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Performance of Fiscal Accounts in South Africa in a Cross-Country Setting

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**Performance of Fiscal Accounts in
South Africa in a Cross-Country Setting**

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Abstract

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This paper analyzes the cyclical fluctuations in South Africa in a cross country context, and studies the impact of banking crisis, output contraction, and export decline in the recent downward trend. Results show that South Africa had an outstanding revenue performance during the mid-2000s, and the recent decline in revenue was one of the least amongst the emerging and advanced markets. Results on the elasticity of tax revenue show that South Africa's elasticity is higher during the business upturns, indicating that it has good prospects to recover back the revenue lost during the global financial crisis.

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I. INTRODUCTION

This paper analyzes the cyclical fluctuations in South Africa in a cross country context. In this paper, we compare the revenue trends in South Africa with respect to other emerging and advanced market economies. We analyze where South Africa stands with respect to these economies, and study the impact of banking crisis, output contraction, and export decline in the recent downward trend in revenues.

In this comparison we focus on quantifying answers to three main questions. First, how well did South Africa perform during the global growth years of the 2000s? Second, how much revenue did South Africa lose during the global economic crisis? Third, how fast South Africa's revenues will improve during the 2010s as the economy recovers?

In answering the first two questions, we will focus on South Africa's revenue performance during the global economic upturn of the mid-2000s and during the global financial crisis of the late-2000s in a cross-country context. We will compare South Africa's revenue collection during the boom and the bust period to a set of advanced and emerging market economies. These economies are listed on Table 1.

Table 1. List of Comparison Countries for South Africa

Resource Rich Economies			
Commodity		Fuel	
Chile		Azerbaijan	
Botswana		Kazakhstan	
		Russia	
Diversified Economies			
Advanced		Emerging Markets	
Iceland	Argentina	Turkey	India
Ireland	Brazil	Ukraine	Indonesia
Portugal	Colombia	Latvia	Malaysia
Spain	Mexico	Hungary	Thailand
Korea	Peru	Poland	

Note: A total of 24 countries excluding South Africa

In answering the third questions, we focus on both the comparison group listed in Table 1, and also to two larger set of groups: a 64-country group of emerging market economies and a 182-country group of low-income, emerging market, and advanced market economies.

For quantifying the answer of the third question, we estimate the elasticity of revenue with respect to the output gap, export decline, and banking crisis in order to measure the responsiveness of revenue performance with respect to the business cycle. We also differentiate this response during business upturns and downturns, and also between commodity exporters and diversified economies.

Results of this paper show that South Africa had an outstanding revenue performance with respect to its comparison group during the mid-2000s. Revenue as a share of GDP increased by some 4 percentage point of GDP from 2003 to 2007, this is the second highest increase with respect to South Africa's comparison group.

During the economic downturn, the decline in South Africa's revenues was limited to less than half a percentage point of GDP, when we compare the trough of the recession year 2009 to the average of the peak years during the mid-2000s. This decline in revenue collection is the least when compared to South Africa's peers in other advanced and emerging market economies.

Last, the results on the elasticity of tax revenue with respect to the business cycle show that South Africa's responsiveness to the business cycle is less than that of natural resource exporters. Nevertheless, the elasticity of revenue is higher during the business upturns, indicating that South Africa has good prospects to recover back the revenue lost during the global financial crisis.

In what follows, Section II provides the literature review. Section III presents the data. Section IV studies how well South Africa did during the global growth years of 2000s. Section V provides the analysis on how much revenue South Africa lost during the global financial crisis. Section VI studies how fast South Africa's revenues will recover during the 2010s. Last, Section VII concludes.

II. LITERATURE

The literature on analyzing the impact of business cycle on tax revenue performance mostly focused on estimating the elasticity of tax revenue with respect to the business cycle. However, the literature on this area did not focus on the impact of external accounts and financial sector on tax revenue performance. As the recent economic crisis has shown, these indicators had played an important role in the deviation of the tax revenue from its structural level in many of the countries.

Amongst the literature that focused on explaining the elasticity of tax revenue with respect to the business cycle, some researchers focused on explaining tax revenue elasticities. In

particular for South Africa, Aydin (2010) estimated the elasticity of tax revenue with respect to the business cycle, incorporating the impact of asset and commodity prices and the credit cycle. Results of this paper show that business cycle and credit growth has an important impact on the revenue performance in South Africa.

