Estimating Tax Elasticities: the case of Corporate Income Tax, Value Added Tax and Personal Income Tax in South Africa

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Abstract

Cyclically adjusted budget balances play an important role in fiscal policy formulation at Finance Ministries across the globe as they indicate sustainability of fiscal policy over the business cycle. The adjustment process depends on the correct estimation of tax elasticities, which may differ in the short- and long-run, as well as during periods of economic booms and busts. This paper estimates tax elasticities for the three major South African taxes, which will contribute to improved estimates of the cyclicality of tax revenues and the Cyclically Adjusted Budget Balance (CABB). After testing for the number of co-integrating relationships, single equation regression methods are employed to estimate the respective long run tax elasticities. Unlike previous studies, the effect of the terms of trade on the Cyclically Adjusted Budget is incorporated. This effect is especially important for commodity exporting countries such as South Africa. This has important implications for the Structural and Cyclical Budget Balances.

JEL Classification Numbers: H24, H30, H60

Keywords: Tax elasticity, Fiscal Policy, Budget Balance

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1. Introduction

Commodity booms and economic growth above long term potential output often result in strong revenue collection. Mining companies receive more for their output in commodity booms which is reflected in higher revenue, salaries and dividends. At the same time growth above potential also translates into higher demand for products and factors of production and often results in upward pressure on inflation. This has a strong positive, but temporary, impact on tax revenue. As the economy enters the next phase of the business cycle and the output gap narrows, however, tax revenue growth slows. Failure to distinguish between temporary and permanent flows of revenue threatens the sustainability of fiscal policy and the ability to conduct counter-cyclical fiscal policy.

Decomposing government revenue into a structural and transitory component gives a more accurate reflection of the funds available to the fiscal authorities over the longer term and ensures that important expenditure items such as social and investment expenditures are not compromised by temporary swings in tax revenue. The structural balance reflects revenue collection eliminates any temporary swings emanating from the commodity and/or business cycle. This paper aims to provide a more accurate estimation of the structural budget balance (SBB) taking into consideration not only the output gap, but also the terms of trade effect, which reflects the impact of commodity prices on tax collection. This paper thus uses the income gap – i.e. the output gap adjusted for terms of trade effects. The elasticities of Corporate Income Taxes (CIT), Personal Income Tax (PIT) and Value Added Tax (VAT) with respect to the income gap rather than the output gap are estimated and calculated.

This paper uses a number of measures to obtain a robust estimates of these elasticities. These methods include using survey data for the PIT equation. The results broadly indicate that using the income gap rather than the output gap to calculate tax elasticities leads to a more pronounced response to the cycle. The sensitivity of the structural budget balance to the different tax elasticities is quite large. For example, using unitary elasticities suggests a SBB of -2.62 per cent in 2008/2009, compared to a SBB of -3.39 per cent when the methodology in this paper is used.

The remainder of the paper comprises 7 sections. Section 2 briefly investigates the relationship between changes in commodity prices and fiscal revenue. This is then followed by a brief literature review. Section 4 provides a brief synopsis of the methodology employed in estimating and calculating the elasticities. Section 5 presents the results and section 6 provides estimates for the CABB for the three methods employed. Section 7 concludes with some policy implications and recommendations.

2. The relationship between commodity prices and tax revenue

The three main tax revenues in South Africa are Value Added Tax (VAT), Personal Income Tax (PIT) and Corporate Income Tax (CIT). Together, they constitute close to 86 per cent of total tax revenue.

The contribution of these three revenue streams has remained relatively stable over time. However, tax reforms in the late 90s, along with booming commodity prices, have changed the relative contribution of CIT and PIT over the last 8 years.

Tax legislation has changed considerably during the past five years. Normal adjustments for bracket creep have been implemented. The tax structures are of a progressive nature as to make the income distribution more equal. These include subsistence items that have zero rated taxes and higher taxes for those earning proportionately more of the countries income.

