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Cyclicality of Revenue and Structural Balances in South Africa

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Abstract

This paper applies a disaggregated method for the calculation of the cyclical component of the budget balance for South Africa with an emphasis on the effect of commodity and asset prices, and credit cycle. Results show that the cyclicality of tax revenue is mostly explained by the variations in tax bases. Change in the credit to private sector also has some affect on the revenue performance; however, asset and commodity prices are not significant in explaining the deviation of revenue from its trend. Nonetheless, quantitative effects of these prices are subject to assumptions used for long-run price levels.

JEL Classification Numbers: C32, C50, E32

Keywords: South Africa, structural balance, credit growth, commodity and asset prices

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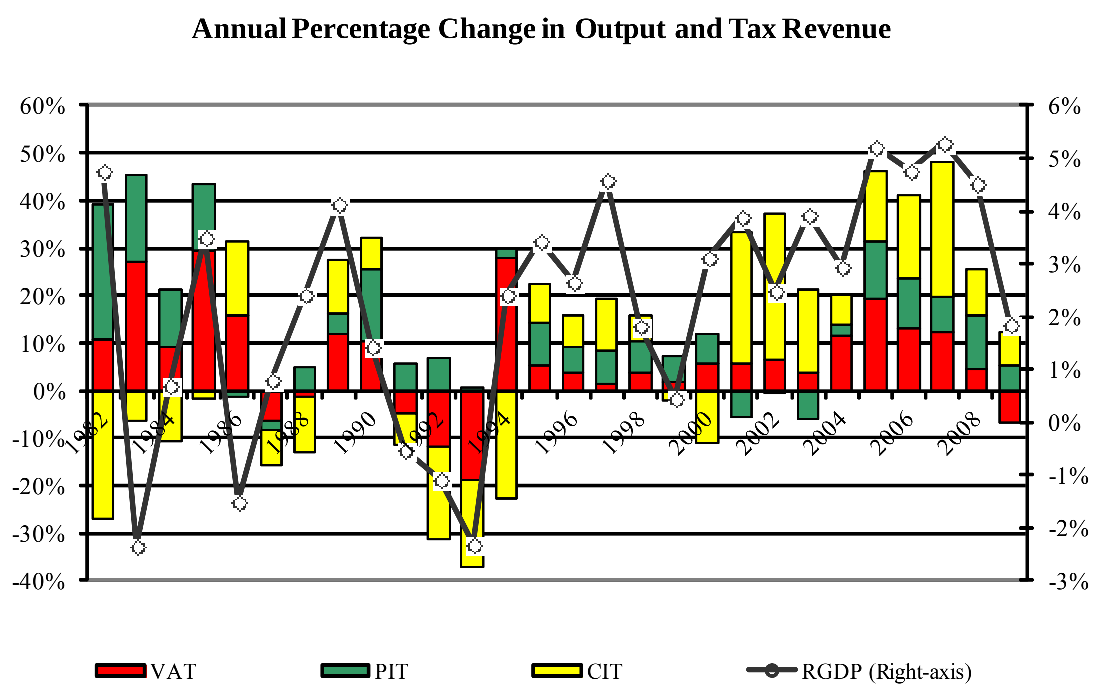
I. Introduction

This paper applies a disaggregated method for the calculation of the cyclical component of the budget balance for South Africa. This methodology estimates the cyclically adjusted budget balance with an emphasis on the effect of commodity and asset prices and the credit cycle.[1] This paper describes quantitatively the effect of the business cycle and changes in the commodity and asset prices and credit growth on fiscal revenue generation in South Africa.

Cyclical balances are estimated to net out the impact of the economic cycle from tax revenues because tax revenue is highly correlated with the business cycle. During economic upturns tax revenues increase owing to positive improvements on the supply side—for example, higher corporate and personal income taxes—and on the demand side—higher tax revenue collected on goods and services (Figure 1). Similarly, government expenditure would be lower on cyclical accounts such as unemployment benefits.

Figure 1. Tax Revenue and Business Cycle



Note: Percent changes are estimated in fiscal year; x-axis labels indicate the fiscal year ending March of that year.

Cyclical adjustment has various advantages. First, cyclically adjusted balances better reflect the medium-term fiscal outlook. Second, countries that target cyclically adjusted balances

[1] This paper uses structural and cyclically adjusted balances as two interchangeable terms.

can apply and benefit from countercyclical policies, such as increased fiscal space to reduce a country's need for foreign financing and to sustain spending on social policies.

On the other hand, some caveats exist in using cyclically adjusted balances. First, cyclical adjustment relies on potential/trend level estimates for output and tax bases. As in any statistic, calculation of a potential level contains an estimation bias, and the estimated structural balance deviates from the true structural balance as the bias in the estimated potential increases. Second, there is a bias in the estimate of the elasticity of tax revenue to the deviations in the business cycle, commodity and asset prices, and the credit cycle. This bias would also cause a deviation between the true and the estimated values of the cyclically adjusted balance.

This paper studies the impact of the business cycle in South Africa's tax revenue collection, together with the impact of the commodity and asset prices and the credit cycle. The impact of the commodity prices on revenue collection is analyzed owing to the significant share of mining exports in total exports.[2] The mining sector constituted around 30 percent of total exports in South Africa during the late 2000s. This share was more than 50 percent during the early 1990s.

The impact of asset prices on revenue collection is considered because of their direct impact—for example, through capital gains tax collection—and their indirect effect, for instance, through altering the consumption and investment behavior of firms and households. Additionally, similar to the global trend experienced during the 2000s, South Africans enjoyed double digit growth rates in various asset prices. House prices on average increased by more than 15 percent, and the Johannesburg Stock Index increased by more than 35 percent per year during 2005–08.

The impact of the credit cycle on tax revenue performance is measured, because of its influence on saving-investment behavior. Also, South Africans' access to bank credit increased significantly during the 2000s. Bank credit extended to the private sector grew on average around 20 percent per year during the mid-2000s.

Results in this paper show that the cyclicality of tax revenue is mostly explained by variations in the tax bases. Change in credit to the private sector also affects revenue performance. On the other hand, the impact of asset and commodity prices is not sufficient to explain the deviations of revenue from its trend. However, the quantitative effect of these prices is subject to the assumptions used for long-run price levels.[3]

In what follows, Section II provides the literature review. Section III presents the data. Section IV provides the model and presents the results of this model. Section V concludes.

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[2] Note, however, that the share of mining revenue in total tax revenue is quite limited.

[3] Fluctuations in commodity and asset prices are measured as the deviation of these prices from their long-term levels.

II. Literature

The literature on estimating structural balances is vast. Various institutions including the International Monetary Fund (IMF), European Central Bank (ECB), and Organization for Economic Cooperation and Development (OECD), as well as the national treasuries of many countries, have published papers on structural budget balance estimates.

Researchers in this literature focused on methodologies to estimate the cyclical adjustment either for the aggregate revenue or for the disaggregated revenue by measuring the cyclical part of the main components of the total tax revenue.