Amongst the literature that focused on explaining the elasticity of tax revenue with respect to the business cycle, some researchers focused on explaining tax revenue elasticities in a cross-country context. Bouthevillain, et al. (2001) estimated the tax elasticities for the European countries, and Girouard and André (2005) for the OECD countries. These papers estimated individual tax elasticities separately for each country in their sample either by using specific tax information or by applying time series econometrics. To our knowledge, there is no research done on estimating tax elasticities by employing panel data econometrics.

Last, on the recent research papers in the literature, some focused on the impact of the business cycle on the fiscal accounts from the tax efficiency perspective. Sancak et. al (2010) studied tax revenue response to the business cycle by quantifying the impact of the output gap on the tax efficiency ratios in a cross-country context. Authors show that business cycle has a significant impact on the tax efficiency ratio, and this impact differs depending on the phase of the cycle due to changing consumption patterns and tax evasions during the economic expansions and contractions.

III. DATA:

In this paper we use an annual unbalanced panel dataset, of earliest data starting from 1960 and the latest extending to 2009. The cross-section of this dataset includes the 182 countries reported in the World Economic Outlook of the IMF.

Macroeconomic variables in this dataset is obtained from the World Economic Outlook (IMF, 2010a), and from the IMF Staff Projections¹. The Banking Crisis dataset is obtained from the Research Department of the IMF, and the data on financial indicators are obtained from the DataStream. The data on tax-to-GDP and corporate income tax-to-GDP ratios are obtained from Abbas et. al. (2010).

¹ One of the definitions of output gap used in this paper is obtained from the staff projections of the Strategy, Policy, and Review Department of the IMF.

IV. HOW WELL DID SOUTH AFRICA PERFORM DURING THE GLOBAL GROWTH YEARS OF THE 2000s?

In this section, we compare South Africa's tax revenue performance with respect to 24 advanced and emerging market economies (AEMEs). As listed in Table 1, in the AEMEs sample, there are 5 advanced economies and 19 emerging market economies. Amongst the advanced economies sample, the comparison group is chosen to compare the impact of the financial crisis, economic slowdown and export decline on the fiscal accounts. Within the advanced market economies, Iceland and Ireland experienced a systemic banking crisis starting in 2008. Portugal and Spain had been experiencing an economic slowdown due to structural problems in their product and labor markets. Korea is an advanced market economy with high export intensity, and included in the comparison sample to analyze the impact of export decline on the fiscal accounts.

In the comparison group, the remaining 19 countries are emerging market economies. Amongst these 20, five of them are resource-exporters. Commodity exporters—Botswana and Chile—and fuel exporter—Azerbaijan, Kazakhstan, and Russia—are included to analyze the impact of natural resource intensity on the impact of fiscal responsiveness to the business cycle.

Within the emerging market comparison sample, 14 countries are diversified economies, which have similar dynamics to that of South Africa. Amongst these diversified economies, three European economies suffered the most during the global financial crisis. Hungary, Latvia and Ukraine fell into an economic crisis by the end of 2008.