Figure 1: Tax composition

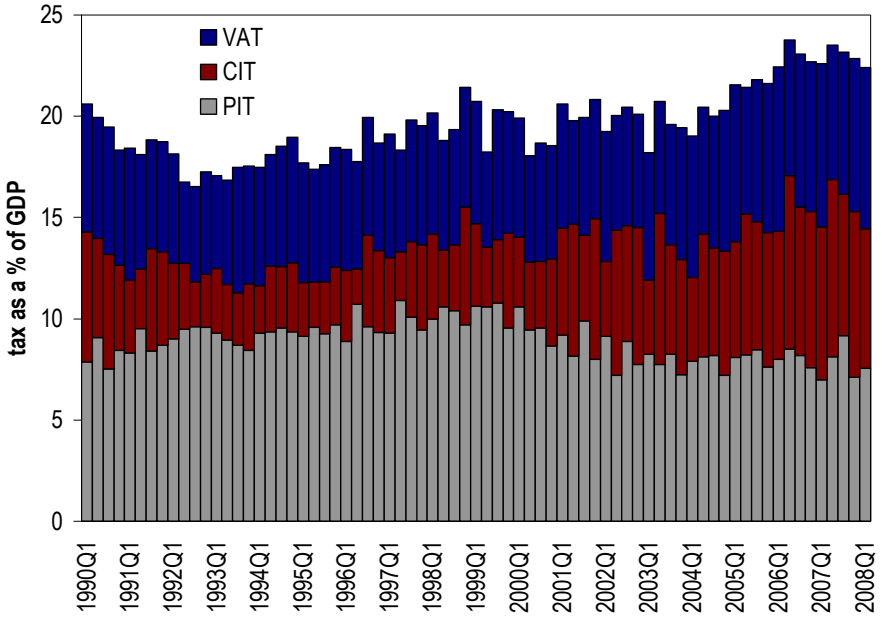

Figure 1 above, shows that CIT's contribution to total tax revenues increased significantly in the post 2003 period

Commodity prices have played an important role in increasing the contribution of CIT to total revenue. Close to 45 per cent of South Africa's exports are commodity based. Commodity prices increased to record high levels at the beginning of 2008. Platinum prices reached US$2166.5 per oz in February 2008, some 342 per cent higher than in 2002. In comparison, gold peaked at US$1733 per oz in February 2008, 228 per cent higher than the 2002 level. Oil prices jumped from a monthly average of US$19.37 in January 2002 to an average monthly high of US$133 in July 2008. During the 2008/2009 year, CIT, PIT and VAT increased by 16, 18 and 2.6 per cent respectively, reflecting the importance of commodity prices to the tax revenue pool. Many of the largest payers of CIT, for example Sasol, Anglo-American and Implats are commodity exporters. In addition, commodity price booms also have a significant indirect effect on the economy and tax revenues via the impact on domestic income and spending (for instance when profitability increases, dividends, salaries, and bonuses also rise). This ultimately affects not only CIT, but also other taxes such as PIT and VAT. In 2008, the global financial crisis resulted in a sharp fall in most commodity prices. This is expected to have a strong negative impact on South Africa's revenue collection.

Figure 2: Commodity price trends in local currency

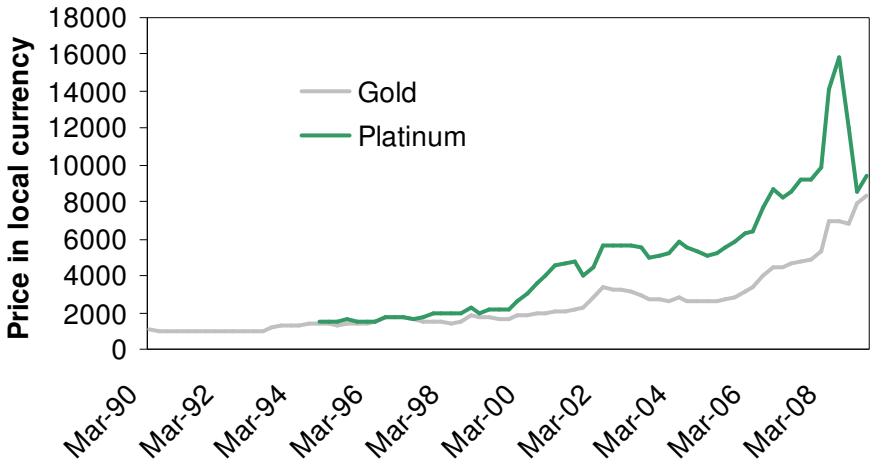

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Figure 3: Y-O-Y percentage change in tax revenues, GDP and the terms of trade