In the first strand of this literature, where structural balances are estimated from an aggregate perspective, Fedelino, Ivanova, and Horton (2009) estimate the cyclicality of total revenue with respect to the output gap by focusing on the approach used by the IMF's Fiscal Affairs Department, with special attention to scaling factors—potential GDP versus nominal. Similarly, the Congressional Budget Office (2009) estimates the cyclically adjusted budget balances by relying on the output gap.

In the second strand of this literature, researchers followed a disaggregated methodology and estimated the elasticities of the main components of the tax revenue with respect to the cycle in their relevant tax bases. Based on estimates of the structural levels of individual tax revenues, total cyclically adjusted tax revenue is estimated from the sum of the structural balances of these individual components (Bouthevillain and others, 2001). In this literature, some researchers relied on econometric estimates of tax revenue elasticities (Debrun, 2006), and some relied on the elasticities calculated on the basis of statutory tax rates and the income distribution to which they are applied (Girouard and André, 2005).

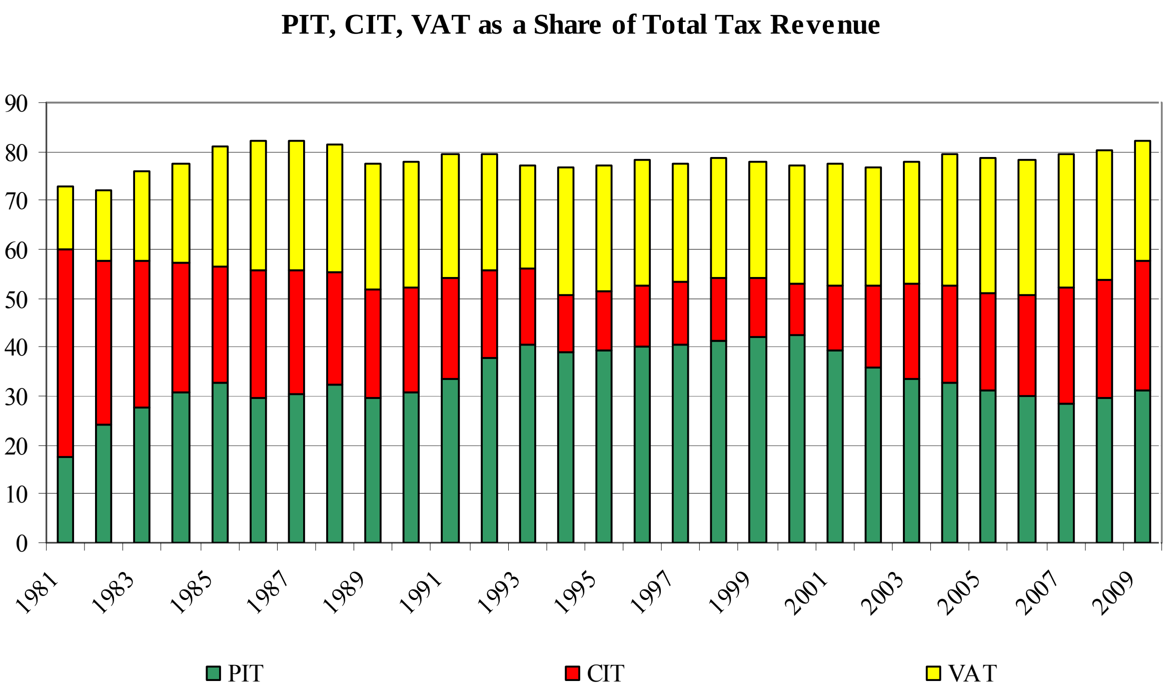
However, the literature studying the impact of the commodity and asset prices and the credit cycle on the cyclicality of tax revenue is limited. In this literature, Farrington and others (2008) adjust structural balances for equity and stock market effects. Rodriguez, Tokman, and Vega (2007) study the impact of copper and molybdenum prices on the structural fiscal balances of Chile. To our knowledge there is no paper that studies the impact of credit growth on tax revenue performance.

III. Data

This paper uses seasonally adjusted macroeconomic variables available in annual and quarterly frequency from January 1980 to December 2008. These variables are national government revenue and its components, general government revenue and expenditures, output, price deflators, real interest rate, prices of gold and platinum, an index of asset prices, house prices, stock price indices, price earnings ratio, and credit extended to the private sector. The first three data series are obtained from the National Treasury of South Africa, and the latter series are obtained from the South African Reserve Bank, World Economic Outlook (IMF, 2010), DataStream, and Bloomberg.

The three main components of tax revenue in South Africa are personal income tax (PIT), corporate income tax (CIT), and the value-added tax (VAT). The sum of these three taxes constitutes around 80 percent of the total tax revenue in South Africa (see Figure 2).

Figure 2. Share of Three Main Taxes on Total Tax Revenue



Given the high share of PIT, CIT, and VAT in the total tax revenue in South Africa, this paper focuses on estimating the cyclical adjustment of these three tax revenues with respect to the fluctuation in their tax bases. The remaining tax revenues will be adjusted with respect to the output gap.

IV. Cyclically Adjusted Balances

A. A Simple Adjustment: Methodology

This paper uses a disaggregated approach to measure the cyclically adjusted budget balances for South Africa. This approach decomposes revenue into its main components and estimates individually the fluctuation in these components. Then the cyclical revenue fluctuation is deducted from the overall budget balance.

If one were to express overall fiscal balance of a country as given in equation (1):

$$OB_t = R_t - E_t \quad (1)$$

where OB_t stands for the overall fiscal balance, R_t is the total revenue, and E_t is the expenditure. Then the structural balance could be expressed as:

$$\dot{O}B_t = \dot{R}_t - E_t \quad (2)$$

where $\dot{O}B_t$ stands for the structural balance and $\dot{R}_t$ is the structural revenue.[4] One can decompose actual revenue into cyclical, R^c, and structural, $\dot{R}$, components as given in equation (3):

$$\ln\left(R_t\right) = \ln\left(\dot{R}_t\right) + \ln\left(R_t^c\right) \quad (3)$$

If one were to define the output gap as the logarithmic difference between the real level and the potential level of a variable, then the cyclically adjusted component of revenue can be expressed as:

$$\ln\left(R_t\right) - \ln\left(\dot{R}_t\right) = \varepsilon_R\left[\ln\left(Y_t\right) - \ln\left(\dot{Y}_t\right)\right] \quad (4)$$

In the equation above, ε_R is the elasticity of revenue with respect to the output gap. If output is larger than the potential, then the actual revenue would be higher than the cyclically adjusted revenue.

In the disaggregated method, tax-specific elasticities for the three main taxes are estimated separately: personal income tax, corporate income tax, and value-added tax. Other tax revenues are adjusted relative to the output gap with an elasticity of one.

