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Fiscal policy, employment, and output in South Africa: An open economy analysis

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ABSTRACT

We provide strong evidence of a positive shock to government spending on increase in employment (public and private), an appreciation of the real effective exchange rate and deterioration in the trade balance; but it has no effect on output for South Africa during the period 1994:1-2008:4. We also document that positive shocks to net taxes generate an increase in output, private employment and have no effect on public employment; it also leads to a depreciation of the real effective exchange rate and an improvement in the trade balance. An important finding in this study is that the transmission channel between government expenditures and output is not as direct as suggested in the Keynesian doctrine, but is indirectly shown by public employment's effects on output. We conclude that classical effects are predominant in the South African economy, i.e., only improvements in the supply-side components can be linked to increases in output.

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1.0 Introduction

There is a renewed interest amongst economists on the role of fiscal policy in fostering economic development (Benetrix & Lane, 2007; Fatas & Mihov, 2009). Fiscal policy works through both aggregate demand and aggregate supply channels. Changes in total taxes and public expenditure affect the level of aggregate demand in the economy, whereas, the structure of taxation and public expenditure affect, among others, the incentives to save, work and invest, export and import goods and services (Jha, 2007).

The most notable quest for explaining the effects of fiscal policy shocks in an open economy, arguably, began with Kim and Roubini (2005). Nonetheless, there is no universally agreed upon transmission channel both in the closed and open economy scenarios (Giordano, Momigliano, Neri, & Perotti, 2007; Perotti, 2002, 2007). The empirical evidence matches this theoretical ambiguity, with some studies finding a positive association between government spending and output (Blanchard & Perotti, 2002; Fatas & Mihov, 2009), others a negative association (Baxter & King, 1993).

Despite numerous studies being done on the subject and the lack of consensus among different theoretical models, there is scant empirical evidence on the effects of fiscal policy shocks on private and public sector employment.

Most of the debate in the literature on the transmission channel of fiscal policy has concentrated on non-African economies with the exception of a few authors (see, M'Amanja, Morrissey, & Lloyd, (2006) for Kenya and; Perkins, Fedderke, and Luiz (2005) for South Africa). To the best of our knowledge there is no study done for the South African economy that links the impact of fiscal shocks on employment whilst controlling for the external sector. This study aims to fill this gap.

To understand the workings of the macroeconomy, economists have often found it useful to think of the economy as a dynamic, stochastic system, which responds to both present and past random shocks. It is from this perspective that we employ the vector autoregressive (VAR) model in this study to analyse the effects of fiscal policy shocks[1] on output and employment in South Africa.

The results reveal that in the short run, a positive shock to government spending results in an increase in employment (public and private), an appreciation of the real effective exchange rate and deterioration in the trade balance; but it has no effect on output. Positive shocks to net taxes generate an increase in output, private employment and have no effect on public employment; it also leads to a depreciation of the real effective exchange rate and an improvement in the trade balance. An important finding in this study is that the transmission channel between government expenditures and output is not as direct as suggested in the Keynesian doctrine, but is indirectly shown by public employment's effects on output.

This study is organised as follows; literature review is discussed in section 2; section 3 delivers the methodology and in section 4 we talk about the empirical estimation and results whilst section 5 provides the conclusion and recommendations.

2.0 Literature review

2.1 Fiscal policy effects on output and employment

The impact of fiscal policy on output and employment is inconclusive both in the theoretical and empirical literature. In the body of theoretical literature, according to the Keynesian (old and new) doctrine and the real business cycle (RBC) theory, expansionary fiscal policy has a positive effect on output and employment whilst in the classical and neo-classical theory, fiscal policy is considered to be ineffective in the long run.

The distinguishing feature in these theories is the nature of household behaviour. Classical theory bases its argument on the presence of Ricardian equivalence and consumption smoothing, wherefore households are rational and quickly notice that an expansionary fiscal policy in the form of an increase in government spending will eventually be met by a future tax rise, hence they adjust their consumption patterns (i.e., decrease) in an attempt to save for the future when wealth is diminished from a tax increase. In doing so, the decrease in consumption reduces output through aggregate demand and eventually lowering the equilibrium level of output and employment. In RBC models on the other hand, households seek to maximise their lifetime utility through intertemporal and intratemporal substitution effects of leisure. Faced with a rise in government spending, these households in their bid to maximise utility would cut consumption and leisure through intertemporal substitution**.** This would result in an increase in labour supply and output.

The New Keynesian and Keynesian theories to fiscal policy transmission differ markedly from the classical theories by claiming the presence of non-Ricardian type of households and 'crowding-in' effects which ultimately lead to a positive correlation between government spending, consumption, output and employment.

Keynesian economics differs markedly from laissez-faire economics in that; it believes public expenditures can be the key engine for higher output or economic growth. The Keynesians argue that, public expenditures have a positive impact on output through the multiplier effect. This rests on its assumption of price rigidity and the existence of excess capacity. Traditional Keynesian IS-LM model explains that an increase in government spending directly boosts aggregate demand and leads to an increase in employment levels. This channel is through the consumption - multiplier effect on output. The New-Keynesian (NK) school is borne out of disequilibria and price-wage stickiness in the economy. From this perspective, involuntary unemployment is seen as the outcome of quantity constraints generated by trading at non-market-clearing prices. In the NK world, price rigidities and non-Ricardian consumers form the major assumptions. If the two assumptions hold then increases in government expenditures will result in increases in private consumption. The rise in labour income triggers an increase in consumption of 'rule of thumb' households implying a rise in aggregate demand, leading to a further expansion in output and employment.