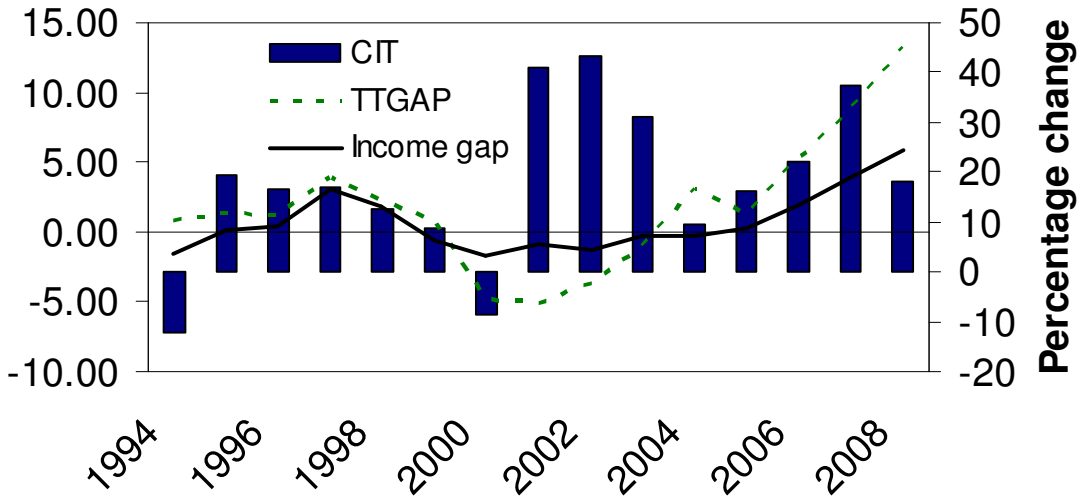


Figure 3 illustrates revenue collection, the income gap and the terms of trade gap since 1994. The spikes in CIT collection seems to coincide with similar spikes in the income gap. There is also a link between movements in the terms of trade gap and CIT collections. In a given tax year, if the terms of trade were rising, CIT collections were high and vice versa.

Figure 4: Cross correlation between corporate income tax, gold and platinum prices

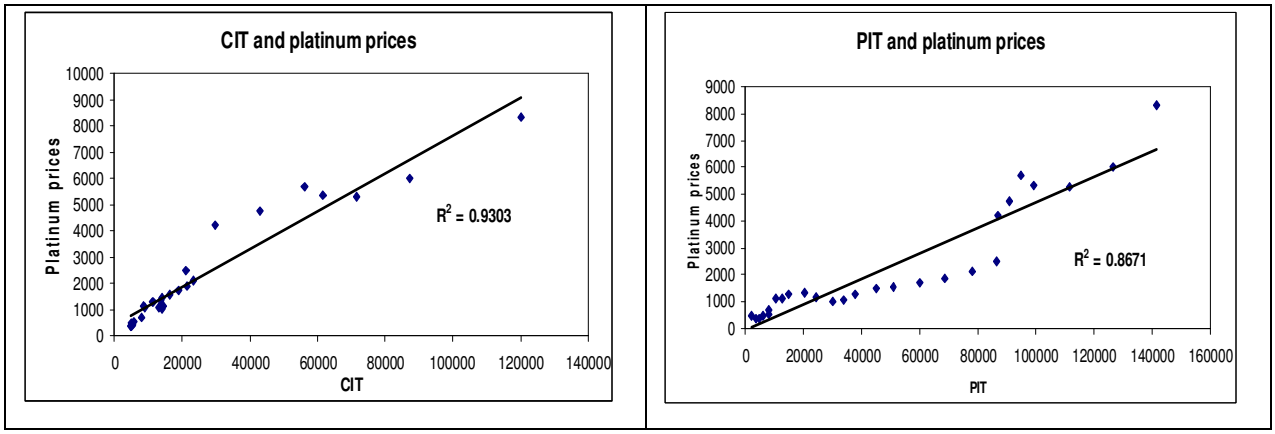


Figure 4 shows the strong correlation between CIT collections and platinum prices. It is assumed that mining exports are a close proxy for sales. If this assumption is correct then the share of mining exports as a percentage of GDP should impact profits and ultimately affect CIT. Mining exports rose to almost 17 per cent of GDP in 2007 and are close to 40 per cent of total exports.

Figure 5: Mining exports as a % of GDP

3. Literature review

The Structural Budget Balance (SBB) is defined as the conventional budget balance adjusted for the output gap.under the assumption that aggregate output fluctuates over time around an underlying path that reflects the long term trend (potential) of the economy. This underlying path is subjected to permanent and temporary shocks.

Various methods are used to calculate the structural budget balance (Hageman, 2006**)** but, the estimation generally relies on three steps:

(i) Estimation of potential output and the associated output gap.
(ii) Quantifying the cyclical component of revenues and expenditures.
(iii) Subtracting the cyclical revenues and expenditures from the actual (observed) levels.

Steps (ii) and (iii) require the estimation of tax elasticities which indicate the response of tax revenue to cyclical changes in the underlying tax bases.

Before estimating the tax elasticities one has to construct a CABB which can incorporate the various elasticities. The methodology used in this paper closely follows that of Branconier and Forsfält's (2004) construction of a CABB for Sweden. A traditional CABB was constructed using net government lending. However this CABB incorporated a degree of resource utilisation and adjustments for the unemployment gap on government spending effects. They found that for the case of Sweden these additional adjustments had a significant impact on the CABB. They adjust net lending for the following three factors:

- the output gap
- the unemployment gap (the difference between actual and equilibrium unemployment) and
- composition effects (the deviation of the tax base to the proportion of GDP

To account for different tax rates, it is assumed that tax rates are independent of the business cycle and the authors use actual tax revenues. Similarly, they assume that the

unemployment benefits payable to individuals does not change over the cycle, although the aggregate amount paid out will.

Their results suggest that in the 1990's actual deficits were much higher than the CABB. They also compare differences in their method with the OECD method (Girourd and Andre, 2005) and highlight that the difference is the result of exports which the OECD methodology ignores. This study in part implements Braconier and Forsält's methodology for the South African economy.

