, 2000; Subramanian, 1997). In contrast in Tanzania, the government was not able to formulate credible fiscal adjustment policies, which built confidence among the domestic and foreign investors.

Economic reforms also have had an effect on fiscal balance. During the fiscal reforms, government size is reduced rapidly, resulting in a fall in tax revenue faster than expenditure Pirtillä (2001). The reason is that policy changes affects output growth, the tax base and the consequence is fiscal deficit.

As pointed out earlier, stable output growth facilitates the determination of medium term public spending and fiscal balance. In particular, economic shocks adversely affect the outcomes of fiscal adjustment policies, when they results in output volatility. Usually, following an economic shock, improvement in fiscal balance depends on the propagation mechanism that leads to output stability (Kose and Riezman, 1999; Simon, 2001). Different research studies have identified varying reasons for output stability after an economic shock.

Debs (2001), McConnel and Quiros (2000) and Simon (2001) revealed that after economic shock, the gdp fluctuations declined due to the narrowing of the mean growth rate. Such a situation led to output stability. A number of studies have also identified factors associated with output growth stability after experiencing economic shocks. For example, Kose and Riezman (1999) and Simon (2001) pointed out that output stability experienced in different countries was associated with domestic economic policy changes that protected the economy against external demand and productivity shocks. Such conditions did not exist in Tanzania when the adjustment policies were being formulated.

In addition, it has been observed that changes in monetary policy that targeted the inflation rate and microeconomic reforms insulated the economy from temporary shocks, leading to output stability. Targeting the inflation rate resulted in the control and stability of the price level leading to output smoothing. It also led to a stable aggregate demand that contributed to increased economic growth Debs (2001).

Inflation targeting was also an economic policy objective for Tanzania during fiscal adjustment episodes Wangwe, Semboja and Tibandibage (1998). However, inflation volatility continued for some years after policy reforms. Only in the 1996-2000 period, inflation declined and stabilized at a low level. This provided a condition for hedging the economy against demand shocks.

Microeconomic policies also contribute to output stabilisation, during the episodes of economic shocks. In this regard, Simon (2001) argues that long-term supply factors are important in stabilizing output. Specifically, the author associates output stability with the change in the structure of the economy from manufacturing to services at the level of the firms. Another factor is an increase in skilled manpower and employment opportunities Debs (2001).

In Tanzania, like most developing countries, neither the manufacturing nor services sector constitute a large part of national output. Employment opportunities in the manufacturing sector are limited and the informal economy provides large employment opportunities. For example, while in the 1977-85 period informal economy was 17 percent of official gdp, it was 40 percent of gdp in the 1986-2000 period.

Furthermore, the largest part of the labour force is unskilled and engages in agricultural activities. In addition, in a number of sectors the productivity is low (World Bank 1996; Mjema and Shitudu 1995). In this regard, the economy is poorly insulated from short and long-term supply shocks. But, as highlighted above attainment of a low inflation rate in recent years provides an opportunity for stabilizing output and limiting the negative effect of demand shocks.

Trade and financial market integration also affect consumption, output and investment activities in different countries. They also affect the level and stability of output growth, following economic shocks. However, trade and financial market integration have different impacts on macroeconomic volatility in industrial and developing countries. Kose, Prasad and Terrones (2003) found that trade and financial market integration was associated with low consumption volatility in industrialised countries. In developing countries, volatility of output was higher in more financially integrated countries than in less financially integrated economies.

In developing countries, increased financial integration is associated with consumption volatility but only to certain levels. The argument that financial market integration improves risk sharing and reduces consumption volatility is not valid for most African countries. Although consumption and income volatility are associated with financial market openness, in most African countries including Tanzania, the large inflow and outflow of capital is a recent phenomenon. It is therefore expected to have a minimal effect on consumption and income volatility.

The study by Kose and Reizman (1999) revealed that trade and financial market shocks affected output and investment in Africa as well. The authors also found that trade and financial shocks account for 45 percent of output fluctuations and 80 percent of investment fluctuations in Africa. World interest rate shocks have no significant effect on output in Africa. Specifically, the study identified that manufacturing output is more volatile than total output in Africa.

However, in Tanzania, agricultural production constitutes the largest part of official gdp that is about 44 percent. In this regard, output fluctuation is largely caused by vagaries of weather rather than trade and financial shocks (Lipumba and Ndulu 1989; Kouassy and Bohoun 1994). Nonetheless, the variation in the production of exportable agricultural commodities leads to the fluctuations in the supply of inputs and contribute to manufacturing output volatility in Tanzania. Overall, economic policy shocks and trade and financial integration may have had impact on the outcome of the efforts to correct fiscal deficit in Tanzania, since they affect the tax base, that is, output growth, though to a limited extent.

### **3.2 Structural breaks and break dates in output growth and public spending**

Apart from the insights into the effect of economic shock on output stability, determination of a break date for structural changes is an important aspect for policy analysis. It is also necessary for examining the impact of the economic policies changes on the fiscal balance in Tanzania.

Scholars have not yet reached consensus on methods to determine structural breaks Hansen (2001). As a result, some studies have focused either on structural change in a specific period after an economic event such as post stabilization period or post business cycle in order to avoid controversy on the determination of the break date in the analysis (Debs 2001; Simon 2001).

Furthermore, authors in different studies have used varied approaches to determine stability and break dates in output trends. For example, Simon (2001) used business cycle periods to study stability of output in Australia. Debs (2001) and Watson (1994) used quarter-to-quarter fluctuation in gdp to analyse stability in the US and Canada respectively. McConnel and Quiros (2000) analyse fluctuations in output on a year-to-year basis.