Equation (5) shows that the disaggregated tax revenue of component *i*, R_{it}, is equal to the sum of the structural tax revenue and the cyclical component that changes with respect to the cycle in its tax base, TB_{it}.

$$\ln\left(R_{it}\right) - \ln\left(\dot{R}_{it}\right) = \varepsilon_{iR}\left[\ln\left(TB_{it}\right) - \ln\left(\dot{T}B_{it}\right)\right] \quad (5)$$

[4] Following the empirical evidence provided in this literature, no adjustment is made on the expenditure side (Fedelino, Ivanova, and Horton, 2009). Similarly, Bouthevillain, and others (2001) use a near-zero (-0.2) adjustment on the cyclical component of the total expenditure.

In equation (5), there are three unknowns: potential revenue, potential tax base, and elasticity of tax revenue with respect to its tax base. In the literature, researchers used various methods to reduce the number of unknowns in this equation.

Some researchers approximated elasticity of that tax revenue, ε_{iR}, with respect to the cycle in its tax base, by estimating the change in revenue over time with respect to the change in tax base over time, as shown in equation (6):

$$(\ln R_{it} - \ln R_{it-s}) = c + \hat{\varepsilon}_{iR}\left(\ln TB_{it} - \ln TB_{it-s}\right) + \nu_t \quad (6)$$

where the subscript s stands for the frequency of the data and where s is equal to 1 in annual data and to 4 in quarterly frequency, netting out the impact of seasonal fluctuations.

Other researchers approximated the elasticity of that tax revenue, ε_{iR}, by estimating the change in revenue over time to the gap in its tax base.

Some problems are associated with these approximations. First, approximation of $\hat{\varepsilon}_{iR}$ to ε_{iR} may not be very reliable if the over time changes in tax revenue do not approximate the structural gap in the tax base. Second, the level of the structural tax base is an estimated statistic, and as in any estimation, this calculation is prone to biases. By regressing the change in tax revenue over time to the output gap or to the tax-base gap, one would introduce an unbalanced one-sided bias to this regression.

This methodology estimates the potential real tax base and real tax revenue through an HP filter.[5] By this, the problem of approximating the tax revenue gap with the over time change in tax revenue will be eliminated. Also, assuming the HP filter produces a similar bias in calculating the potential level of the tax revenue and the tax base, and the problem of introducing a one-sided bias to the regression will be eliminated: in this methodology, the right and left hand sides of equation (5) would be balanced.

After estimating the elasticity of tax revenue with respect to tax base gap from equation (5), the cyclical component of tax revenue is going to be calculated as a residual by deducting the actual revenue from the predicted revenue gap of equation (5).

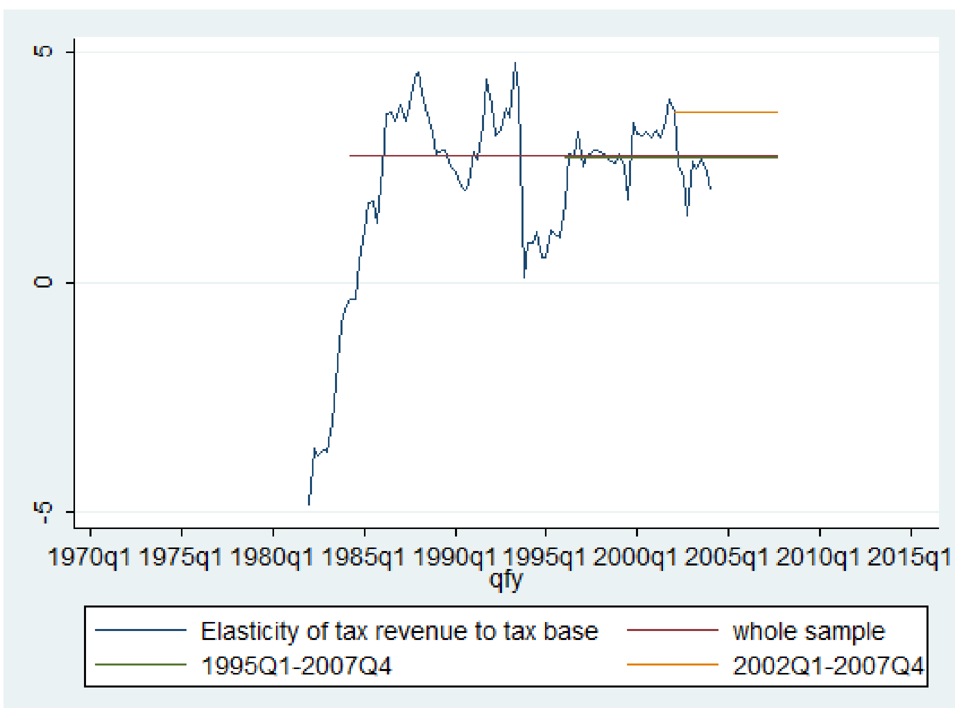
[5] Note the caveats in estimating potential output and potential tax bases via an HP filter: First, the potential levels vary depending on the smoothing parameter used in these estimations. Second, an end-point problem exists in the HP-filter estimation. Nevertheless, this problem is minimized by using the 2015 IMF staff projections. Third, the HP filter does not detect structural breaks in the data. The bias created by these problems is discussed in Appendix B.

B. A Simple Adjustment: Results

Equation (5) is estimated recursively for each of the three main tax revenues over each business cycle, where each cycle is approximated by 24 quarters, or by six years, covering 1981 to 2009.[6] Recursive estimates of CIT with respect to its base, gross operating surplus, are shown in Figure 3. Recursive estimates of PIT with respect to its base, compensation of employees, are presented in Figure 4. Recursive estimates of VAT with respect to its base, total consumption, are given in Figure 5. Results presented in these figures show that tax elasticity estimates of equation (5) are not constant over time.

As shown in these figures, elasticity of PIT, CIT, and VAT with respect to their tax bases changes depending on the sample selection. These results indicate there might be some variables other than the fluctuation of the tax base affecting the cyclical component of the tax revenue, and the change in the value of these variables over time creates a shift in the magnitude of these elasticities. This finding motivates us to examine the impact of commodity and asset prices and the credit growth in the cyclicality of revenue performance in South Africa.

Figure 3. Recursive Elasticity Estimate of CIT with Respect to Gross Operating Surplus



[6] This paper estimates the elasticities based on the fluctuation of real variables. Tax revenue is deflated by the GDP deflator to obtain the real variables. As discussed in the Appendix A, elasticity estimates from nominal variables are biased, and the elasticity estimates tend to approach 1.