[1] Fiscal policy shocks in this context comprise government spending and revenue shocks. Different fiscal policies such as balanced budget expansions can then be described as different linear combinations of these two basic shocks.

A central conclusion of Keynesian economics is that there is no strong automatic tendency for output and employment to move towards the full employment level. This conclusion conflicts with the tenets of classical economics, and other schools, such as supply-side economics or the Austrian school, which assume a general tendency towards equilibrium. Policy conclusions derived from the new-classical school is for governments not to rely on fiscal policy or monetary policy to stabilize the economy but rather rely on the self-correcting mechanisms of the market. If new classical view holds, fiscal policy is completely ineffective in the long run.

According to RBC theorists, there is no need for policy to affect the level of output in the economy as fluctuations in output are real and they do not represent a failure of markets to clear, but rather reflect the most efficient possible operation of the economy. However, recently RBC models of government spending have reaffirmed the role of the government expenditure in output and employment generation. RBC studies argue that government expenditure shocks are more important in explaining labour market movements along a cycle (Finn, 1998).

2.2 Empirical evidence

Using a VAR model on U.S. data, Koray and McMillin (2007) obtain results that support the NOEM framework, where positive shocks to government expenditure leads to a transitory positive effect on output and long-lived positive effect on the price level. There is a depreciation of the real exchange rate and the trade balance improves. This finding is similar to the result obtained by Kim and Roubini (2005); they find that government deficits are associated with a currency depreciation and an improvement in the current account. Afonso and Sousa (2009) also report similar findings for Spain.

Fatas & Mihov (2009) investigates the effects of fiscal policy shocks on the USA economy. In their study, they show that positive innovations to public expenditures had a positive and significant impact on GDP, employment and private consumption. Their empirical findings are at odds with a number of versions of real business cycle models, while they fit in with the predictions of the Investment Savings and Liquidity Monetary (IS-LM) model.

On the other hand, Rezk, Avramovich, and Basso (2006) and found that the effects of fiscal shocks on a set of macroeconomic variables notably unemployment and gross domestic product had relatively low statistical significance and the impact of the innovations was short lived thus casting doubt on the Keynesian doctrine of fiscal transmission mechanism.

Kneller, Bleaney, and Gemmell (1999) uses panel data on OECD countries and finds that productive expenditures, other (unclassified) expenditures and the budget surplus have a significant positive coefficient in explaining GDP per capita. However they note that these positive coefficients are only significant in the short run period and insignificant in the long run. These findings support the classical framework, that fiscal policy has no long run effects on output.

Studies on the issue are limited in the South African context. In one of the earliest studies on fiscal policy impact, Perkins et al. (2005) investigate the effects of public infrastructure investments on economic growth and find a bidirectional relationship between the variables. Ocran (2011), investigates the impact of fiscal policy on output and interest rate. While he finds the impact on output to be modest but persistent, the impact on interest rate is found to be substantial but temporary. Jooste, Liu, and Naraidoo (2013) analysed the impact of government expenditure and taxes on short and long-run GDP growth. The findings point to a positive and negative impact in the short run respectively but no significant impact is found in the long run. The surveyed studies do not look into the impact of fiscal policy on private and public employment.

2.3 Variables and expected signs

There are diverse and differing explanations when it comes to the transmission channel of fiscal policy shocks, hence this study seeks to trace out these relationships for the South African economy. The time chosen is before the financial crisis of 2009 which could distort the transmission of fiscal shocks.

Total government expenditure (g) and Net taxes (nt) are used as measures of fiscal policy in this study. It is assumed in this model that g is exogenous since the government determines the values of g prior to the fiscal period. Net taxes is used as a measure of government revenue. There is a need to control for the budget constraint, failure to do so leads to non-robust and inefficient estimates, hence the need to include net taxes (Deverajan, Swaroop, & Zou, 1996; Levine & Renelt, 1992; Su, Yucel, & Taylor, 2003). The aim of this study is to capture how employment responds to fiscal policy shocks. To capture these responses we would use the private (pe) and public (ple) employment indices taken from the South African reserve bank database. One transmission channel for this could be through output growth, where fiscal shock impacts output growth which in turn impacts employment

levels as enunciated under Okun's law (Attfield & Silverstone, 1998). The study follows on previous studies on fiscal policy shocks that adopted real GDP (*y*) as a measure of real output in the transmission channel of fiscal policy shock (see Blanchard & Perotti, 2002; De Castro & Hernandez de Cos, 2006; Perotti, 2002). However fiscal policy shocks can impact on employment more directly through public works programme which may or may not result in output growth in the short run (Koohi-Kamali, 2010).

During the period under study the South African economy has become progressively more open to the world, hence we need to control for external influences by including the effects of international trade and we also exclude the time period after the financial crisis of 2009. Trade openness leads to lower volatility through a number of channels. Firstly, openness reduces the effectiveness of monetary policy as the prices of more goods become linked to the exchange rate, thus reducing the incentives to pursue inflationary policies (see, Rogoff, 1985; Romer, 1993). Secondly, it allows for a quicker recovery from external shocks (Calvo & Mishkin, 2003). Finally, it is expected that the role of fiscal policy is less emphasised in an open economy. It has become common in SVAR analysis to include the trade balance (*tb*) (for example see, Koray & McMillin, 2007; Monacelli & Perotti, 2006) and the real effective exchange rate (*reer*) in favour of their counterparts (for example see, Beetsma, Giuliodori, & Klaassen, 2007), i.e., current account and the real exchange rate, hence we follow suit. The exchange rate variable is used as a proxy for international influence by including the real effective exchange[2] rate for South Africa's 15 trading partners while the trade balance is constructed from the ratio of exports to imports.