Although determination of the period is dictated by data and the specific aim of the study, year-to-year fluctuations are relevant for ascertaining the impact of policy changes in a particular country. McConnel and Quiros (2000) argue in favour of year-to-year fluctuations. The reason is that the process governing output fluctuation is an important element in macroeconomic research as well as policy. For the analysis of stability of output in Tanzania, year to year fluctuations are significant. The reason is that policy makers such as the IMF and the World Bank assess the economic performance of the countries on yearly basis.

Structural break and break dates have implications for public spending and fiscal position as well. Firstly, the insight into structural break and break-date provide the opportunity to control public spending as well as to project medium term spending. Secondly, structural breaks highlight the process governing output stabilization and their effects on the fiscal position. The reason is that stabilization that is achieved by reducing the mean growth rate of an output gap during an expansion will affect the output level and the tax base.

The determination of the structural break in the output trend in Tanzania provides an opportunity to analyse the effect of fiscal adjustment policies on budget deficit. The analysis also provides insights into the prospects of understanding the output growth pattern. In this regard, fiscal imbalance is better analysed through understanding the process involved in year to year fluctuations of output and the determination of the break date in the stabilization of output growth.

In econometric analysis, the stability of the parameters of estimated models is important. Parameter stability allows forecasting and analysing the impact of policy changes in an economy as well as the matching of data to economic theories. Parameter instability arises from breaks in the deterministic trend in the data series and is tested by using different econometric methods. The literature on econometrics does not provide a definite definition of structural stability. However, in most studies structural stability refers to changes in regression parameters Maddala and Kim (1998). In this study the structural break also refers to the changes in the regression coefficients.

One of the problems in testing for structural change is the determination of the structural break periods. While in some cases break-points can be determined a priori, in other cases such identification is not possible. This has led to the discussion on whether structural breaks in deterministic trends, which are associated with parameter instability, are endogenously or exogenously determined. As part of the attempt to deal with problem of determining the period of structural changes in the time series data, methods that do not require prior knowledge of the break-point periods are used. Among the methods used are those that are based on the recursive residuals. They include cusum, cusumq and recursive chow tests methods.

Hansen (2001) points out that the best method for testing parameter stability is the one that focuses on a cumulative series of a full sample parameter and is constructed using a full sample estimate. He further highlights that optimal methods do not require a sample split. The methods mentioned above do not require the splitting of the sample. None the less, in this study recursive chow test methods are used.

### **3.3 Factors contributing to the success or failure of fiscal adjustment policies**

Research studies on fiscal adjustment attribute failure of fiscal adjustment policies to non-policy and policy factors. IMF, (1999); Giavazzi and Pagano, (1990a); Kouassy and Bohoun, (1994) and Purfield, (2003) attributed the failure of fiscal adjustment policies to economic shock or political economy factors. Búilir and Moon (2004) relate failure of fiscal adjustment polices to cyclical factors and general macroeconomic stance.

Macroeconomic policies or changes in macroeconomic conditions may enhance or neutralise the effect of tax changes to increase tax revenue in the short-term. In particular, macroeconomic

condition determines the effect of tax policy changes on generating tax revenue and fiscal balance (Ayoki, Obwona and Ogwapus, 2005; Osoro, 1994; Tanzi, 1989). Zikky and Mansouri (2003) also identified that exogenous events or policy shocks caused fiscal problems in developing countries with weak economic structure and inappropriate policies.

Furthermore, output growth is identified as an important condition for successful fiscal adjustment, as it is expected to expand the tax base and increase fiscal revenue. McDermott and Wescott (1996) and Kouassy and Bohoun (1994) also support the view that output growth is important for correcting fiscal imbalances. In their study on the effect of business cycles in correcting the fiscal deficit, McDermott and Wescott (1996) observed that short term output growth influenced the success of fiscal adjustment policies. The reason is that tax changes are associated with an increase in government revenue if it is elastic.

Following from the above discussions, experience from a number of developing countries suggests that economic policy changes that promote output growth provide an opportunity to correct the fiscal deficit and attainment of macroeconomic stability in the short and long-term.

### **3.4 The review of the some previous studies on fiscal adjustment policies in Tanzania**

Most of the studies on fiscal adjustment policies in Tanzania are part of the analysis of stabilization and structural adjustment programme in the country. A number of scholars have examined fiscal adjustment policies in various periods, that is, 1973-77 or the 1980-1985 or the 1986-2000 (Aiko, 2003; Gibbon and Raikes, 1996; Green, Rwegasira and Van Arkadie, 1982; Ndulu, 1987; Singh, 1986).

In their study, Green, Rwegasira and Van Arkadie (1982) revealed that between 1975 and 1977 fiscal deficit declined as a result of the adopted economic policies. However, low priority in public spending in key areas such as infrastructure and the expansion of exports restricted the impact of adjustment policies in enhancing output growth and increasing tax revenue.

Engberg-Pedersen et. al. (1996) and Ndulu (1987) examined macroeconomic policies under structural adjustment programme in the 1982-85 period. The analysis focused on among other issues relationship between resources gaps and macroeconomic stability. Ndulu (1987) observed a modest decline in the fiscal deficit in the 1982-85 period. The deficit declined because public spending growth was lower than that of the inflation rate. Thus, government spending had exerted little pressure on the economy.