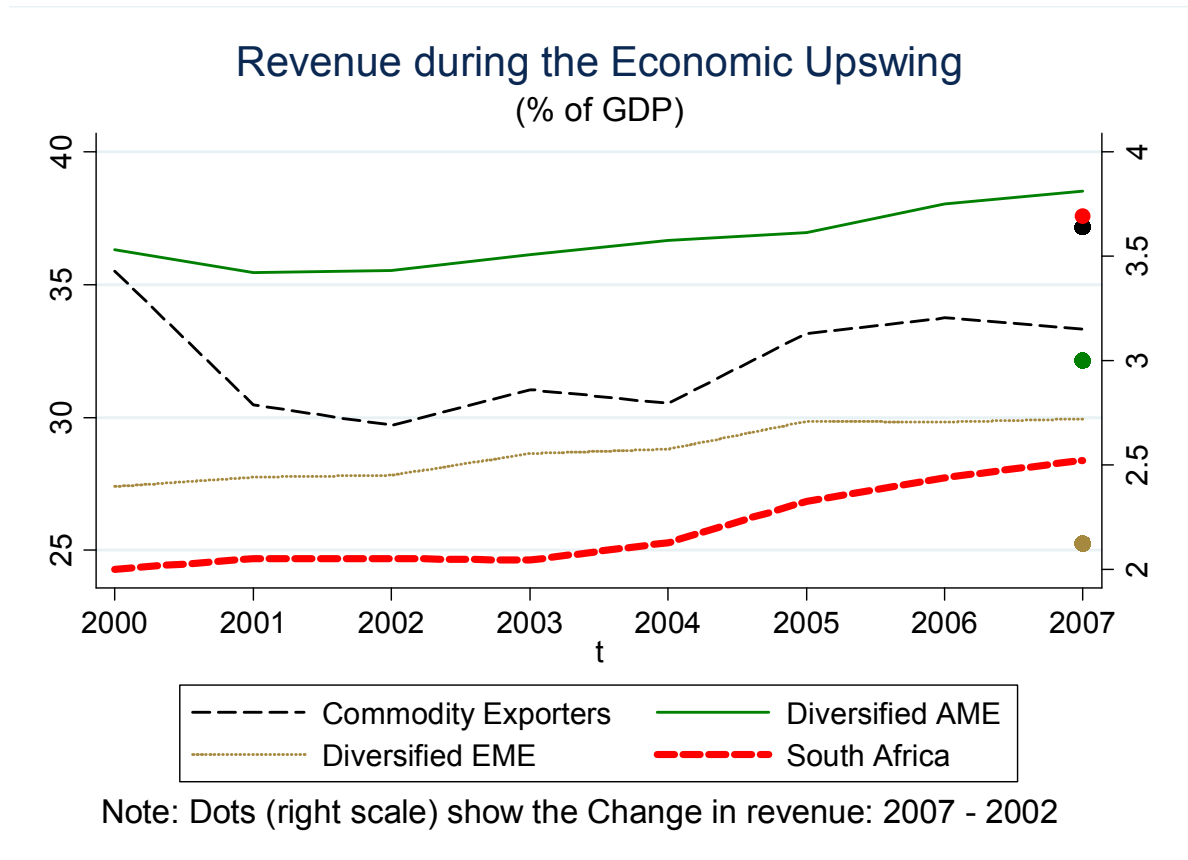
In this section, we compare the revenue performance of South Africa to the revenue performance of its comparison group during the global economic upturn of the 2000s. Figure 1 presents revenue performance, defined as total government revenue as a percent of GDP, in calendar year, of South Africa and of its comparison group.

Looking at Figure 1, one can see that revenue as a share of GDP had been on an increasing trend in all countries during the 2000s, excluding the fluctuation in the two commodity exporters. This figure indicates that the positive economic indicators during the 2000s had enabled these countries to improve on their income stream.

Looking at the revenue trend of the advanced and emerging markets, one can see that the revenue trend in South Africa is similar to the revenue trend of diversified EMEs. Both the size of the revenue to GDP ratio and the rate of increase in this ratio are quite similar between that of South Africa and the diversified emerging markets.

Next, we look at the difference of the revenue-to-GDP ratio of these countries from 2007 to 2002. The former year is assumed to be the end of the global business upturn, and the latter as the starting year. The dots in Figure 1 show the difference in revenue-to-GDP ratios between these years for South Africa and its comparison group.

Figure 1. Revenue Performance during the Global Growth Years



Change in revenue-to-GDP from 2002 to 2007 shows that all of these countries achieved a better revenue performance during this period; and South Africa and the commodity exporters had the highest increase in revenue collection during these five-years, of more than 3.5 percent of GDP increase in tax-to-GDP ratio.