Figure 4. Recursive Elasticity Estimate of PIT with Respect to Compensation of Employees

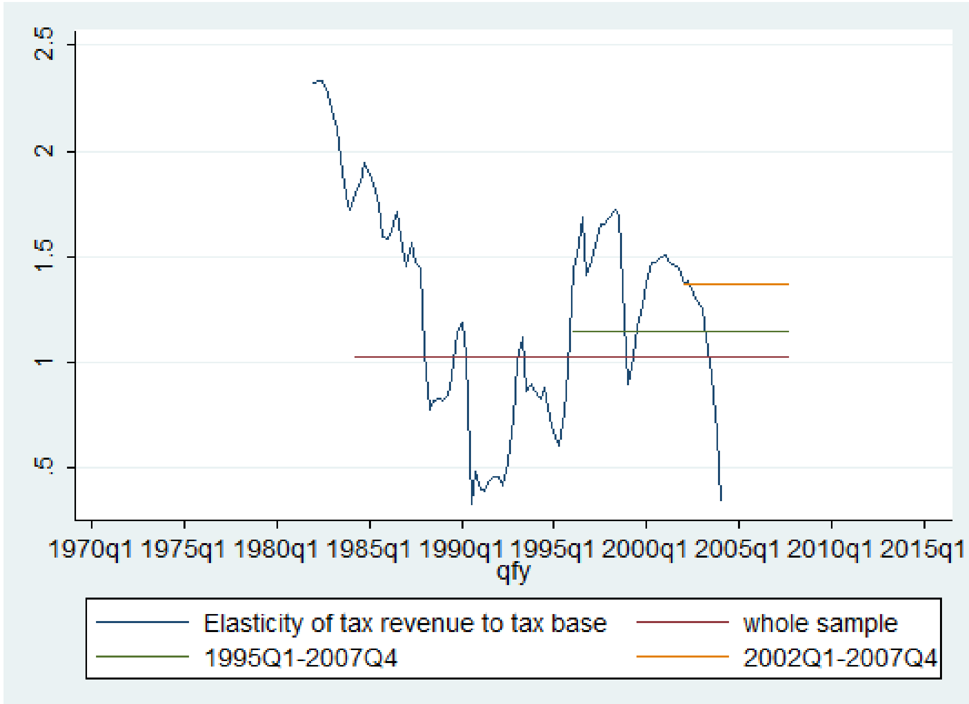
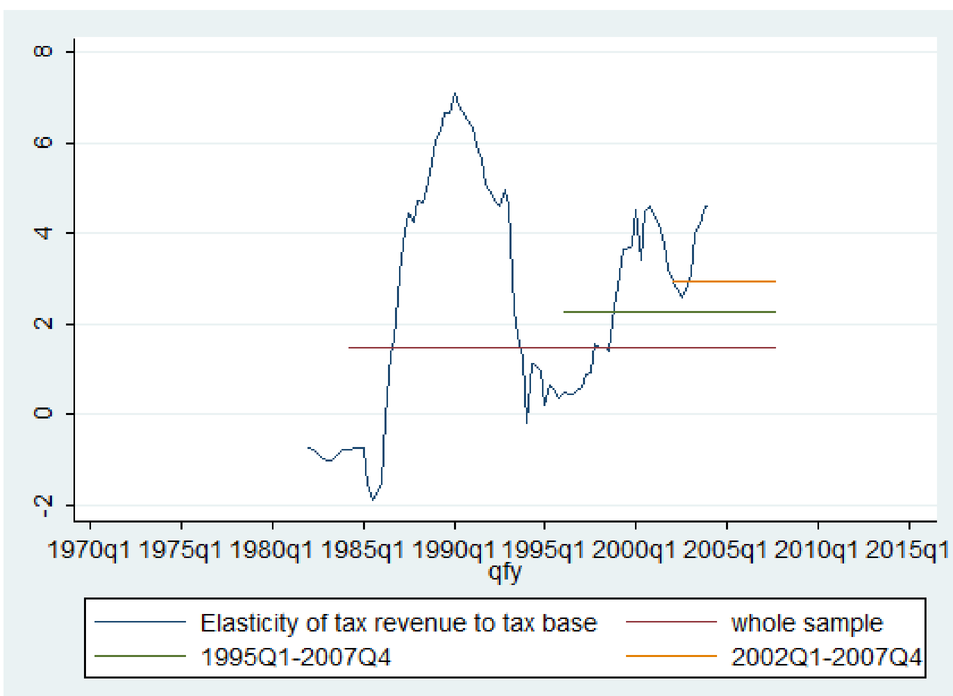


Figure 5. Recursive Elasticity Estimate of VAT with Respect to Total Consumption



C. Impact of Commodity and Asset Prices and the Credit Cycle

Given the time variance in elasticity estimates, the impact of commodity and asset prices and the credit cycle on the cyclicality of tax revenue in South Africa is studied to account for this variation. In addition to the impact of these indicators, changes in tax policy and tax rates in South Africa are also controlled. Table 1 summarizes the changes in tax policy during the last two decades in South Africa. Similarly, Table 2 presents the highest marginal tax rate for CIT, PIT, and VAT during the 1990s and 2000s.

Table 1. Changes in Tax Policy in South Africa

Date	Policy	Effects
1991	Introduction of value-added tax (VAT)	
1997	Establishment of South African Revenue Services (SARS)	All
2000	Introduction of worldwide income taxation (WWIT)	PIT, CIT
October 2001	Introduction of capital gains tax (CGT)	PIT, CIT
2003/04–2006/07	PIT tax relief	PIT
2003–2006	Foreign exchange amnesty	All
2008/09	Decline in the number of registered VAT vendors	

Table 2. Marginal Tax Rates in South Africa

	Maximum Marginal Tax Rate		
Fiscal Year	PIT	CIT	VAT
1992/93	43	48	10
1993/94	43	48	14
1994/95	43	40	14
1995/96	43	35	14
1996/97	45	35	14
1997/98	45	35	14
1998/99	45	35	14
1999/00	45	30	14
2000/01	42	30	14
2001/02	42	30	14
2002/03	40	30	14
2003/04	40	30	14
2004/05	40	30	14
2005/06	40	29	14
2006/07	40	29	14
2007/08	40	29	14
2008/09	40	28	14

Given that tax elasticity is a long-run relationship between revenue and its tax base, the short-term fluctuation in tax revenue are controlled for owing to the changes in tax policy and tax rate by introducing control variables into equation (5).

Following, the impact of the changes in the commodity and asset prices and the credit cycle on the cyclical fluctuations of tax revenue is estimated by controlling for the changes in the business cycle, tax policy, and tax rate in South Africa. For this, a general-to-specific method is applied by estimating equation (7), and reaching the most efficient model by eliminating the insignificant variables and minimizing the error variance of the regression.

$$\begin{aligned}\left(\ln R_{it}-\ln R_{it}^{*}\right) = c_i + \sum_{j=0}^{2}\varepsilon_{ij}^{R}\left(\ln TB_{i,t-j}-\ln TB_{i,t-j}^{*}\right)+\sum_{j=0}^{2}\varepsilon_{ij}^{P^C}\left(\ln P_{t-j}^{C}-\ln P_{t-j}^{C*}\right)+ \\ +\sum_{j=0}^{2}\varepsilon_{ij}^{P^A}\left(\ln P_{t-j}^{A}-\ln P_{t-j}^{A*}\right)+\sum_{j=0}^{2}\varepsilon_{ij}^{C}\left(\Delta\frac{Credit_{t-j}}{Y_{t-j}}\right)+\sum_{j\in P}d_j I_{j,t}^{Pchange}+ \quad (7) \\ +\delta TRate_{it}+\upsilon_{it}\end{aligned}$$

In equation (7), P_{t-j}^{C} denotes the commodity prices.[7] P_{t-j}^{A} is an index of asset prices—of either house prices or the price earnings ratio. The fifth term on the right hand side of equation (7) is the change in the credit to GDP ratio over time. Among the tax policy/rate control variables, $I_{j,t}^{Pchange}$ is an indicator variable controlling for the changes in the tax policy as listed in Table 1, and the subscript *j* stands for the policy change listed in the j^th^ row of this table. The last variable in equation (7), $TRate_{it}$ shows the highest marginal tax rate applied to the tax revenue *i* —PIT, CIT, or VAT— as listed in Table 3.