Furthermore, Ndulu (1987) argued that given the structural weakness of the economy, Tanzania needed policies that focused on medium or long-term issues that enhance output growth and macroeconomic stability. It was necessary that the adjustment policies focus on restructuring the economy so as to promote the high level of output growth and reduction of fiscal deficit. Furthermore, in the 1986-89 and 1990-94 periods, fiscal adjustment policies did not result in the successful correction of the fiscal deficit. The reasons were the low output growth and little tax revenue generation.

A number of scholars have also examined the implementation of fiscal adjustment policies in the 1986-2000 period in Tanzania. (Aiko, 2003; World Bank, 1996, 2001; Gibbons and Raikes, 1996 and Wangwe, 1991) analysed the effect of adjustment policies on correcting the fiscal deficit in the 1986-1989 and 1986-1994 periods respectively. Notwithstanding various studies undertaken to examine the impact of fiscal adjustment policies on correcting budget deficit, Rhodes and Gibbons (1990), in Aiko (2003) pointed out that structural adjustment policies acted as exogenous shocks and complicated fiscal management in Tanzania. They further argued that adjustment policies overlooked the relationship between fiscal deficit and other macroeconomic variables and structural measures underway or planned.

In contrast to the previous studies on fiscal adjustment policies in a particular episode, this study seeks to examine whether economic policy shocks had restricted improvement of the fiscal balance in the 1972-2000 period in Tanzania. In particular, this study seeks to examine the trends in gdp growth and public spending and their impact on the fiscal positions in different fiscal adjustments epochs using econometric methods.

#### 4.0 Framework of analysis and methods

This section highlights the framework of analysis and methods used in examining the impact of economic policy shocks on fiscal balance in the 1972-2000 period in Tanzania. In order to examine the impact of economic policy shocks on public spending and gdp growth, the generation process of the time series data for the two variables is examined Hansen (1991, 2001). The analysis of data generation process enables the determination of the structural changes in them and the discerning of the implications on the fiscal balance. Specifically, the impact of economic policy shocks is expected to be revealed by parameter instability.

The data generation process is specified by a model that is also used to test parameter stability. One type of models used to specify the data generation process and testing structural changes in the series is a first order autoregressive ar (1) model (Debs 2001; Hansen 1991, 2001). The model represents the data and parameter generation process, features necessary for a stability test. The assumption is that the data series generated by the model match the alternative explanation of “policy shock effect” and “random effect” on the variables.

The first order autoregressive models have been used to specify the process of the gdp growth and to test for parameter stability in a number of studies (Debs, 2001; McConnell and Quiros 1997, 2000). The findings revealed that the ar(1) model represented the growth of gdp and was optimal. The ar(1) shall also be used to specify public spending data series generation process. The model is presented as:

$$\Delta y_t = \alpha_0 + \gamma T + \alpha_1 y_{t-1} + e_t \quad (1)$$

Where,  $\Delta y_t$  is a change in a specific variable analysed, “t” is a trend variable,  $y_{t-1}$  is a lagged variable and  $e_t$  is the error term.  $\alpha_0$ ,  $\gamma$ , and  $\alpha_1$  are parameters to be estimated.

Furthermore, eclectic models explaining gdp growth and fiscal deficit in Tanzania are also estimated. The models are used to determine the impact of policy changes on output growth and fiscal positions. They are also used to confirm the results from estimating ar (I) models for gdp and public spending. The models are presented in sections 4.2 and 5.

#### 4.1 Chow test methods

As pointed out in section 3.2 there is a number of techniques that can be used to determine parameter stability. However in this study chow test methods are used. The methods are adopted because, they are based on the recursive residuals and are able to generate robust results. In addition, it does not require prior knowledge of the break-point periods.

Three chow test techniques are used in this study. They are the one-step chow test, break-point chow test and predictive chow test. These are briefly described below.

### 4.1.1 One-step chow test

The one-step chow test indicates the presence of outliers. The test determines the sequence of one period ahead prediction from the recursive estimation period for a sample period (s) and total sample period (t). The underlying assumption of the test statistic is that the dependent variables are approximately normally distributed. The statistic is calculated as:  $(rss - rss_{t-1} (t-k-1)/rss_{t-1}/t-s-1)$

Where  $rss$  is residual (error) sum of squares, “t” is sample period and “k” is a number of independent variables. The break-point and the predictive failure chow tests determine the structural breaks and provide formal statistical criteria to distinguish outliers from more fundamental structural change.

### 4.1.2 Break-point chow test

The break-point chow test is another method used to determine a structural break in parameters. The test involves estimating the model over a whole sample period. This is followed by an assessment of the structural breaks in the parameters, as the sample is recursively reduced. The break-point chow test is calculated using the formula:

$$(rss - rss_{t-1} (t-k-1)/rss_{t-1}/t-s-1)$$

### 4.1.3 Predictive failure chow test

The predictive failure chow test also assesses the structural break in parameters. The test is done by first estimating a model for initial sample period observations. The estimated model is then used to test for structural changes in parameters as the number of observation is progressively increased. This is followed by the f-test calculation. The model tests the null hypothesis that the estimated model and forecast will explain or predict the full sample. The test assesses the unbiasedness of prediction for second regime observations ( $n_2$ ) from the regression estimate from the first regime observations ( $n_1$ ) (Calza, Gartner and Sousa 2001; Gamber and Fredrick 2005). The chow tests are used to test parameter stability on stationary variables Maddala and Kim (1998).

## 4.2 Output growth and fiscal deficit models

As previously highlighted, eclectic models for gdp growth and public spending are estimated to confirm the findings on parameter stability tests and their implications on fiscal performance in Tanzania. This is done in order to assess the impact of the economic policy shocks on the outcomes of fiscal adjustment policies on budget balance.