The study makes use of quarterly data for South Africa spanning 1994q1 to 2008q4. The data employed in this study are obtained from the South African reserve bank database, and the International Monetary Fund's International Financial Statistics database (see, Table A.1 for a list of variables and summary statistics). Government expenditure is measured by gross government expenditure and net taxes are measured by tax revenue less transfers. Gross domestic product (GDP) is used as a proxy for output. Public and private employment figures are expressed as indices. Due to unavailability of quarterly data for the real effective exchange rate index, monthly indices are used to compute quarterly figures (see, MacDonald & Ricci, 2002). All level variables have been logged and deflated using the GDP deflator with year 2005 as the base year. Further the data is seasonally adjusted by making use of the Census X12 procedure. Following on Koray & McMillin, (2007), the trade balance is derived from the ratio of real exports to real imports. We note that there is a structural break in private and public employment series at about 2002q3 (see, figure A.1), we follow the procedure done in Blanchard and Quah (1989) to demean the series.

3.0 Methodology

In an attempt to trace the short run relationship we utilize the innovation accounting technique and variance decomposition in the vector autoregression (VAR) modelling framework. This has the ability to capture the dynamic interaction of fiscal policy variables and macroeconomic variables endogenously.

3.1 VAR Model

In a VAR model, all variables are treated as endogenous hence a VAR is a system of n-equations and n-variables put in a linear representation where each variable is explained by its own past, the past values of the other variables in the system and an error term. The equations in the system can be estimated using ordinary least squares (OLS) with each error term capturing 'surprise movements' or 'shocks'.
The VAR model is derived from the following structural model:

$$Y_t = \sum_{k=0}^{n} A_k \; Y_{t-k} + \varepsilon_t \qquad \text{Eq. (01)}$$

Y_t is a 7x1 matrix of endogenous variables. This vector comprises of real gross domestic product (*y*) in logarithms, net taxes (*nt*) in logarithms, public expenditure (*g*) in logarithms, trade balance ratio (*tb*), real effective exchange rate (*reer*), total public employment index (*ple*) and total private employment index (*pe*), A_0 is a 7x7 matrix of coefficients specifying contemporaneous relations among variables in the model and A_k, $k=1,\ldots n$, are coefficient matrices on k lagged values of Y, and ε_t is a vector of structural shocks which are independent and identically distributed (*iid*). The reduced form of the structural model yields the VAR model:

$$Y_t = B(L)Y_{t-1} + u_t \qquad \text{Eq. (02)}$$

Where $B = (1-A_0)^{-1}A_k$ and $U_t = (1-A_0)^{-1}\varepsilon_t$. $U_t = [u_t^y, u_t^g, u_t^r, u_t^{reer}, u_t^{tb}, u_t^{ple}, u_t^{pe}]'$, (L) is the lag operator, hence $B(L)$ is a matrix of autoregressive coefficients. The relationship between structural shocks and the reduced form residuals is given by this representation:

$$C\varepsilon_t = Bu_t \qquad \text{Eq. (03)}$$

[2] We use monthly real effective exchange rate to construct the average quarterly real effective exchange rate.

where $\varepsilon_t \sim WN(0, \Omega)$ and B and C are 7x7 matrices. Structural shocks are assumed to be contemporaneously uncorrelated; hence Ω is a diagonal matrix with the variances of the structural shocks on the diagonal. $U_t \sim WN(0, \Sigma)$ are reduced form innovations, they are a linear combination of the structural shocks and reduced form innovations of the other variables (see, for example, Enders (2004) and Hamilton (1994)) with Σ being a matrix of covariance. For one to analyse the effects of shocks, identifying restrictions should be imposed on the contemporaneous relations in the model by constraining some elements of matrix A_0 to equal zero.

3.2 Identification of fiscal shocks

Fiscal policy shocks are unanticipated changes to fiscal variables. However, such a definition is not only utopian but unrealistic (Mountford & Uhlig, 2002; Perotti, 2002) in a world where information dissemination is ever improving. In an attempt to recover these shocks, we employ the Choleski factorisation and the non-recursive decomposition would be used as an alternative identification scheme for sensitivity analysis.

In this study we are interested in estimating structural shocks of the fiscal variables (g_t and nt_t) and in studying the responses of macro-economic variables; (y_t; $reer_t$; tb_t; pe_t; ple_t). The relationship in Equation (03) can be decomposed into the following equations;

$$u_t^g = \alpha_y^g u_t^y + \alpha_{reer}^g u_t^{reer} + \alpha_{tb}^g u_t^{tb} + \alpha_{ple}^g u_t^{ple} + \alpha_{pe}^g \alpha_t^{pe} + \beta_{nt}^g \varepsilon_t^{nt} + \varepsilon_t^g \quad \text{Eq. (04)}$$

$$u_t^{nt} = \alpha_y^{nt} u_t^y + \alpha_{reer}^{nt} u_t^{reer} + \alpha_{tb}^{nt} u_t^{tb} + \alpha_{ple}^{nt} u_t^{ple} + \alpha_{pe}^{nt} \alpha_t^{pe} + \beta_g^{nt} \varepsilon_t^g + \varepsilon_t^{nt} \quad \text{Eq. (05)}$$

$$u_t^y = \partial_g^y u_t^g + \partial_{nt}^y u_t^{nt} + \varepsilon_t^y \quad \text{Eq. (06)}$$

$$u_t^{reer} = \partial_y^{reer} u_t^y + \partial_g^{reer} u_t^g + \partial_{nt}^{reer} u_t^{nt} + \varepsilon_t^{reer} \quad \text{Eq. (07)}$$