As in equation (5), variables with an "*" denote the trend or the long-run level of the explanatory variables. Following, $\varepsilon_{ij}^{P^C}$ and $\varepsilon_{ij}^{P^A}$ measure the elasticity of tax revenue *i* with respect to the fluctuation of commodity prices and asset prices from their long-term level, and ε_{ij}^{C} measures the elasticity with respect to the change in the credit extended to the private sector.

The challenge in this estimation is measuring the long-run levels for commodity and asset prices. In general, existence of a trend value for these prices is counterfactual and any measurement of trend prices contains a significant measurement error. Nevertheless, this section assumes that prices may tend to revert back to their long term values, and measures the long-term prices from a two-sided moving average model, going back six years and going forward two years.

[7] Commodity prices are measured through various indicators: first separately from the Rand denominated prices of gold and platinum—the two largest commodity exports of South Africa—and second, through a factor analysis of the comovement of these price indices.

The most efficient results of equation (7), based on the general-to-specific modeling, are shown in Table 3.[8] These estimations restrict the estimation sample to the post apartheid period for several reasons. First, the recursive estimates shown in Figure 3 through Figure 5, show that parameter space differs significantly during the apartheid period. Second, VAT was introduced only during the 1990s. Third, there is not sufficient information on tax policy changes during apartheid.

Table 3. Elasticity of PIT, CIT, and VAT

	PIT-gap	CIT-gap	VAT-gap
Wage-Gap	1.818***		
	(0.336)		
NOS-Gap		1.802***	
		(0.235)	
NOS-Gap (-1)		2.522***	
		(0.294)	
RTC-Gap			1.789***
			(0.432)
Establishment of SARS	2.616**	10.38***	
	(1.101)	(2.195)	
Capital Gains Tax	2.366*	5.488***	
	(1.093)	(1.662)	
PIT tax Relief	-2.566**		
	(1.139)		
Change in Credit/GDP		0.683**	0.491**
		(0.265)	(0.204)
Constant	-1.006	-6.778***	-0.371
	(0.793)	(1.574)	(0.643)
Observations	16	16	16
R-squared	0.813	0.941	0.755

Standard errors in parenthes
*** p<0.01, ** p<0.05, * p<0.

Based on the results provided in this table, elasticity of PIT with respect to the compensation of employees (denoted as wage-gap in Table 3) is 1.8, similar to the elasticities found for the OECD countries (Girouard and André, 2005). Elasticity of CIT with respect to net operating surplus (NOS) is 1.8 for the current period, and 2.5 for the previous period. Because corporations make provisional tax payments in South Africa, both the current and the past

[8] Results in this table are presented from regressions solved with annual data. Use of annual and quarterly data does not yield different coefficient estimates, as long as seasonal deviations in quarterly data are correctly accounted for. All components of tax revenue, in particular CIT are highly seasonal.

year are relevant for CIT. Elasticity of VAT with respect to real total consumption (RTC) is 1.8.

Additionally, the estimation results reported in Table 3 show that only the credit cycle has a significant impact on the cyclical component of tax revenue. CIT has an elasticity of around 0.7 and VAT has an elasticity of around 0.5 to the changes in the credit extended to the private sector. The significance of the credit cycle can be related to the increasing share of the financial sector in South Africa. For instance, the largest number of VAT vendors are in the financing, insurance, real estate, and business services sector (around 33 per cent in fiscal year 2007/08), and again in the corporate taxation side the same sector is responsible for the largest amount of assessed taxes (28 percent in fiscal year 2007/08).[9]

Last, in the control variables for changes in tax policy and tax rate, only the establishment of SARS, introduction of the capital gains tax, and PIT tax relief are significant for explaining the deviations of PIT from its trend. For CIT only the establishment of SARS and introduction of the capital gains tax are significant. For VAT neither of the tax policy changes is significant. Also the marginal tax rates listed in Table 2 were not significant as control variables in any of the tax revenue regressions.

D. Robustness

To account for the impact of the commodity and asset prices and the credit cycle, the marginal impact of these variables on the tax revenue is measured by controlling for the cycle in the tax base. The intuition behind this specification is to capture any movements in tax revenue other than what can be explained by the deviation in the tax base.

Even though the tax base should give all the information on the amount of revenue that can be collected in a year, in practice this is not the case. First, revenues are subject to provisional payments—not all taxes paid are attributable to income earned in the same year. Second, revenue data is subject to netting-out effects—tax returns are submitted and assessed over a period of time. Third, different sectors of the economy have different effective tax rates. Fourth, tax payments are subject to exemptions, allowable deductions, and special tax dispensations. Last, the relationship between the tax revenue collected and its standard tax base is less direct for some sectors of the economy, such as VAT collected from the financial sector. These factors and others would cause the revenue cycle to co-move with factors other than the cycle in its tax base. Owing to such factors, this paper looks at the marginal impact of the commodity and asset prices and the credit cycle on the tax revenue.

Nevertheless, one can argue that not finding a significant impact of commodity and asset prices may not necessarily indicate that these prices do not affect tax revenues implicitly through their impact on the tax base. To capture whether any other implicit impact of these prices on the revenue cycle is ignored, this section regresses the tax-base gap on the commodity and asset prices. However, the results do not capture a significant impact of these

[9] 2009 Tax Statistics: a joint publication between National Treasury and the South African Revenue Service.

prices to explain the deviations of the tax base from its potential (results are available upon request).[10]

E. Some Practical Issues

A practical issue for those who monitor structural balances is obtaining the structural gaps in tax bases for the forecast horizon. Generally, researchers produce forecasts of output gap, but not the gap in tax bases.

This section estimates the elasticity of the tax-base gap with respect to the output gap, by estimating the seemingly unrelated regression below.

$$\left(\ln R_{it} - \ln R_{it}^{*}\right) = c_i + \varepsilon_{ij}^{R} \sum_{j=0}^{2} \left(\ln TB_{i,t-j} - \ln TB_{i,t-j}^{*}\right) + \varepsilon_{ij}^{C} \sum_{j=0}^{2} \left(\Delta \frac{Credit_{t-j}}{Y_{t-j}}\right) +$$

$$+ d_j \sum_{j \in P} I_{j,t}^{Pchange} + \upsilon_{it} \qquad (8)$$

$$\left(\ln TB_{it} - \ln TB_{it}^{*}\right) = \tilde{c}_i + \varepsilon_{iTB}\left(\ln Y_t - \ln Y_t^{*}\right) + \varepsilon_{iTB_{-1}}\left(\ln Y_{t-1} - \ln Y_{t-1}^{*}\right) + \tilde{\upsilon}_{it}$$

Equation (8) estimates the elasticity of tax revenue *i* with respect to the business and the credit cycle jointly with the elasticity of tax base *i* with respect to the output-gap. This joint estimation is done to estimate the tax-base gap for the forecast horizon based on the forecasts of the output gap.