Girourd and André (2005) estimate tax elasticities for a panel of 28 countries which is then incorporated in the SBB calculations. Unlike Braconier and Forsfält (2004), their study takes account of structural reforms. The study uses micro data on the distribution of earnings for the estimation of the PIT elasticity. The results suggest that the sensitivity of government net lending to a 1 percentage point change in the output gap remains around 0.5 per cent of GDP. A further analysis of their results also suggests that the countries where a significant difference between the CABB and the budget balance was observed, were countries where commodity exports make up a large share of GDP.

Using the Girourd and André (2005) methodology , Lizondo et al. (2006) calculates the tax elasticiticies for the output gap for South Africa. The estimated elasticities with respect to CIT, PIT and Indirect taxes are 2.52, 1.44 and 0.99 respectively. This reflects the progressive nature of both CIT and PIT. An elasticity smaller than one is suggestive of a regressive tax structure as revenues don't respond equally in changes to the tax base

Van Rensburg (2007) calculated[1] the various elasticities according to the different tax types. The calculated elasticities with respect to CIT, PIT and VAT are 2.35, 1.10 and 1.33 respectively.

Turner (2006) estimates the structural budget balance for Australia, asking whether commodity dependent countries' structural budget balances should be adjusted for the terms of trade. Turner (2006) shows that these countries' tax revenues are significantly

[1] Van Rensburg estimates point elasticities as the percentage change in the actual tax revenue divided by the percentage change in the proxy tax base.

influenced by commodity price volatility. The final results obtained for Australia were compared to the panel of countries Girourd and Andre (2005) estimated. Because Australia is a major commodity exporting country the terms of trade effect is included in calculating the SBB. The income gap captures both the output gap and terms of trade effects. If a country has a large export share of GDP, that country is then ideally a suitable candidate for a terms of trade adjustment in estimating these elasticities. In the list of OECD countries, Norway had the highest share with mining exports contributing 17 per cent to GDP. Turner adjusts the CCAB based on PIT, CIT and Indirect taxes. The results are significantly different to previous studies done for Australia and illustrate the role of the terms of trade in calculating the SBB. The adjustments based on the income gap for PIT and CIT are 0.54 and 1.96 compared to the standard OECD panel elasticities of 1.04 and 1.45 for PIT and CIT respectively.

Swanepoel (2007) employs Turner's methodology to estimate the elasticity of aggregate tax revenue in South Africa. His estimated elasticity is 1 implying that 1 per cent increase in the income gap translates into 1 per cent increase in total revenue.

Du Plessis' (2008) paper focuses mainly on answering the question whether fiscal policy has been pro or countercyclical. They, like Lizondo et al (2007) employ Girourd and Andre's methodology (with the exception of using the HP filter). Their elasticity results for PIT, CIT and VAT corresponding to the output gap are 1.05, 0.82 and 1.3 respectively. Du Plessis in Burger (2008) raised concerns on using the HP filter as a measure of obtaining the output gap. This study continues the use of the HP filter to obtain the output gap as this is used in most studies (notably Girourd and Andre). The problem with employing Du Plessis' output gap measure is the continuous negative output gap during the 1990's which only turned positive in recent years.

4. Methodology

The methodology is based on Girourd and André (2005), Turner (2006), Lizondo (2006) However, unlike Swanepoel (2007) the paper estimates separate elasticities for CIT, PIT and VAT.

The aim of the paper is to calculate the CABB using the formula:

$$b^* = \frac{b_c}{y^*} = [(\sum_{i=1}^{3} T_i^*) - G_0 + X] / y^*$$

where

$$T_i^* = T_i (\frac{y^*}{y})^{E_{t,y}}$$

y^* *is potential output*
T^* *is the cyclically adjusted tax for three tax categories*
G *is unadjusted government* exp *enditure*
X *is nontax revnue* min *us capital and net* int *erest spending*
$\varepsilon_{t,y}$ *is the estimated revenue elasticity regarding the cycle and tax collections*

This requires the calculation of potential income and the revenue elasticity with respect to the cycle.

The first step in the analysis is to calculate the income gap to capture the terms of trade effect and the output gap. Following Turner (2006), gross national income can be derived as follows:

RGDI= RGDP.[1+xsh.(TT-1)] (1)

RGDI*=RGDP*.[1+xsh.(TT*-1)] (2)