### *Output growth models*

The output growth model is used to further ascertain the result on structural parameter stability is specified as follows:

$$gdpt = \beta_0 + \beta_1 gdp_{t-1} + \beta_2 gvspt_{-1} + \beta_3 lml_{t-1} + \beta_4 tt + \beta_5 du + et \quad (2)$$

The output equation is specified as a function of lagged variables on gdp, public spending (gvsp) and money supply (lml). Institutional changes are captured by a trend variable (t). Furthermore, a dummy variable (du) is introduced to determine the impact of exogenous events and policy changes on output growth and  $et$  is the error term. The dummy variable takes the value of one for all the years in which structural breaks in gdp growth were observed. In all other years it is zero.  $\beta_0$ ,  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$ , and  $\beta_5$  are parameters to be estimated. The eclectic model is used because the study investigates the effect of economic policy shocks on output growth and its implications for macroeconomic stability in Tanzania.

The lagged output variable is expected to be positively related to gdp growth. Public spending is also presumed to be positively related to gdp growth. This is through the direct impact of public spending on the aggregate demand as well as indirectly through its effect on the productivity of capital. Money supply is also expected to positively influence output growth in Tanzania.

### *Fiscal deficit model*

The fiscal deficit model is presented as equation (3). The variables used in the model reflect the objectives of the IMF supported adjustment programme in Tanzania, which included reduction of the fiscal deficit and inflation rate as well as stimulation of output growth.

$$fdft = \beta_0 + \beta_1 fdf_{t-1} + \beta_2 gdpt_{-1} + \beta_3 infl_{t-1} + \beta_4 debt_{t-1} + \beta_5 du + \beta_6 t + \epsilon_t \quad (3)$$

Fiscal deficit is expressed as a function of a previous year deficit, (fdf), lagged output growth (gdp), inflation rate (infl) and public debt (debt), trend variable (t) that captures the institutional changes. Dummy (du) variable is also added to capture the effect of the exogenous events and policy changes on the fiscal deficit in the 1977-2000 period in Tanzania. As highlighted before, the dummy variable is one for all the years in which structural breaks in gdp growth is observed. In all other years it is zero. The coefficients  $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  are parameters to be estimated.

The correction of the fiscal deficit as a result of policy changes depends on the level of the fiscal deficit prior to adjustment. It is expected that the high level of the fiscal deficit will be associated with an improvement in the fiscal balance. Furthermore, output growth is likely to positively influence the correction of the fiscal balance. The high level of output growth is expected to result in the higher level of tax revenue generation.

A high inflation rate is expected to negatively affect the fiscal balance because of the Oliver-Tanzi effect on nominal tax revenue Agénor and Montiel (1996). As a result of the collection lag, nominal tax revenue is fixed in the short-term, leading to reduced tax revenue due to high inflation levels. Public debt is also another variable that influence fiscal balance. It is expected that high level of fiscal deficit will be associated with an improvement in the fiscal deficit.

### **4.3 Unit root test**

Time series data are used in this study. Economic time series variables are random and thus may not be perfectly predicted. The variables are generated by either a stochastic or random process. The time series may also be stationary or non-stationary. The economic variables that are non-stationary are characterised by a changes in the variance that becomes infinite over a time. In addition, the series wander without reverting to the fixed mean. These characteristics result in spurious relations between variables in econometric analysis involving time series variables Charemza and Deadman (1997). In addition, testing of parameters using standard tables may lead to wrongly rejecting the null hypothesis.

A unit root test is one of the methods used to test the stationary of time series variables. In order to perform the unit root test, a random process generating a particular time series is specified as a first order autoregressive model (ar (1)). The model is specified as:

$$\Delta y_t = \alpha_1 y_{t-1} + \epsilon_t \quad (4)$$

where  $\Delta y_t = y_t - y_{t-1}$  and  $\alpha_1 = (\beta_1 - 1)$

In this respect, the unit root test will involve testing:

the null hypothesis  $H_0: \beta_1 = 1$

and the alternative hypothesis  $H_1: \beta_1 < 1$

#### **4.4 Data sources and limitations**

In the analysis of the impact of exogenous event and policy changes on correcting the fiscal deficit, this study uses time series macroeconomic data for the period of 1970 – 2000. This period is chosen because it captures the adoption of fiscal adjustment policies in different policy regimes and during various exogenous events. Specific data required were: total public spending, gross domestic product (gdp) and total tax revenue. In addition, the analysis required data on the domestic inflation rate, the gdp deflator and the total population in Tanzania.

The main data sources were the Bank of Tanzania, Economic and Operation Reports Bank of Tanzania (1982, 1986, 1990, 1997, 2002) and Economic Surveys published by the Government of United Republic of Tanzania (1997, 1999, 2000a). Other data sources included the International Monetary Fund, Government Finance Statistics Yearbooks (IMF 1980, 1990 and International Finance Statistics IMF 1991, 1992, 1999, 2000) as well as the World Tables for Economic Data 2003, published by the World Bank World Bank (2003).

The data have a number of limitations. Firstly, time series data in developing countries are unreliable because of divergence of data values from different sources. It is also difficult to identify data that are unauthentic. Data deficiencies affect the reliability of results Ariyo (1996). Additionally, unreliable data cause difficulties in policy recommendations because various data sources could result in different policy solutions. In this regard, Tanzania is not an exception.