$$u_t^{tb} = \partial_y^{tb} u_t^y + \partial_E^{tb} u_t^E + \partial_{reer}^{tb} u_t^{reer} + \partial_g^{tb} u_t^g + \partial_T^{tb} u_t^r + \varepsilon_t^{tb} \quad \text{Eq. (08)}$$

$$u_t^{ple} = \partial_y^{ple} u_t^y + \partial_{tb}^{ple} u_t^{tb} + \partial_{reer}^{ple} u_t^{reer} + \partial_g^{ple} u_t^g + \partial_{nt}^{ple} u_t^{nt} + \varepsilon_t^{ple} \quad \text{Eq. (09)}$$

$$u_t^{pe} = \partial_y^{pe} u_t^y + \partial_{tr}^{pe} u_t^{tr} + \partial_{reer}^{pe} u_t^{reer} + \partial_{ple}^{pe} u_t^{ple} + \partial_g^{pe} u_t^g + \partial_{nt}^{pe} u_t^{nt} + \varepsilon_t^{pe} \quad \text{Eq. (10)}$$

Where : α_j^i capture both the automatic elasticity of fiscal variable *i* to the macroeconomic variables *j* (*y; reer; tb; ple; pe*) and the discretionary change in variable *i* by the policymaker in response to an innovation in these macro variables.

β_j^i, measures how structural shocks to the fiscal variables affect each other contemporaneously and ∂_j^i measures the contemporaneous effects of shocks from one variable *j* to another *i* within the system. As a result the innovation accounting technique can be reduced into equation (03) and represented by these matrices:

$$\begin{bmatrix} 1 & \beta_g^{nt} & 0 & 0 & 0 & 0 & 0 \\ \beta_{nt}^g & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} \varepsilon_t^g \\ \varepsilon_t^{nt} \\ \varepsilon_t^y \\ \varepsilon_t^{reer} \\ \varepsilon_t^{tb} \\ \varepsilon_t^{ple} \\ \varepsilon_t^{pe} \end{bmatrix} = \begin{bmatrix} 1 & 0 & -\alpha_y^g & -\alpha_{reer}^g & -\alpha_{tb}^g & -\alpha_{ple}^g & -\alpha_{pe}^g \\ 0 & 1 & -\alpha_y^{nt} & -\alpha_{reer}^{nt} & \alpha_{tb}^{nt} & \alpha_{ple}^{nt} & -\alpha_{pe}^{nt} \\ -\partial_g^y & -\partial_{nt}^y & 1 & 0 & 0 & 0 & 0 \\ -\partial_g^{reer} & -\partial_{nt}^{reer} & -\partial_y^{reer} & 1 & 0 & 0 & 0 \\ -\partial_g^{tb} & -\partial_{nt}^{tb} & -\partial_y^{tb} & -\partial_{reer}^{tb} & 1 & 0 & 0 \\ -\partial_g^{ple} & -\partial_{nt}^{ple} & -\partial_y^{ple} & -\partial_{reer}^{ple} & -\partial_{tb}^{ple} & 1 & 0 \\ -\partial_g^{pe} & -\partial_{nt}^{pe} & -\partial_y^{pe} & -\partial_{reer}^{pe} & -\partial_{tb}^{pe} & \partial_{ple}^{pe} & 1 \end{bmatrix} * \begin{bmatrix} u_t^g \\ u_t^{nt} \\ u_t^y \\ u_t^{reer} \\ u_t^{tb} \\ u_t^{ple} \\ u_t^{pe} \end{bmatrix}$$

From the above system, it is difficult to extract coefficients from the above system of equations, we need to impose some restrictions; following on Blanchard & Perotti (2002) who cite the existence of decision lags in fiscal policy which render automatic response to macroeconomic variables impossible within a short period of time, i.e., in a quarter. Blanchard & Perotti (2002) further identify these parameters based on institutional information about automatic elasticity of fiscal variables to macro variables. It takes more than a quarter for policymakers to adjust and respond to a fiscal policy shock, hence $\alpha_j^i = 0$. Blanchard & Perotti (2002) suggest the need to independently derive estimates of the automatic elasticities; however, in this study we utilise the *Eviews* structural factorisation procedure in estimating such elasticities.

We proceed to derive the reduced form residuals for the fiscal variables;

$$u_t^g = \beta_{nt}^g \varepsilon_t^{nt} + \varepsilon_t^g \quad \text{Eq. (11)}$$

$$u_t^{nt} = \beta_g^{nt} \varepsilon_t^{nt} + \varepsilon_t^{nt} \quad \text{Eq. (12)}$$

Based on the above system, we cannot solve for the coefficients yet. For identification purposes, we impose restrictions so as to ascertain the order of exogeneity. We do this by making these assumptions:

- Assume that government spending is totally exogenous and 'comes first' irrespective of other budget components, i.e., expenditures are set before the start of the fiscal year, therefore $\beta_{nt}^{g} = 0$
- Government revenue\net taxes are ordered second, revenue targets are set after the budget has been announced for the forthcoming fiscal year. Equation (13) and (14) reduce to;

$$u_t^g = \varepsilon_t^g \quad \text{Eq. (13)}$$

$$u_t^{nt} = \beta_g^{nt}\varepsilon_t^g + \varepsilon_t^{nt} \quad \text{Eq. (14)}$$

The ordering of the other variables in the system is not important since we want to investigate the effects of fiscal policy shocks (Koray & McMillin, 2007).

4.0 Estimation and discussion of results

4.1 Benchmark model estimation

We pre-test for the presence of unit roots and cointegration. However, its relevance for VAR analysis is not emphasized because firstly, the variables are integrated of differing orders. Secondly, the data may be quasi-nonstationary as the presence of unit roots in the time series cannot be tested with high power (Enders 2004).