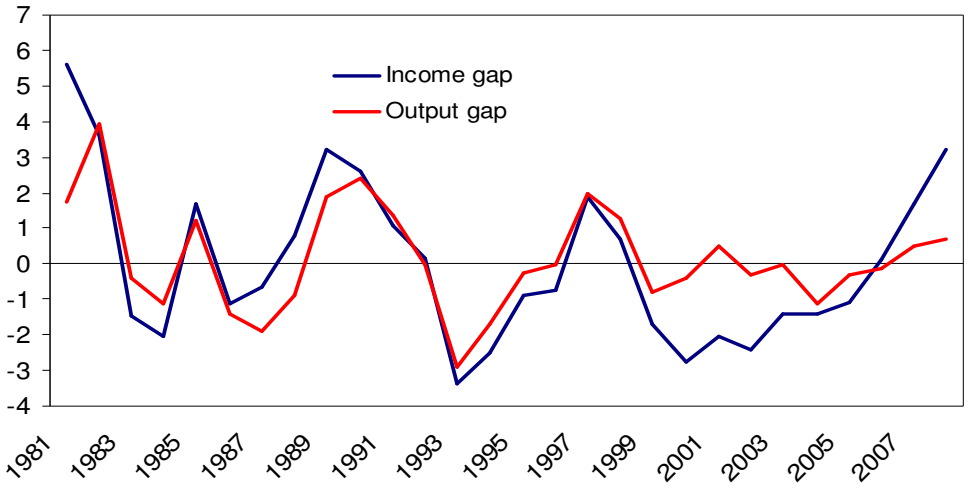
where
RGDI-real gross domestic income
RGDP-real gross domestic product
TT-terms of trade
RGDI*-potential real gross domestic income
RGDP*-potential real gross domestic product
TT*-long run trend in the terms of trade

xsh - the share of exports to GDP in the base year

The above specification implies that real gross domestic income (RGDI) measures the purchasing power of income generated by both domestic production and changes in the terms of trade. The income and output gaps are then defined as (RGDI/RGDI*) and (RGDP/RGDP*).

The HP filter is then used to calculate potential income and output (Giorno, 1995). The HP filter decomposes a series in its trend and cycle. Figure 4 provides a graphical representation of the implied income- and output gaps for South Africa.

Figure 6: The GDP and GDI gaps



The income gap follows the GDP gap quite closely until 1999. During the 1999 - 2003 period the South African terms of trade deteriorated, but recovered again in the post 2003 period as the commodity price boom took off. The divergence between the income and output gaps is largely associated with the terms of trade movements over the period.

Once the income and output gaps have been calculated, there are three methods for calculating the CIT, PIT and VAT elasticities, namely:

i) Applying a rule of thumb method by assuming a unitary elasticity of tax revenues to the output gap / income gap (Lizondo et al., 2006)

ii) Using different elasticities in broad tax categories, which are estimated using econometric techniques
iii) And by using a disaggregated method that allows for possible composition effects in the GDP cycles (Lizondo et al., 2006)

This paper generates results that are based on the second methodology which is then also compared to the other methodologies described above. The study calculates two types of elasticities for CIT, PIT and VAT. The first one links changes in the tax base to the tax revenue collected, while the second elasticity measures the response of the tax base to changes in the output or income gap. In order to calculate the final elasticity of tax revenue to the income gap, the study multiplies the tax base elasticity with the income gap elasticity. Mathematically,

$$\varepsilon_{t,y_i} = \rho_i^{y_i} \rho_{y_i}^{y} \quad (3)$$

Where:

$\varepsilon_{t,y}$ Total elasticity of tax revenue to the income gap.

$\rho_i^{y_i}$ The elasticity of the different taxes with respect to the various tax bases.

$\rho_{y_i}^{y}$ The elasticity of the various tax bases with respect to the income or output gap.

The reduced form elasticities are then defined as follows:

For PIT

$$\varepsilon_{t,y} = (\partial T / \partial Y)Y / T = (\partial((T / L)L) / \partial Y)Y / T = (\partial((T / L)L)\partial W)W / T(\partial W / \partial Y)Y / W = \varepsilon_{t,w}, \varepsilon_{wl,y}$$

Where $\varepsilon_{t,y}$ is the elasticity of personal income tax with respect to the output gap, $\varepsilon_{t,w}$ is the elasticity of personal income tax to the wage bill and $\varepsilon_{wl,y}$ is the elasticity of the wage bill to the income gap.

For CIT

$$\varepsilon_{t,y} = (\partial T / \partial Y)Y / T = (\partial Z / \partial Y)Y / Z = (\partial Y - WL)) / \partial Y)Y / Z = (1-(1-Z / Y))((\partial WL / \partial Y)Y / WL))Y / Z = (1-(1-$$

Where $\varepsilon_{t,y}$ is the elasticity of value added tax with respect to the output gap, PS is the profit share in GDP, Z is the gross operating surplus and $\varepsilon_{wl,y}$ is the elasticity of the wage bill to the output gap.

For VAT

$$\varepsilon_{t,y} = (\partial T / \partial Y)Y / T = (\partial V / \partial Y) / \partial Y)Y / V = ((\partial V / Y)L) / Y / V) / (\partial Cs / \partial Y)Y / Cs = \varepsilon_{t,w}, \varepsilon_{cs,y}$$

Where $\varepsilon_{t,y}$ is the elasticity of value added tax with respect to the output gap, $\varepsilon_{t,Cs}$ is the elasticity of value added tax to consumption and $\varepsilon_{Cs,y}$ is the elasticity of consumption to the output gap.