Regression results of equation (8) are reported in Table 4. Model 1 reports the results for joint estimation of the cycles in PIT and compensation of employees, Model 2 for CIT and operating surplus, and Model 3 for VAT and consumption. Elasticity results reported in this table are quite similar to those reported in Table 3, indicating that the elasticities of tax revenues with respect to their bases are stable across equations (7) and (8).

Elasticity of tax base *i* with respect to the output gap is reported under the second columns of models (1)–(3) in Table 4. As reported in this table, compensation of employees and total consumption have a unit elasticity with respect to the output gap; whereas the elasticity of net operating surplus is around 2.

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[10] However, as indicated in the previous section, results are prone to biases in the specification and measurement of long-term price levels for commodities and assets.

Table 4. Seemingly Unrelated Regression of Tax Revenue and Tax Base

	Model (1)		Model (2)		Model (3)	
	PIT-gap	Wage-Gap	CIT-gap	NOS-Gap	VAT-gap	RTC_fy
Wage-Gap	1.618***					
	(0.269)					
NOS-Gap			1.872***			
			(0.202)			
NOS-Gap (-1)			2.586***			
			(0.265)			
RTC-Gap					2.107***	
					(0.279)	
Establishment of SARS	2.662**		10.67***			
	(1.159)		(2.455)			
Capital Gains Tax	2.809***		5.307***			
	(1.010)		(1.879)			
PIT tax Relief	-2.768***					
	(0.958)					
Change in Credit/GDP			0.699***		0.453***	
			(0.224)		(0.124)	
output gap		0.880***		1.968***		1.148***
		(0.223)		(0.463)		(0.132)
output gap (-1)		-0.0979		-0.146		-0.257*
		(0.244)		(0.493)		(0.140)
Constant	-1.145	0.0214	-6.892***	-0.490	-0.747*	0.0341
	(1.016)	(0.293)	(2.070)	(0.576)	(0.422)	(0.163)
Observations	13	13	13	13	13	13
R-squared	0.826	0.420	0.939	0.573	0.899	0.853

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

F. Cyclically Adjusted Balances

Based on the results provided in Table 4, the structural balances for PIT, CIT, and VAT are estimated. The cycle in the remaining tax revenue with respect to the output gap is approximated by an elasticity of 1. Based on these calculations, structural budget balance is the sum of these structural revenues minus total expenditures.[11] Structural and nominal budget balances for fiscal years 2003/04 to 2014/15 are presented in Figure 6.

In Figure 6, cyclically adjusted balances are plotted with the output gap observed during that fiscal year. Because business cycle is the biggest contributor to the cyclical component of the tax revenue, these structural budget balances are plotted with the underlying output gaps.

Figure 6. Cyclically Adjusted Budget Balance of the National Government[12]