Neglecting of cointegration constraints is further motivated by the following considerations. The analysis is generally focused on short-run constraints and the short-run dynamic response of the system. When cointegration constraints are excluded, this only implies that the long-run responses of some variables are not constrained and might follow a divergent path. However, the short-run analysis is still valid (Breuting, Bruggemann, & Lutkepohl, 2004; Hamilton, 1994, Chapter 18; Koray & McMillin, 2007; Rezk et al., 2006). Additionally, Sims et al. (1990) prove that standard asymptotic inference is not affected even when the variables included in a VAR in levels are cointegrated see for example, Breuting et al. (2004, p. 175 and 185). Nonetheless, we find that the Johansen test fails to reject the null hypothesis of no-cointegrating relationship at 1% level of significance. Above all, the goal of this study is to determine the short run dynamics, interrelationships among variables and not the interpretation of parameter estimates.

We also decided to use variables in levels despite some of them being non-stationary (see, results in Table A.2); this is motivated by Sims (1980) and Sims et al. (1990) who advise against differencing even if variables have unit roots (Kamps, 2005, p. 537; Koray & McMillin, 2007, p. 4; Phillips, 1998; Rezk et al., 2006, p. 6). Sims cites the danger of 'differencing away' important information on the relationship and co-movements contained in the data. Enders (2004, p. 270) also notes that variables in a VAR system should mimic the real data generating properties, hence one should be careful not to difference.

The optimal lag length for the VAR was chosen by using the Schwarz Bayesian Information Criteria (SBIC) as this method has been found to have desirable properties if the sample size employed is small (Perotti, 2002). Accordingly the VAR estimate with the lowest SBIC is the most efficient and will be chosen.

Table 01: Lag length selection

lag	LL	LR	df	AIC	HQIC	SBIC
0	-2292.06			82.1	82.2	82.36
1	-1971.83	640.48	49	72.49	73.2*	74.44*
2	-1928.9	85.853	49	72.63	74.11	76.44
3	-1843.79	170.32	49	71.34	73.5	76.92
4	-1772.3	142.85*	49	70.54*	73.39	77.89

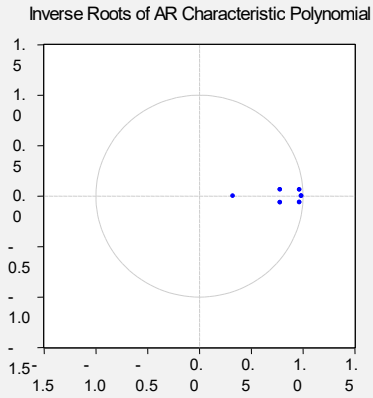
*, 1% significance level
Source: Author's calculations

After weighing the pros and cons of choosing between parsimony over efficiency we decided to use a single lag (see, Table 01). This was motivated by the fact that the HQIC also chose a single lag and VAR estimates produce stable characteristic roots, shown in Figure 01.

4.2 Impulse response for benchmark model

With the aid of impulse response functions (IRFs) we trace out the dynamic interaction between fiscal variables and other variables of interest.

Figure 01: Inverse roots



Source: Author's calculations

4.2.1 Impact of government expenditure shock

In Figure A.2 the first row shows the responses following an increase of government expenditure. The response of output is statistically insignificant throughout the time horizon; this is in sharp contrast with the Keynesian doctrine, and in line with the classical theory which negates any demand induced output growth. This could be linked to the limited and less emphasised role of fiscal policy in spurring economic growth in South Africa for the period 1994-2008, for example the privatisation of most services by the government as spelt in GEAR (Hoskins, 1999).

The impulse response of public employment to a fiscal policy shock in the form of a positive increase to government expenditure is positive and statistically significant. The impact of expenditure shock on public employment is long lived, reaching its maximum at the second quarter. Private employment responses are significant and positive for a period of six quarters. This implies a responsive private sector employment to government efforts. This could be due to the nature of expenditures that were carried out during the period under review; in the last decade and a half the government has been pursuing poverty mitigation policies that had a main thrust on basic education, infrastructure building and health for the majority (Gordhan, 2009). While at first instance the impact of government expenditure on output and employment seem against expectations, it must be remembered that the period under study saw the government of South Africa pursue policies that were meant to reduce government deficits, redress inequality and reduce unemployment and poverty among the black population through the PWPs. The likely effect of such a fiscal mix coupled with low and falling labor productivity (Ferreira, 2013), is an increase in employment with no direct link to output. This finding is in line with that of Giordano et al. (2007, p. 720) who notes that the response of output to government wages/employment is unresponsive and statistically insignificant.

The response of the trade balance and exchange rate are statistically insignificant. This finding is in line with Baxter and King (1993) where she finds that a shock to government expenditure in a small open economy with incomplete asset markets among other rigidities had no effect on the current account (trade balance). This could be due to the low influence that fiscal policy had in shaping the South African economy for the period under study. The South African economy has over the years been steered from the monetary side, since mid-nineties, when the central bank adopted the inflation targeting policies while the treasury aimed at reducing its deficit and achieving balanced budgets (Manuel, 2007).

4.2.2 Impact of net taxes shock

The second row in figure A.2 shows the responses following an increase in net taxes. The response of output is positive and statistically significant; this defies the Keynesian doctrine, and coincides with classical theory where we have Ricardian agents who increase their labour supply following an increase in taxation. With an increase in labour supply, we expect an increase in production hence output too.