Another data problem is with regard to time period in which various data series refers to. On one hand, data on tax revenue and public spending refers to the government financial years that starts on the 1st of July of each year and ends on 30th of June in the following year. On the other hand, data on gdp, population, and inflation series are recorded according to calendar year. In order to reconcile the time periods for different data series, all data recorded according to government financial year were lagged for six months in order to have a uniform starting and ending data recording period. The adjustment of time periods may have effect on the quality of results obtained. In addition, the number of observations was not large enough. This may have effect on the power of tests and the conclusions reached.

#### **5.0 Econometric estimation results**

This section presents the results for testing of unit root and estimation of ar(1) models for gdp growth and public spending. It also present tests for parameter stability estimation results of eclectic models for gdp growth and fiscal balance.

#### **5.1 Unit root diagnostic test results**

The EViews econometrics programme was used to perform the unit root tests for both nominal and real public spending and gdp time series (Quantitative Micro Software 2004). The test was performed using the different model specifications of data series processes. The time series variables were first transformed into logarithms, before being examined for the unit root. The test results for both variables in first difference were stationary. The results are presented in this section.

##### ***Unit root test results for real and nominal public spending and gdp series in first difference***

Table 1 shows the unit root test results. The result reveals that for nominal public spending and gdp growth in first difference the respective coefficient were negative and significant at five percent

significance level. However, for real variables the coefficients of public spending was positive and significant but that of gdp was negative and significant.

**Table 1: Unit root test results for nominal and real public spending and gdp Series**

**(in first difference)**

$$\Delta \Delta y_t = \beta_0 + \alpha_1 \Delta y_{t-1} + e_t$$

| adf function                    | $\beta_0$ ( t-stat) | $\alpha_1$ (t-stat) |
|---------------------------------|---------------------|---------------------|
| lspend <sub>t-1</sub> (nominal) | 0.187 (3.605)       | -0.904 (-4.600)**   |
| lspend <sub>t-1</sub> (real)    | 0.002 (0.575)       | -0.953 (-4.972)**   |
| lgdp <sub>t-1</sub> (nominal)   | 0.157 (3.889)       | -0.691 (-4.011)**   |
| lgdp <sub>t-1</sub> (real)      | 0.046 (3.200)       | 1.240 (-6.502)**    |

\*\*Rejection of null hypothesis at 5 percent significance level based on Davidson and MacKinnon 1993 values. Table 1 of Dickey-Fuller and Augmented Dickey and Fuller test for critical values at 5 percent was used to test null hypothesis (Cheremza & Deadman 1997).

The t-statistics tests for both nominal public spending and gdp were used to test null hypothesis of unit root. The test results for both real and nominal public spending and gdp series suggested that the variables became stationary after taking their first differences. Thus, the public spending and the gdp series were integrated of order 1, represented as I(1).

The results confirm that macroeconomic flows or stock variables are non-stationary. The results have important implications for macroeconomic policies. Particularly, since gdp is characterised by integration of order I(1), shocks will have permanent effects on the economy.

## 5.2 Stability test results

The stability test was done using the real variables in first differences because they provided equations with better results compared to those equations estimated using nominal variables. Table 2 and 3 show the results of estimating stability tests. However, the models specification did not take into account structural changes. This may lead to biased results and wrong conclusions about stationarity. This is one of the limitations of this study.

**Table 2: The estimated autoregressive equation specifying the generation of real public spending Series (in first differences)**

| Independent Variable | Estimated Coefficient | t-ratio |
|----------------------|-----------------------|---------|
| C                    | -0.014                | -0.340  |
| lpsp <sub>t-1</sub>  | -0.460**              | -2.376  |
| r <sup>2</sup>       | 0.64                  |         |
| Dw                   | 2.288                 |         |
| log likelihood       | 4.958                 |         |

Note: lgdp: logarithm of real public spending growth, r-coefficient of correlation, DW- Durbin Watson, \*\* denotes significant at 5 percent level

Table 2 presents coefficient estimates of the ar (1) model for the real public spending series in the 1973-2000 period. The t-statistics indicate that the regression coefficient of lagged public spending was significant at the 5 percent significance level. In addition, the coefficient of determination

shows that 64 percent of the variation in public spending was explained by the previous year's government spending.

Table 3 below shows the results of estimating the ar (1) model for gdp series in the 1973-2000 period. The estimation results of the ar (1) model revealed that the constant coefficient was insignificant, but the coefficient of lagged gdp was significant at the 5 percent level. The coefficient of determination also showed that 53 percent of the variation in gdp growth was accounted for by the previous year's output growth.