Following, Bouthervillian et al. (2001), the progressive tax elasticity is estimated by regressing the nominal tax revenues on proxy tax bases in real terms. These short run elasticities indicate the progressive nature of each tax. The regression can be expressed as follows:

$$\rho_i^{y_i} = \Delta \log(Ti,t) = \beta 0 + \beta 1 time + \beta 2 \Delta \log(Ti,t-1) + \beta 3 \Delta \log(Yi,t) + \varepsilon t \qquad (4)$$

Where the first term $\Delta \log(Ti,t)$ represents the tax revenue expressed as an AR(1) representation (which allows for a delayed response of tax revenues to the cycle), the respective tax base, a dummy variable, a constant and an error term.

However, to account for possible endogeneity, Johansens cointegration tests were applied (Johansen, 1995).The results from the test indicate the presence of a single cointegrating relationship and hence single equation regression techniques using OLS have been employed.

Compensation of employees is used as a tax base for PIT. This captures most income derived by individuals. The progressive nature of the personal income tax implies that the calculated elasticity for PIT should be greater than one.

In the case of PIT, an additional method to equation (4) above is proposed by Girourd and André (2005) and is employed in order to obtain a more robust elasticity for the tax revenue to the tax base. The method uses the Labour Force Survey (LFS) and Income and Expenditure Survey (IES) and is based on the following formula:

$$\rho_i^{y_i} = [\sum_{i=1}^{n} \gamma_i MA_i] / [\sum_{i=1}^{n} \gamma_i AV_i] \quad (5)$$

$\rho_i^{y_i}$: Elasticity tax per worker.

γ_i : Weight of the earnings level *i* in total earnings expressed in currency units earned.

MA: The marginal income tax rate at point i on the earnings distribution.

AV: The average income tax rate at point i on the earnings distribution.

Worker remuneration was split into deciles whereby marginal and average taxes were assigned to each income category by applying the tax brackets as is stipulated in the various budget reviews. A log normal distribution has been fitted according to two parameters, i.e. the ratio of the earnings level at the first decile to the median decile and the ratio of the ninth decile to the median decile.

Going back to equation (4), CIT revenues are regressed on gross operating surplus, a time dummy, a constant and an autoregressive term. The net operating surplus or gross operating surplus is used as the tax base for corporate income tax.

Household consumption is used as the proxy tax base for value added taxes. VAT may be either progressive or regressive as some items are exempted.

The next step in our analysis is to estimate the cyclicality of the respective tax bases. The paper follows Girourd and André (2005) and Turner (2006) and regresses the cyclical components of the base on the output or income gap as follows:

$$\rho_{y_i}^{y} = \Delta \log(Yi, t / Y*i, t) = \gamma 0 + \gamma 1 \Delta \log(Yi, t-1 / Y*i, t-1) + \gamma 2 \Delta \log(Yt / Yt*) + \nu t \quad (6)$$

The dependant variable is the tax base expressed as a ratio of potential output or potential income. This is a function of the differenced lagged dependant variable and the income/output gap. To account for exchange rate fluctuations, which is an important driver of exports and CIT collections, Lizondo (2006) suggests that the log difference of the nominal Rand/US$ exchange rate be included in the CIT regression.

5. Results

The results are divided into three parts. Firstly the elasticities reflecting the elasticity of the relevant tax to the proxy tax base is estimated. This is followed by the elasticity of the tax base to the income and output gaps and finally the tax elasticities with respect to the income and output gaps are calculated.

The results in table 1 column A indicate that a 1 per cent change in the wage bill (also known as the total compensation of employees) should result in 1.16 per cent change in PIT revenue[2]. The size of the coefficient reflects the progressive nature of PIT and is inline with other studies (Girourd and André :2005). The elasticity of CIT with respect to its tax base is also larger than 1. It reflects the strong growth in company profitability over the last couple of years. The VAT elasticity is estimated at 1.13 per cent, which is in line with estimates for some OECD countries (Girourd and André: 2005).

Looking at the responsiveness of the respective tax bases to the income gap in column B, the estimation results suggests that the wage bill will rise by 0.9 per cent when the income gap widens by 1 per cent. In the case of the gross operating surplus, the elasticity was estimated at 1.38 per cent.

Using equations (3) and (6), the results from table 1 and 2 are combined to calculate the overall tax elasticity with respect to the income and output gaps. These are then compared to the rule of thumb, the output gap method and the calculated results. Table 1 clearly shows that the differences between the output and income gap have significantly different impacts on projected tax revenues. Taxe revenues seem to be much more responsive to income- than output gaps (especially in the case of CIT).