A positive shock to net taxes has no effect on public employment; impulse responses are statistically insignificant throughout the time horizon. Having looked at the South African budget deficit/surplus time series, one can argue that a government bent on reducing its budget deficit would be expected to have an inelastic 'public sector employment-tax elasticity', i.e., unresponsive public sector employment to an increase in net taxes (Weeks, 1999). This result perhaps resides in the flow of causality between the two variables, it is expected that a rising public

sector wage-bill will lead to a need to increase the tax base and not the other way around. Taxes are not raised with the hope of increasing the public sector workforce.

However, private employment responses are positive and significant for a period of three quarters. This could imply the presence of Ricardian effects in the South African economy, an increase in taxes and the associated reduction in wealth, raises the marginal utility of wealth, inducing workers to devote a large fraction of their time to work, thereby increasing the long-run output growth and employment levels (Turnovsky, 2000). Perhaps an increase in net taxes makes consumers substitute away from consumption of leisure in favour of labour in the South African context, this finding is at odds with RBC models.

The response of the exchange rate is negative as expected; a positive net tax shock leads to an exchange rate depreciation with a one period lag response. The response is short lived with a span of three quarters and thereafter becoming insignificant. The impulse response reaches its peak after three quarters from impact and then steadily subsides for the next quarter. This is consistent with findings of Bartolini and Lahir (2006). It also matches the portfolio balance approach to balance of payments which stipulates that, following an increase in taxation the local unit depreciates due to a fall in spending. A fall in spending leads to an increase in overall savings and a decrease in interest rates if we assume Ricadian equivalence does not hold, possibly due to uncertainty. This result is at odds with the findings of Koray and McMillin (2007), Rebei (2004) and Burnside, Eichenbaum, and Fischer (2004) support the standard Mundell-Fleming models (Dornbusch, 1976; Fleming, 1962; Mundell, 1963) that postulate an exchange rate depreciation after an increase in taxation.

Trade balance's response is negative and ephemeral, lasting for a single quarter before it becomes insignificant. Interestingly the trade balance moves into a positive position after the first quarter despite the IRFs being insignificant. Net tax shock on the external economy can be reconciled with the J-curve phenomenon to current account adjustment following an exchange rate depreciation; it can be seen that the trade balance deteriorated on impact following an exchange rate depreciation before it started trending upwards. However, caution must be taken before making definite conclusions; this is in light of the noticeably low impact and the lack of statistical significance along the time horizon. Nonetheless, this could be linked to the nature of South Africa's current account position (2004-2008), i.e., being a net-importer and most of those imports commanding an inelastic demand (e.g., capital goods and petroleum products); hence the effect of an increase in taxes will not significantly reduce the volume of imports entering the economy. This is further supported by the negatively trending trade balance series for the period under study (see, Figure A.1). The South African economy has over the years been moving from a net-exporter position to being a heavily importing country of consumer and capital goods.

4.3 Variance decomposition

With variance decomposition we are able to analyse the proportion of movements in one variable that are due to errors in own and other variables' shocks in the system.

Variance decompositions to a government shock are shown in table 03. Government expenditure deviations barely explain output variation; it reaches a maximum of 2% at the second quarter and then declines gradually throughout the forecast period. This could be due to the strong presence of neo-classical characteristics in the economy's production function, where output growth is attributable to supply-side components and not demand-side components like government consumption of final goods. Table 3 also shows that deviations in public employment (PLE) are mostly explained by the government expenditure with the impact rising over the forecast period, starting from a low of 12.8% in the first period before reaching a peak of 35.3% in the 12th quarter. The proportion of deviations in private employment (PE) due to government expenditure (G) shock is also significant, averaging 28% over the forecast period. Government expenditure explains the greater part of the deviations in private employment in the forecast period than any other variable but private employment itself. This suggests that the type of expenditures carried out by the government were labour augmenting and hence 'crowded-in' private employment (SARB, 2002) . The impact of G on REER is too insignificant to draw any conclusions. The impact of government expenditure on trade balance starts off at very insignificant levels but grows to 5.9% over the forecast period.

Variance decompositions for Net taxes are shown in table 04. Net taxes' variation explains about 11% of the variation in output at the 5th period before it starts decreasing steadily to 7% by the 12th period. Although an average of 7% is a small figure, the results suggest a weak support for Ricardian type of agents in the South African economy, where an increase in taxation leads to a reduction in wealth and a subsequent increase in output. The proportion of deviations in private employment (PE) due to net taxes (NT) averages 16% over the forecast period. Although modest; it highlights the possibility of Ricardian effects in the manner with which agents make their decisions, i.e., increasing labour supply when faced with high taxes.

Table 03: Impact of G on the variance decomposition of Y, NT, PLE, PE, TB & REER

Period	Y	NT	TB	REER	PLE	PE
1	1.792799	9.880458	0.314922	0.189499	17.81057	13.27593
2	2.017832	9.983101	0.34362	0.424056	19.1404	17.10915
3	1.994196	9.796975	0.686089	0.348407	20.97606	20.53444
4	1.864319	9.490302	1.282115	0.307983	23.11299	23.70924
5	1.694445	9.135598	2.041058	0.358005	25.36014	26.58849
6	1.512798	8.757696	2.861208	0.458645	27.56648	29.08646
7	1.332404	8.362961	3.656805	0.568256	29.61553	31.12989
8	1.161116	7.95363	4.369285	0.662454	31.42029	32.67933
9	1.005451	7.533215	4.966042	0.731501	32.92057	33.73375
10	0.871807	7.107698	5.434449	0.774663	34.08126	34.32473
11	0.766662	6.685117	5.775587	0.795873	34.89013	34.50611
12	0.696432	6.274708	5.999183	0.801017	35.35464	34.34322

Net taxes' contribution to REER variation is seen to increase with time until it reaches a maximum of 31.7% at the 12th quarter supporting the standard Mundell-Fleming models that postulate an exchange rate depreciation after an increase in taxation. Net taxes explain on average 8% of the variation in the trade balance (TB).