**Table 3: The estimated autoregressive equation specifying real gdp series generation (in first differences)**

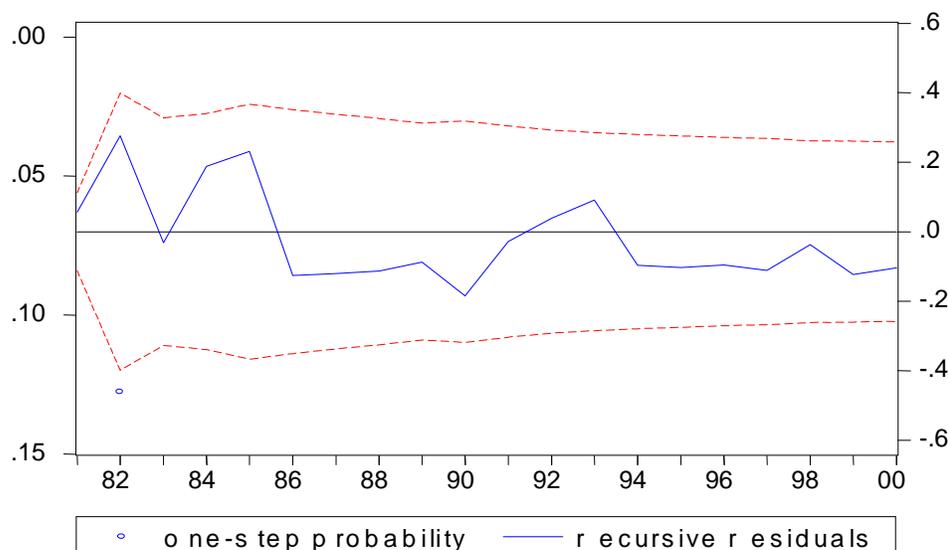
| Independent Variable | Estimated Coefficient | t-ratio |
|----------------------|-----------------------|---------|
| c                    | -0.001                | -0.070  |
| lgdp <sub>t-1</sub>  | -0.485**              | -2.597  |
| r <sup>2</sup>       | 0.53                  |         |
| Dw                   | 2.588                 |         |
| log likelihood       | 21.771                |         |

Note: lgdp: logarithm of real public spending growth, r- coefficient of correlation, dw- durbin watson, \*\* denote significant at five percent level

***Chow test results for the coefficients of ar (1) model for public spending series (in first difference)***

Various chow tests methods were also used to test for structural changes in the coefficients of the ar (1) model for real public spending series. The intention was to identify the impact of exogenous events and economic policy changes on the public spending. One of the tests performed was a one-step chow test. The test results revealed no evidence of outliers in the 1979-2000 period (Figure 1).

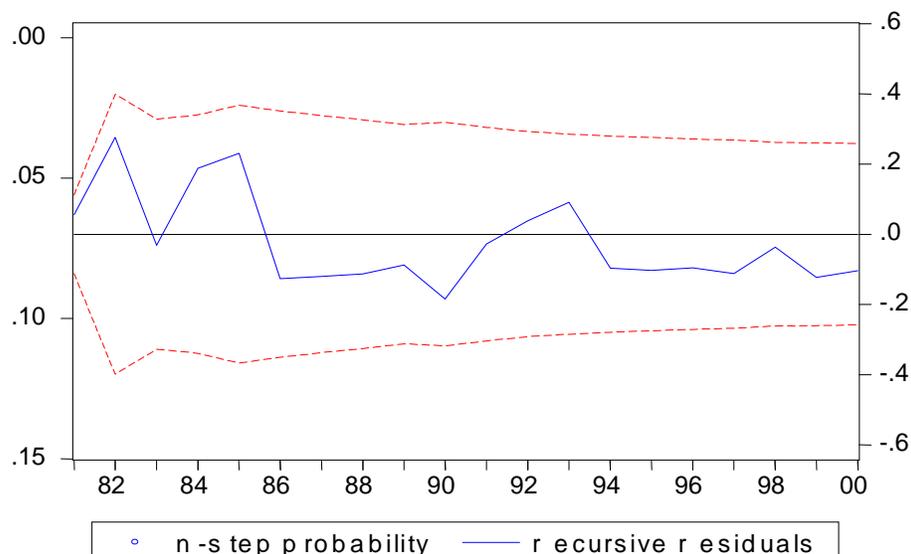
**Figure 1: One-step chow test results for the coefficients of ar (1) model for real public spending series (in first difference)**



A further test for structural break on parameters involved the use of a break-point test method. The results from the test showed an absence of structural breaks on the parameters of the ar (1) model for the real public spending series (Figure 2). However, the results revealed the presence of

instability in public spending in the 1979-86 and 1990-93 periods. The instability of public spending may be attributed to fluctuations in fiscal revenue.

**Figure 2: Break-point chow test for the coefficients of ar (1) model for real Public spending series (in first difference)**