[2] Please take note that when the survey method is used for PIT, the elasticity is 1.16 which is slightly higher than the regression outcome.

Table 1: Total tax elasticity

	Unitary elasticity method	Output gap method	(A) Tax to tax base	(B) Tax base to the income gap	(A)*(B) Income gap method	Calculated method
PIT	1.00	1.08	1.16	0.90	1.04	1.10
CIT	1.00	1.70	1.31	1.38	1.81	2.35
VAT	1.00	0.72	1.13	0.97	1.10	1.33

All the results are statistically significant at the 10 percent rejection level

6. The cyclical adjusted balance using the three proposed methods

Finally, using the methodologies of Braconier and Forsfält (2004) as well as Girourd and Andre(2005), the structurally adjusted budget deficit is calculated by using the rule of thumb (unitary) elasticities, elasticities calculated by van Rensburg (2007) and finally the elasticities estimated in this study.

Figure 7 indicates that Van Rensburg's calculated elasticities will have the strongest effect on the cyclical revenue component, whilst the rule-of-thumb elasticities have the most moderate effect.

It follows that the difference between the highest and lowest cyclical revenue components (and hence the SBB) equates to 127 basis points in the 2007/08 fiscal year - clearly illustrating the importance of employing the correct elasticities.

Figure 7: Structural and cyclical component of the budget balance as a % of GDP

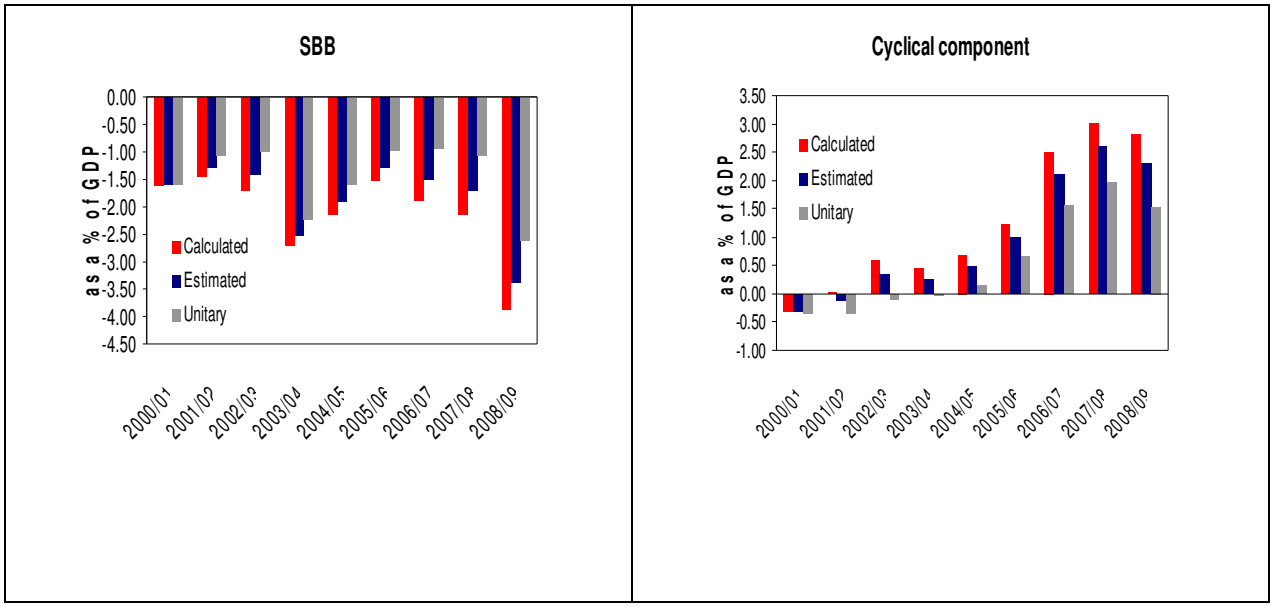
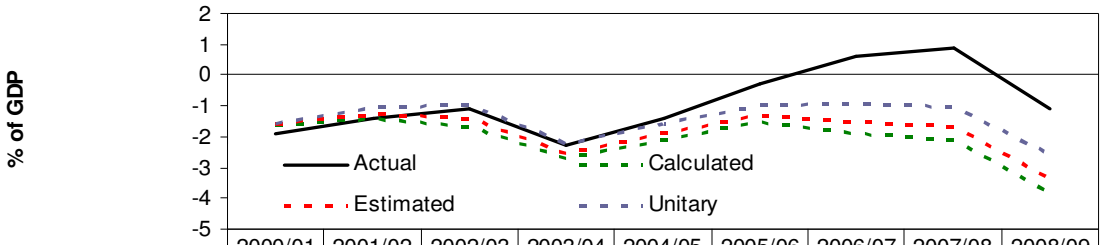


Figure 8: The actual and the SBB, using three different methods



	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Actual	-1.9266	-1.39454	-1.08631	-2.2679	-1.44218	-0.31081	0.607582	0.883708	-1.08908
Calculated	-1.61	-1.43	-1.69	-2.72	-2.13	-1.53	-1.89	-2.13	-3.89
Estimated	-1.60	-1.28	-1.43	-2.53	-1.91	-1.30	-1.50	-1.71	-3.39
Unitary	-1.57	-1.06	-1.00	-2.25	-1.59	-0.97	-0.95	-1.07	-2.62

Figure 8 indicates that the divergence between the actual and structurally adjusted budget balance has increased since the 03/04 fiscal year. This reflects the fiscal benefits emanating from the commodity boom, which has also contributed to an acceleration in the domestic growth performance.