Table 04: Impact of NT on the variance decomposition of Y, PLE, PE, TB & REER

Period	Y	TB	REER	PLE	PE
1	2.4742	8.4216	0.16393	0.386855	8.550918
2	6.709422	7.353828	6.666825	0.228326	16.51045
3	9.442033	6.974635	13.65691	0.18178	19.63844
4	10.77905	7.173633	19.04143	0.14879	20.2035
5	11.1734	7.542348	22.91125	0.129249	19.52213
6	10.99992	7.883697	25.64513	0.11729	18.2867
7	10.51233	8.141401	27.58008	0.106525	16.87225
8	9.871513	8.314771	28.96402	0.09692	15.48435
9	9.176052	8.419196	29.9679	0.094432	14.23004
10	8.484285	8.47172	30.70696	0.107743	13.15603
11	7.828914	8.486727	31.25856	0.145071	12.27219
12	7.226506	8.475203	31.67492	0.212119	11.56726

4.4 Robustness checks

The robustness of the results reported in the benchmark model was checked by employing a different identification criterion, and graphs for the IRFs for robustness checks are available on request.

In the Choleski decomposition we assumed that net tax decisions are made before output has been realized. We checked whether allowing net tax decisions to be made concurrently with output realization (i.e., case 1, $\partial_{nt}^{y} = 0$, $\alpha_{y}^{nt} \neq 0$) had any effect on our results. A_0 was specified as follows for case 1:

$$A_0 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & -\alpha_y^{nt} & 0 & 0 & 0 & 0 \\ -\partial_g^y & 0 & 1 & 0 & 0 & 0 & 0 \\ -\partial_g^{reer} & -\partial_{nt}^{reer} & -\partial_y^{reer} & 1 & 0 & 0 & 0 \\ -\partial_g^{tb} & -\partial_{nt}^{tb} & -\partial_y^{tb} & -\partial_{reer}^{tb} & 1 & 0 & 0 \\ -\partial_g^{ple} & -\partial_{nt}^{ple} & -\partial_y^{ple} & -\partial_{reer}^{ple} & -\partial_{tb}^{ple} & 1 & 0 \\ -\partial_g^{pe} & -\partial_{nt}^{pe} & -\partial_y^{pe} & -\partial_{reer}^{pe} & -\partial_{tb}^{pe} & \partial_{ple}^{pe} & 1 \end{bmatrix}$$

We found that the IRFs (not shown) computed using the above structural decomposition behave the same way as those of the Choleski decomposition. The contemporaneous effect of output on net taxes is positive; this is expected considering that indirect taxes and income tax move in tandem with output. We note that net tax revenue responds positively to a positive shock in output. Thus the previous results are robust to allowing contemporaneous correlation between *nt* and *y*.

A second structural model was estimated. By allowing a dual contemporaneous correlation between the amount of realized output and net tax revenue (i.e., case 2, $\partial_{nt}^{y} = 0,\ \alpha_{y}^{nt} \neq 0$); and also $\partial_{nt}^{ple} = 0$ was restricted, i.e., contemporaneous effect of tax revenue on public employment was set to 0. In the benchmark model, this coefficient (∂_{nt}^{ple}) is not significantly different from 0. The same ordering of variables was maintained as before, the contemporaneous relationships among the model variables (A_0) was specified to be the following for case 2:

$$A_0 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & -\alpha_{y}^{nt} & 0 & 0 & 0 & 0 \\ -\partial_{g}^{y} & 0 & 1 & 0 & 0 & 0 & 0 \\ -\partial_{g}^{reer} & -\partial_{nt}^{reer} & -\partial_{y}^{reer} & 1 & 0 & 0 & 0 \\ -\partial_{g}^{tb} & -\partial_{nt}^{tb} & -\partial_{y}^{tb} & -\partial_{reer}^{tb} & 1 & 0 & 0 \\ -\partial_{g}^{ple} & 0 & -\partial_{y}^{ple} & -\partial_{reer}^{ple} & -\partial_{tb}^{ple} & 1 & 0 \\ -\partial_{g}^{pe} & -\partial_{nt}^{pe} & -\partial_{y}^{pe} & -\partial_{reer}^{pe} & -\partial_{tb}^{pe} & \partial_{ple}^{pe} & 1 \end{bmatrix}$$

We found that our results are robust and similar to those of the benchmark model. Also we note that the restriction on employment is binding and valid (i.e., results of the Chi-square are not shown). We further check for robustness by employing a different sample starting in 1990:1-2008:4 and find that the results (not shown) are qualitatively similar to those of the benchmark model.

5.0 Conclusion

Drawing on the extant literature, this study investigates the effects of fiscal policy shocks on the South African economy. We examined the effects of fiscal policy shocks in a small open economy within a seven-variable VAR model. We find that the response of output to a shock in government expenditure variable is insignificant whilst output's response to a revenue (net tax) shock is positive.

The empirical findings indicate that there is a positive link between government spending and employment (private and public) and contrary to common belief, there seems to be a positive relationship between net taxes and private employment. Our findings also indicate that there is no link between government expenditure and output. This is surprising but reconcilable with classical doctrine; we also note that the effect of net taxes weakly increase output and this signals the presence of Ricardian effects in the economy.