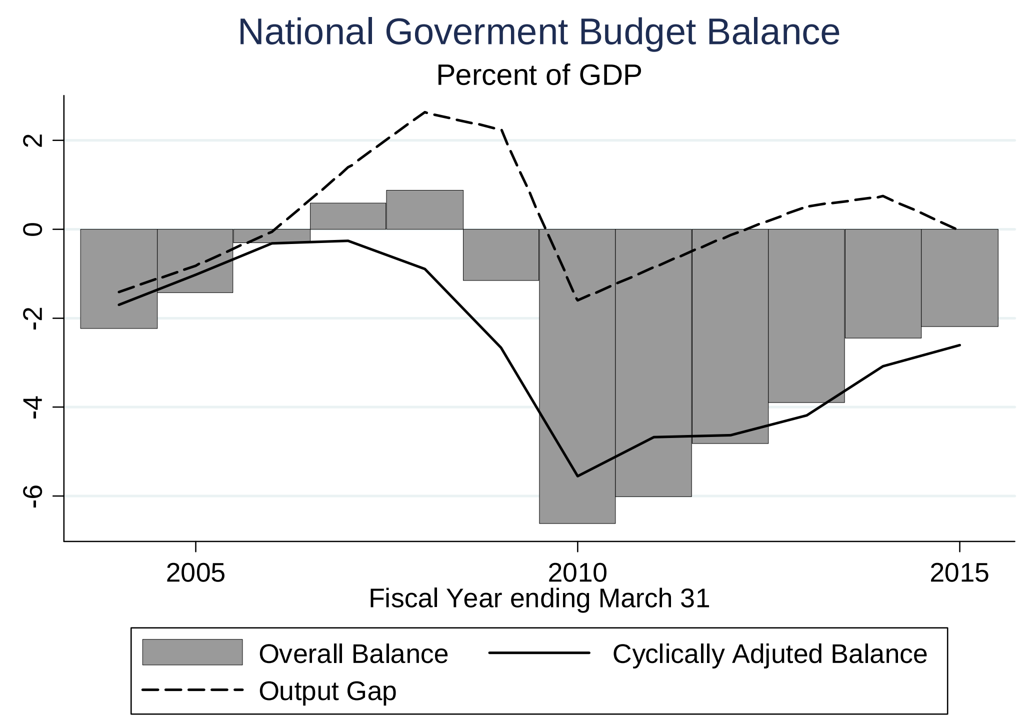


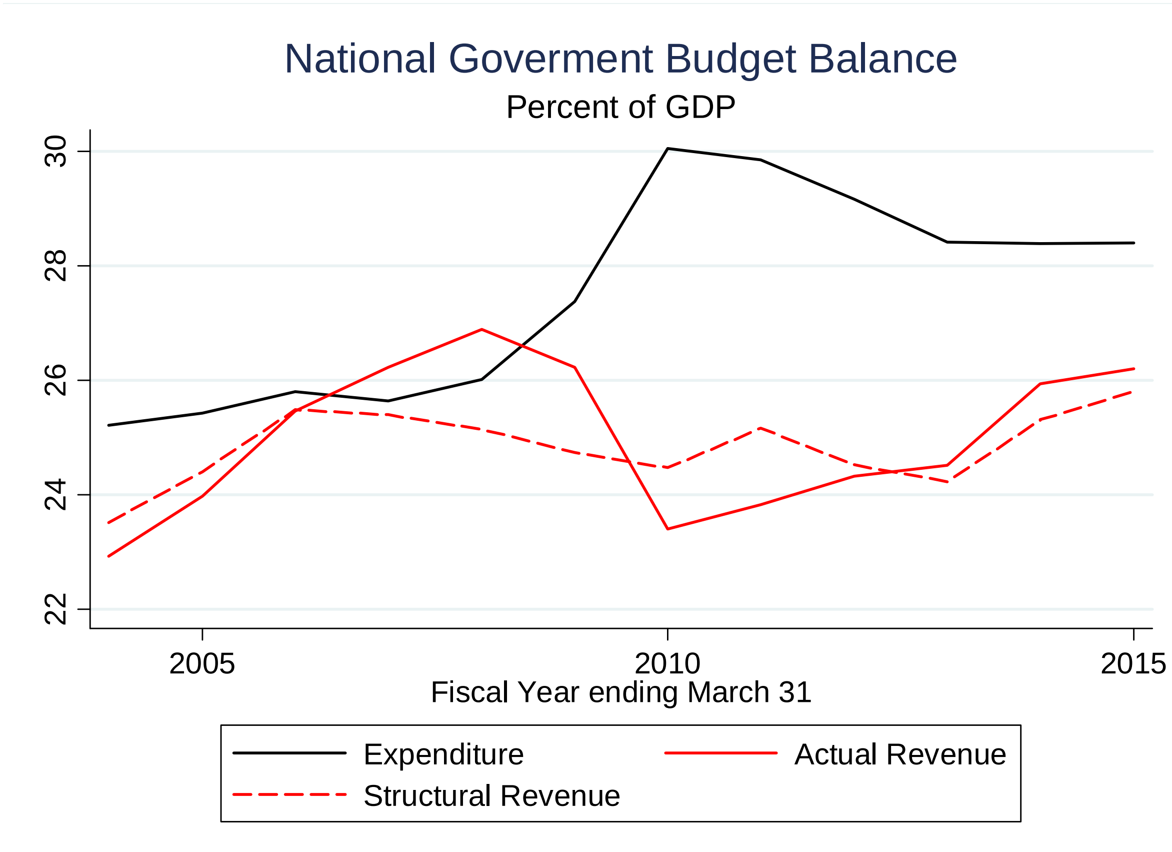
Figure 6 shows that the budget surpluses experienced in South Africa during the mid-2000s were cyclical, mainly owing to the positive output gap experienced in this period. However, looking at the 2009/10 fiscal year, the cyclical component in the budget deficit is quite small, indicating that the budget deficit is mostly discretional. Further, Figure 7 presents structural revenue with nominal revenue and expenditures as a share of GDP in South Africa. This

[11] Expenditures are not adjusted for the business cycle, following Fedelino, Ivanova, and Horton (2009).

[12] Forecast values are based on IMF Staff projections.

figure shows that nominal revenue fluctuates around the structural revenue—25 percent of potential GDP—and the budget deficits in 2008/09 and 2009/10 mainly were due to the rise in total expenditures.

Figure 7. Structural and Nominal Revenue and the Total Expenditures[13]



During the later years, the structural balances in Figure 6 and Figure 7 show that as the negative output gap recovers to potential, the nominal budget balance in South Africa will converge toward the structural balance.

G. Caveats

Some caveats are embedded in the measurement of structural balances for any economy. First, structural balance estimates are based on the economic cycles, and the measurement of economic cycles contains caveats. Use of different methodologies may yield differences in estimating potential output, such as use of structural models versus the HP-filter. The difference in the magnitude of the estimated potential output levels will feed into the size of the output gap and hence to the magnitude of the cyclical component of the tax revenue and

[13] Forecast values are based on IMF Staff projections.

to the size of the structural budget balance. Additionally, existence of structural breaks would also cause shifts in the potential output estimates. These problems in potential output estimates are discussed in more detail in Appendix B.

Second, there is a bias in the estimation of elasticities with respect to the deviations in the business cycle, commodity and asset prices, and credit cycle. These biases would be caused by the measurement of the cycles, the choice of the deflators—or no deflators—and the choice of the estimation method.[14] These biases would also cause a deviation between the true and the estimated values of the cyclically adjusted balances.

V. CONCLUSION

This paper applies a disaggregated method for the calculation of the cyclical component of the budget balance for South Africa. This methodology estimates the cyclically adjusted budget balance with an emphasis on the effect of commodity and asset prices and the credit cycle. Results show that the cyclicality of tax revenue is explained mostly by the variation in the tax base, and the change in the credit to private sector also affects the revenue performance. On the other hand, the impact of asset and commodity prices is not significant in the deviations of revenue from its trend. However, one should mention that the quantitative effect of these prices is subject to the assumptions used for long-run price levels.

[14] The impact of deflators on the magnitude of tax elasticity is discussed in Appendix A.

REFERENCES

Aydin, B., 2010, " Performance of Fiscal Accounts in South Africa in a Cross-Country Setting," IMF Working Paper (Washington: International Monetary Fund).

Bouthevillain, C., P. Cour-Thimann, G. Van Den Dool, P. Hernandez De Cos, G. Langenus, M. Mohr, et al. 2001. "Cyclically Adjusted Budget Balances: An Alternative Approach," Working Paper 77 (Frankfurt: European Central Bank).

Braconier, H., and T. Forsfält, 2004, "A New Method for Constructinga a Cyclically Adjusted Budget Balance: the Case of Sweden," Working Paper No. 90 (Stockholm: The National Institute of Economic Research).

Congressional Budget Office, 2009, "Measuring the Effects of the Business Cycle on the Federal Budget," (Washington: Congressional Budget Office).

Congressional Budget Office, 2002, *Revenue And Tax Policy Brief* (Washington: Congressional Budget Office).

Debrun, X., 2006, *Cyclically Adjusted Balances*, IMF Selected Issues Paper No. 06/328 (Washington: International Monetary Fund).

Eschenbach, F., and L. Schuknecht, 2002 "Asset Prices and Fiscal Balances," Working Paper 141 (Washington: International Monetary Fund).

Farrington, S., J. McDonagh, C. Colebrook, and A. Gurney, 2008 "Public Finances and the Cycle" Working Paper No. 5 (Washington: U.S. Department of theTreasury).

Fedelino, A., A. Ivanova, and M. Horton, 2009, "Cyclically-Adjusted Balances and Automatic Fiscal Stabilizers: Some Computational and Interpretational Issues," IMF Technical Notes and Manuals TNM/09/05 (Washington:International Monetary Fund).

Girouard, N., and C. André, 2005, "Measuring Cyclically-adjusted Budget Balances for OECD Countries," OECD Economics Department Working Paper No. 434 (Paris: Organization for Economic Cooperation and Development).

Gracia, B., G. Di Bella, and M. Cerisola, 2009, *A Longer-Term Approach to Fiscal Policy in Chile*, IMF Staff Country Report No. 09/272 (Washington: International Monetary Fund).

International Monetary Fund, 2005, *Cyclicality of Fiscal Policy and Cyclically Adjusted Fiscal Balances* (Washington:International Monetary Fund).

International Monetary Fund, 2010, April, *World Economic Outlook,* (Washington: International Monetary Fund).

Jooste, C., and R. Naraidoo, forthcoming, "Nonlinear Tax Elasticities and Their Implications for the Structural Budget Balance," (Pretoria: Republic of South Africa National Treasury).