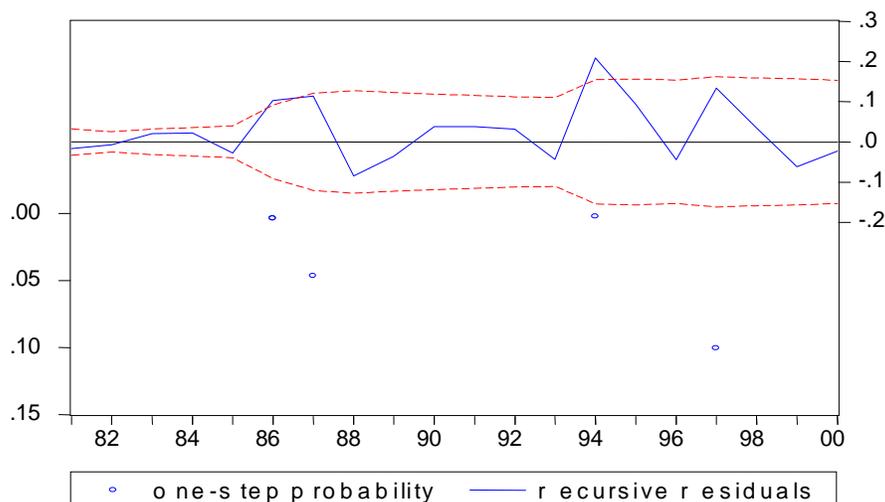


**Chow test result**

**Tests for ar(1) model for real gdp series (in first difference)**

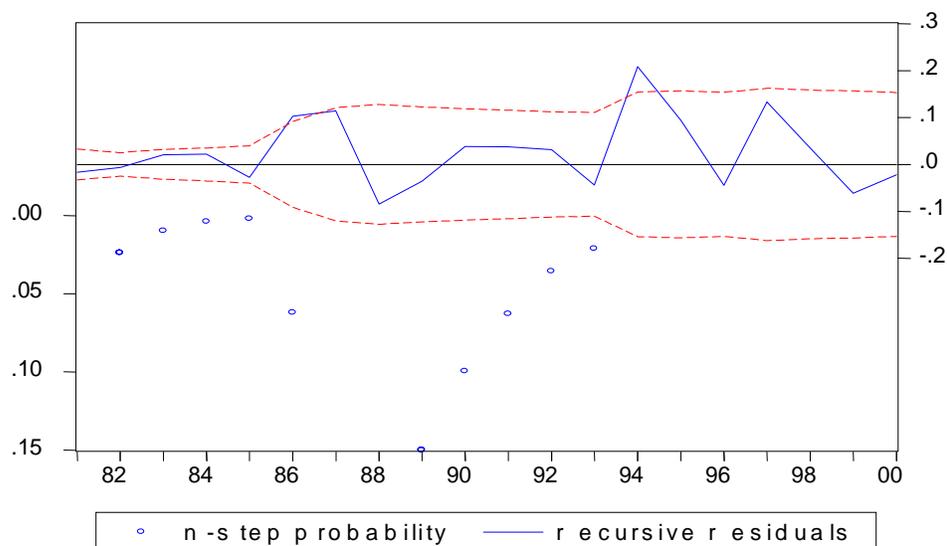
Various chow tests were done to ascertain structural breaks on the parameters for the ar (1) model for the real gdp series. The one-step chow test revealed that extreme values of real gdp were generated in 1985, 1986, 1987 and in 1994 (Figure 3). This signified the presence of outliers on the part of the estimated coefficients.

**Figure 3: One-step chow test results for the coefficients of ar(1) model for real gdp series (in first difference)**



The break-point chow test indicated that the coefficients of the ar (1) model for the real gdp series was characterised by structural breaks (Figure 3). The first and second break-points occurred in 1986 and 1987, and they coincided with adoption of the economic policy reforms in Tanzania. This was also the period that marked the end of the controlled socialist policy regime. The third break-point occurred in 1994. This was the period when Tanzania adopted a market determined exchange rate policy. It was also the year after the introduction of multi-party democracy in Tanzania. Thus, structural changes in gdp growth may be associated with the changes in the economic structure in Tanzania.

**Figure 4: Break-point chow test for results for the coefficients of ar (1) model for real gdp series (in first difference)**



The results from the chow predictive failure test revealed no evidence of a structural break in the coefficients of the model. However, the test indicated instability in the coefficients of the ar(1) model for the real gdp series. The figure showing gdp instability is not presented in this paper.

### 5.3: The analysis of the impact of policy changes on gdp growth and fiscal deficit in Tanzania in the 1977-2000 period

In order to confirm the results obtained from testing structural changes in data generation process and to provide a basis for policy recommendation, the estimation of regression equations for gdp and fiscal balance was done. The two equations were estimated to identify the impact of policy changes on respective variables in Tanzania in the 1970-2000 period. The E-Views econometric programme was used to estimate equations.

The dummy variable was included to take into account the impact of adjustment policies on output growth in the 1972-2000 period. The dummy variable took the values of one in 1986, 1987, 1989, 1992 and 1994; the years in which structural break in gdp growth was identified. In all other periods the dummy variable assumed a zero value.

In estimating the equation real variables were used. The variables were transformed into logarithms and were differenced once. Regression results indicated that a number of individual coefficients and the regression equation were statistically significant (Table 5). Lagged gdp growth, money supply and dummy variables were all significant at 5 percent significant level. The results seemed to suggest that economic performance in the previous years and variation in money supply explained the changes in output growth in Tanzania in the 1977-2000 period.

**Table 5: The determination of the effect adjustment policies on real gdp growth in Tanzania in the 1977-2000 period**

$$gdp_t = \beta_0 + \beta_1 gdp_{t-1} + \beta_2 gvsp_{t-1} + \beta_3 lm1_{t-1} + \beta_4 t_{t-1} + \beta_5 du + e_t$$

| Independent variable    | estimated coefficients |
|-------------------------|------------------------|
| constant                | 3.091 (0.614)          |
| gdp <sub>t-1</sub>      | 0.512 (2.687)**        |
| gvsp <sub>t-1</sub>     | -0.005 (-0.0204)       |
| m1 <sub>t-1</sub>       | 0.195 (2.081)**        |
| T                       | -0.0219 (-0.992)       |
| du                      | -0.158 (-2.037)**      |
|                         |                        |
| Adjusted r <sup>2</sup> | 0.971                  |
| dw                      | 1.623                  |
| F-statistic             | 193.48                 |

Note: (i) gdp: gross domestic product; gvsp: government spending; m1: money narrowly defined, t: trend variable; du: dummy variable; r- coefficient of correlation, dw- durbin watson.

(ii) Figures in parenthesis are the values of t-statistic

(iii) \*\* denotes significant at five percent significance level

The coefficient of public spending was negative and insignificant (Table 5). The estimated coefficient suggests that public spending has a negative impact on output growth in Tanzania. This also implied that cuts in public spending as part of adjustment policies may have adversely affected output growth in Tanzania. The result confirms the findings of Kweka and Morrisey (2000) that in Tanzania public spending has a negative effect on output growth.