The analysis suggests that employment levels can be boosted through government initiatives, mainly government expenditures seem to 'crowd-in' private sector employment and inflate public employment. An important finding in this study is that the transmission channel between government expenditures and output is not so direct as suggested in the Keynesian doctrine, but is indirectly shown by public employment's effects on output, hence we can conclude that classical effects are predominant in the South African economy, i.e., only improvements in the supply-side components can be linked to increases in output.

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Appendix

Table A.1: Summary Statistics

	G	*NT*	*Y*	*TB*	*REER*	*PLE*	*PE*
Mean	269156.1	71480.38	348338.6	1.04	105.28	103.89	139.97
Standard Error	5311.04	4962.57	7209.51	0.01	1.47	0.78	5.49
Standard Dev	41139.21	38439.93	55844.68	0.08	11.38	6.05	42.57
Kurtosis	-0.79	-0.38	-0.89	-0.97	-0.34	-1.37	-1.20
Skewness	0.78	0.83	0.53	-0.19	-0.47	-0.03	0.63
Range	136780	139091	199480.1	0.33	45.45	21.7	115.5
Minimum	221487	22645	264654	0.88	76.65	93.9	98.2
Maximum	358267	161736	464134	1.21	122.10	115.6	213.7
Count	60	60	60	60	60	60	60

Table A.2: ADF test results in levels

Variable	ADF statistic	Critical 10%	Conclusion
g*	-5.199	-2.593	Stationary
nt	0.814	-2.593	Non-stationary
y	1.1	-2.593	Non-stationary
reer	-2.035	-2.593	Non-stationary
tb	-2.436	-2.593	Non-stationary
ple	-0.541	-2.593	Non -Stationary
pe	-1.82	-3.172	Non -Stationary

Figure A.1: Graphs for all variables (In Levels)

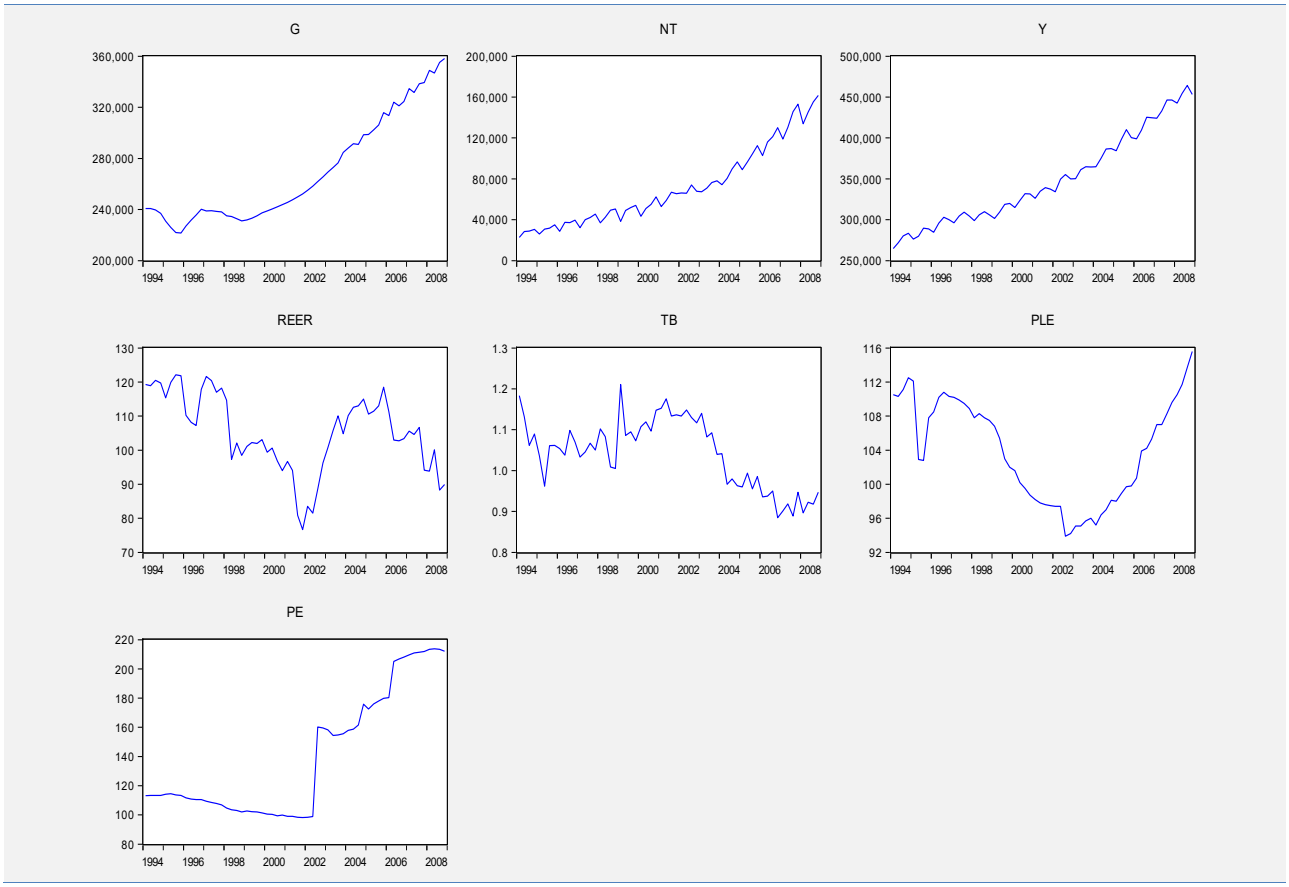

Figure A.2: Impulse response functions to a shock in government spending (g), Net Taxes (NT) and Public Employment (PLE)