7. Conclusions and recommendations

This paper compared estimates of the elasticities of CIT, PIT and VAT to changes in the income and output gaps. These elasticities were used to adjust the budget balance to reflect temporary changes in tax revenue and thus to provide policymakers with better estimates of the sustainability of fiscal policy over the long(er) term.

Considering the differences in the results, based on the three different elasticity estimation methodologies, it is key that a degree of caution is exercised when interpreting and using the results in fiscal planning exercises. Additional information, such as industry reports and other micro data analysis needs to be an integral part of the budget process.

While some phases in the cycle might be long, it is worthwhile to adjust the CABB for asymmetries. Doing this, policy makers would have a better reflection with regards to revenue trends.

Policy makers should take heed of the structural changes an economy goes through. A significant change in the course of revenue collection can severely impact debt if policy is set to spend then fund the spending.

Taking heed of the estimated elasticities and making reasonable deductions regarding the downward path of a cycle, policy makers are enabled to improve their decision making process.

Going forward, further work needs to be done on output gap estimation, accounting for SARS efficiencies and also to establish the effects that changes in tax legislation might have (had) on (cyclical) tax revenue developments.

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Appendix:

Johansen's co-integration

The trace and maximum eigenvalue statistics suggest that there is one co-integrating vector for all the equations.

Tax (i) to tax base (i)

CIT (with 1 cointegrating vector)

1 Cointegrating Equation(s):		Log likelihood	68.91776
Normalized cointegrating coefficients (standard error in parentheses)			
LOG(CIT)	LOG(GOS)	C	
1	-1.310989	8.95075	
	-0.19171	-2.56242	
Adjustment coefficients (standard error in parentheses)			
D(LOG(CIT))	-0.012951		
	-0.03346		
D(LOG(GOS))	0.044717		
	-0.00954		

PIT (with 1 cointegrating vector)

1 Cointegrating Equation(s): Log likelihood 113.5666

Normalized cointegrating coefficients (standard error in parentheses

LOG(PIT)	LOG(WB)
1	-0.932137
	-0.01526

Adjustment coefficients (standard error in parentheses)

D(LOG(PIT))	-0.071596
	-0.09286
D(LOG(WB))	-0.075551
	-0.02413

VAT (with 1 cointegrating vector)

1 Cointegrating Equation(s): Log likelihood 91.9166

Normalized cointegrating coefficients (standard error in parentheses)

LOG(VAT)	LOG(CE)	C
1	-1.130402	4.422133
	-0.05041	-0.80093

Adjustment coefficients (standard error in parentheses)

D(LOG(VAT))	-0.344596
	-0.19861
D(LOG(CE))	0.111976
	-0.03507

Tax base (i) to the income gap

Gross operating surplus(1 cointegrating vector)

1 Cointegrating Equation(s): Log likelihood 124.8664

Normalized cointegrating coefficients (standard error in parentheses)

LOG(GOS/INCOME)	LOG(INCOMEGAP)	C
1	-1.379526	-4.711078
	-24.5887	-0.9174

Adjustment coefficients (standard error in parentheses)

D(LOG(GOS/INCOME))	-0.01316
	-0.00602
D(LOG(INCOMEGAP))	0.004697
	-0.00232

Wage bill(1 cointegrating vector)

1 Cointegrating Equation(s): Log likelihood 147.3166

Normalized cointegrating coefficients (standard error in parentheses)

LOG(WB/INCOME)	LOG(INCOMEGAP)
1	0.9027859
	-26.2275

Adjustment coefficients (standard error in parentheses)

D(LOG(WB/INCOME))	-0.003241
	-0.00789
D(LOG(INCOMEGAP)	-0.015816
	-0.00581

Consumption (1 cointegrating vector)

1 Cointegrating Equation(s): Log likelihood 139.5926

Normalized cointegrating coefficients (standard error in parentheses)

LOG(CE/INCOME)	LOG(INCOMEGAP	82
1	-0.9726374	0.16905
	-42.6557	-0.10613

Adjustment coefficients (standard error in parentheses)

D(LOG(CE/INCOME))	-0.005734
	-0.00456
D(LOG(INCOMEGAP))	0.006009
	-0.00286