Table 5 also shows that the coefficient on the dummy variable was negative and significant. The significance of the dummy variable implied that policy changes had a negative impact on output growth in Tanzania in the 1982-2000 period. This confirms the previous findings on this paper on the presence of structural changes on gdp growth in Tanzania after economic policy reforms.

Table 6 presents the estimation results of the fiscal balance equation. The Table excludes the estimation results of domestic and external debt as well as a trend variable because they were not significant. The Table also reveals that the lagged fiscal deficit variable explained the variation in the fiscal deficit in Tanzania. This seems to suggest that high deficit prior to adjustment lead to increased efforts to overcome the fiscal imbalance.

**Table 6: Determination of the effect adjustment policies on fiscal deficit in Tanzania in the 1977-2000 period**

$$fdf_t = \beta_0 + \beta_1 fdf_{t-1} + \beta_2 gdp_{t-1} + \beta_3 inf_{t-1} + \beta_4 du + e_t$$

| independent variable    | estimated coefficients |
|-------------------------|------------------------|
| constant                | -53.546 ( -2.659) **   |
| fdf <sub>t-1</sub>      | 0.570 (3.724)**        |
| gdp <sub>t-1</sub>      | 4.526 (2.027)**        |
| infl <sub>t-1</sub>     | 0.111 (0.38)           |
| du                      | 10.14 (1.037)          |
|                         |                        |
| Adjusted r <sup>2</sup> | 0.51                   |
| dw                      | 2.071                  |
| F-statistic             | 6.15                   |

note: r- coefficient of correlation, dw- durbin watson. figures in parenthesis are the values of t-statistic

\*\* denote significant at five percent level

note: (i) fdf: fiscal deficit; gdp: gross domestic product; infl: inflation rate; du: dummy variable; r- coefficient of correlation; dw- durbin watson.

(ii) figures in parenthesis are the values of t-statistic

(iii) \*\* denotes significant at five percent level

Table 6 also indicates that the coefficient of the lagged gdp was positive and significant. The result implied that output growth have a positive impact on correcting the fiscal deficit in Tanzania. The finding confirms the observation of Búlr and Moon (2003) that output growth positively influences the improvement of fiscal balance. The coefficient of the dummy variable was positive, but insignificant.

## 6.0 Conclusion

This paper examined whether exogenous events and policy reforms had an impact on public spending and gdp growth and the arising implications on fiscal positions during different adjustment periods in Tanzania. The main finding is that economic policy changes led to structural changes in gdp growth in Tanzania after 1986. This follows from the fact that real output was truly I (1), that is integrated of order one. In such a situation, shocks to the gdp series have permanent effects in the economy Greene (2003).

The times series econometric test results indicated that the structural breaks in the gdp series coincided with the years in which the economic regime changed from a socialist to market economy and financial institutional reforms were adopted. In addition, the changes in gdp series in Tanzania were associated with the introduction of the market determined exchange rate.

Economic reforms led to the adoption of economic policies emphasising economic transformation and efficient allocation of the resources. The change in the political system also had an impact on the levels of economic activities because, it enabled the participation of individuals in the production activities that were restricted to the public sector during the socialist regime or were not undertaken at all. This meant that changes in economic policy and the political regime policy had an impact on macroeconomic conditions in Tanzania because they influenced the gdp growth. This had influenced tax base and fiscal positions, since the economy had weak economic structures.

The finding that policy shocks resulted in structural changes in the gdp series confirms the previous findings in the economic literature (Chevillon 2004; Kapetanios and Tzavalis 2004; Debs 2001). The authors identify that exogenous economic events including policy shocks resulted in fundamental changes in the economy. Such changes affect gdp growth and fiscal position over a short- or long-term.

Economic policy shocks had an effect on the fiscal position as well. The changes in macroeconomic conditions affected the outcome of fiscal adjustment policies, specifically in correcting budget deficit in Tanzania. This was revealed by persistent budget deficit in various fiscal adjustment episodes. Previous studies also indicated that the exogenous events or policy shocks caused fiscal problems, particularly in developing countries with weak economic structures or that pursued inappropriate economic policies (World Bank 1996; Ziky and Mansouri 2003).

In developing countries, continued changes in macroeconomic policies or conditions are detrimental to endeavours to increase tax revenue because they cause difficulties during the adjustment periods. Such a situation also restricts the use of alternative policy measures to deal with the difficulties during the adjustment epochs and thereby exacerbate the fiscal deficit.

Thus, it is recommended that fiscal adjustment policies should not be undertaken when a series of policy changes are envisaged in an economy. The policies will not result in successful correction of

the fiscal deficit. The adjustment policies should be undertaken when few changes in economic policies are undertaken or envisaged to be undertaken.

The findings that economic policy resulted in structural changes in output growth and public spending instability suggest that the two variables determined the success of the efforts to correct fiscal deficit in Tanzania. In that regard, policy makers need to pay attention to these variables in order to realise success in implementing fiscal adjustment policies.

This study has a number of limitations. Firstly, the number of observations is not large and this may have an effect on the robustness of econometric test results. Secondly, as pointed out earlier, the model specification did not take into account structural changes in parameters. This may lead to biased results and wrong conclusion about stationarity.

The paper has not dealt with issues such as the exchange rate and its impact on fiscal policies. However, exchange rate policy may have an impact on fiscal adjustment policies in an open economy. Little is known about the effect of the exchange rate regime in correcting the fiscal deficit in different adjustment periods over the 1977-2000 period in Tanzania. Sketchy knowledge of the impact of exchange rate policy on fiscal policy in Tanzania suggests that a country study is worthwhile undertaking.

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