Kumah, F. Y., and J. M. Matovu, 2005, "Commodity Price Shocks and the Odds on Fiscal Performance: A Structural VAR Approach" IMF Working Paper No. WP/05/171 (Washington: International Monetary Fund).

Republic of South Africa National Treasury, 2007, *Medium Term Budget Policy Statement* (Pretoria).

Republic of South Africa National Treasury, 2008, *Medium Term Budget Policy Statement* (Pretoria).

Republic of South Africa National Treasury, 2009 *Medium Term Budget Policy Statement* (Pretoria).

Rodriguez, J. C., C. R. Tokman, C. R., and A. C. Vega, 2007, "Structural Balance Policy in Chile," *Studies in Public Finance of the Budget Office of the Finance Ministry* (Santiago).

Sancak, C., R.Velloso, and J. Xing, 2010, "Tax Revenue Response to the Business Cycle," IMF Working Paper No. WO/10/71 (Washington: International Monetary Fund).

Swanepoel, J. A., 2007, "Adjusting South Africa's Fiscal Balance For Terms-Of-Trade Effects," *South African Journal of Economics,*Vol. 75 No.4.

Swanepoel, A. S. and N. J. Schoeman, 2002, "Tax revenue as an automatic fiscal stabiliser - a South African perspective," South African Journal of Economic and Management Sciences, vol. 5, no. 3, pp. 566-588.

Appendix A: Real Versus Nominal Variables

Even though fiscal balances are reported in nominal terms, this paper used real tax revenue to estimate tax revenue elasticities with respect to the output gap. Real variables were used rather than the nominal variables because elasticity estimates from nominal variables tend to be biased toward 1.

As an example, equation (9) shows a simple estimate of the tax buoyancy ratio, based on the annual changes in tax revenue and tax base.

$$TB = \frac{\%\Delta\,\mathrm{Re}venue}{\%\Delta Base} \quad (9)$$

Assuming that the nominal revenue increases by 20 percent, the tax base by 15 percent, and the common price deflator by 5 percent, the tax buoyancy ratio estimated from the real balances would be 1.55, as shown in equation (10), whereas the tax buoyancy ratio estimated from the nominal values would be 1.33, as show in equation (11). This simple example shows that tax elasticity estimated from nominal balances would be biased toward 1.

$$TB = \frac{\%\Delta\,\mathrm{Re}venue}{\%\Delta Base} = \frac{\frac{1+.2}{1+.05} - 1}{\frac{1+.15}{1+.05}} = \frac{0.143}{0.095} = 1.5 \quad (10)$$

$$TB = \frac{\%\Delta\,\mathrm{Re}venue}{\%\Delta Base} = \frac{.2}{.15} = 1.33 \quad (11)$$

Appendix B: Bias in Potential Level Estimates

Figure 8 shows that different assumptions used in the estimation of the potential output yield different output gap results. The HP filter used on the raw data estimates much larger output gaps than the one used with accounting for structural breaks. Further, the sign of the gap shows different directions in some years, such as during the mid-2000s (Figure 9).

Figure 8. Potential Output and Tax Bases With and Without Structural Breaks

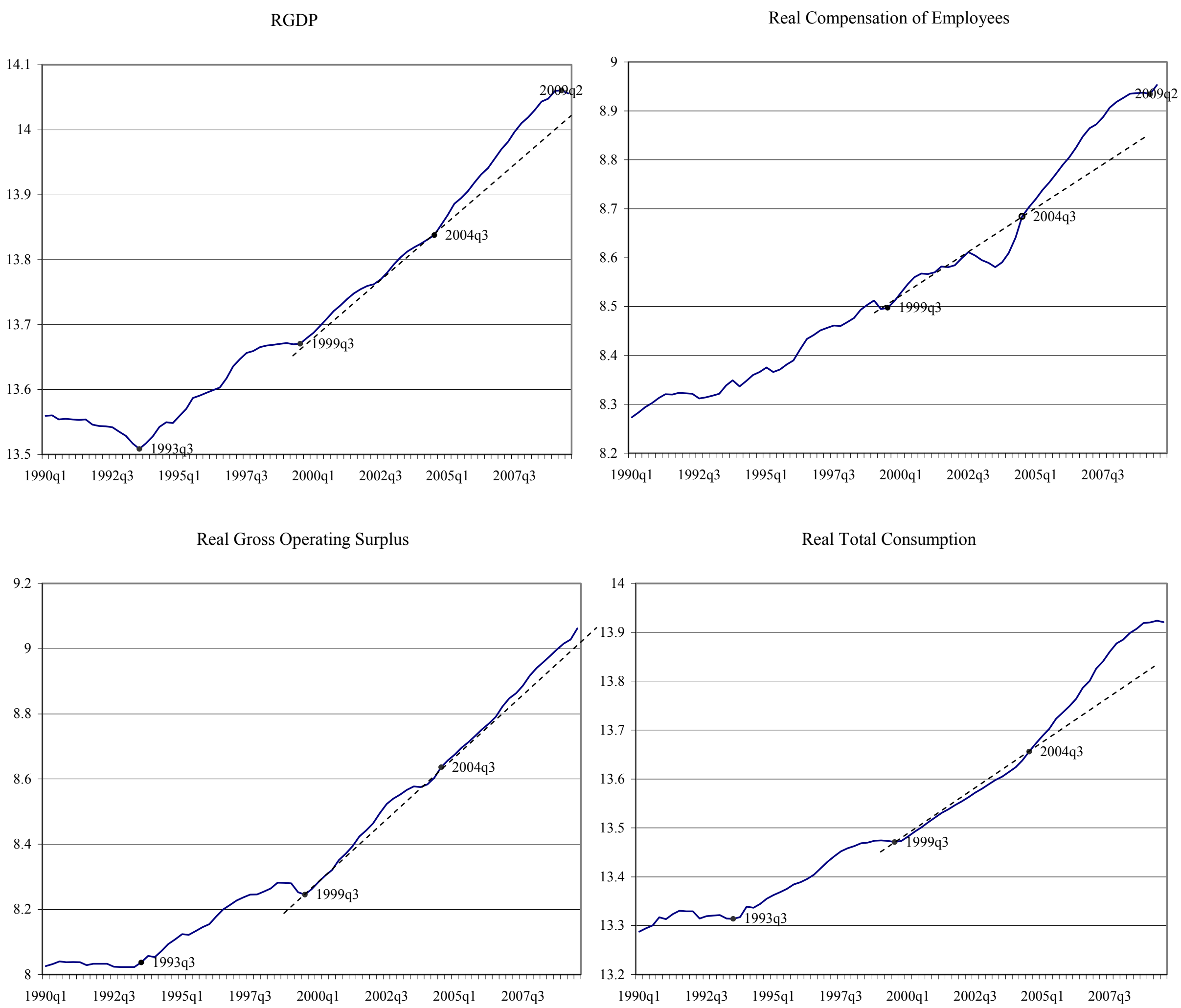


Figure 9. Output Gap and Structural Breaks