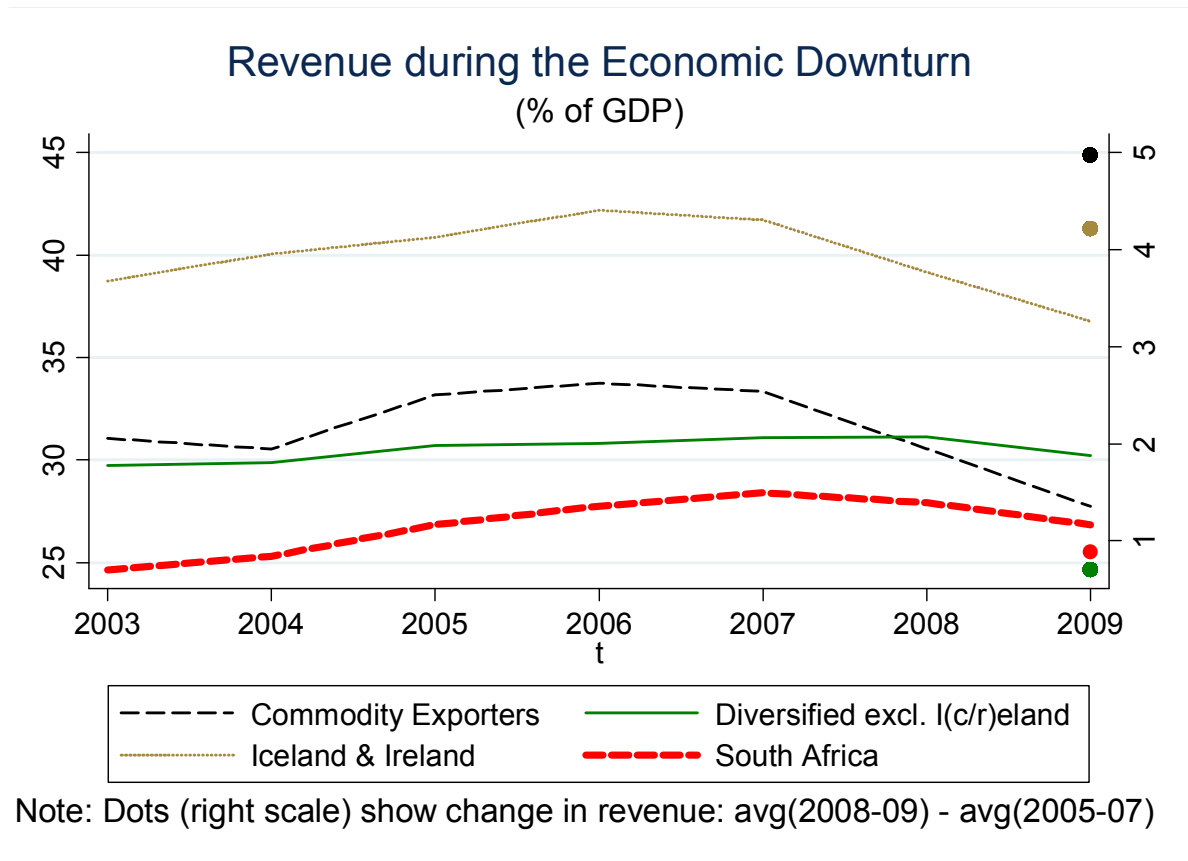
Looking at Figure 1, South Africa significantly improved its tax revenue collection during the economic upswing of the 2000s. South Africa's tax revenue increased steadily during the 2000s, around some 4 percentage points of GDP from 2000 to 2007. The rise in South Africa's revenue collection was outstanding within its comparison group.

V. HOW MUCH REVENUE DID SOUTH AFRICA LOSE DURING THE GLOBAL FINANCIAL CRISIS?

Next we compare the revenue loss of South Africa during the global economic crisis. Similar to the previous section, Figure 2 below compares the revenue-to-GDP ratio of South Africa with respect to its comparison group. However, in this section, we focus on the latter years of this graph, i.e. to the decline in revenue years.

The dots in Figure 2 show the decline in revenue for South Africa and for each of its comparison group. The decline is shown as the difference in revenue from the average of 2005-2007, which are the years of the highest revenue collected in most of these countries, to the average of 2008-2009, the recession years.

Figure 2. Revenue Performance during the Global Recession



The dots in Figure 2 show that the impact of the global financial crisis resulted in a drop of revenue collection as a share of GDP in all the countries. Nevertheless, the decline in revenue experienced by South Africa was one of the least compared to its peer economies. Figure 2

shows that South Africa had a decline in revenues of less than a percentage point of GDP during to the global financial crisis, whereas the financially troubled Iceland and Ireland and the commodity exporters had the largest decline, of around 4.5 percentage points of GDP.

VI. HOW FAST WILL SOUTH AFRICA'S REVENUES RECOVER DURING THE 2010s?

A. Introduction

In this section, we analyze the elasticity of revenue with respect to the business cycle in a cross country setting to quantify how much of the revenue loss in South Africa was due to the global financial crisis, and how fast South Africa will recover this lost.

Figure 3 plots revenue as a share of GDP over output gap for South Africa and for its comparison group. Revenue as a share of GDP can be interpreted as an implicit tax rate, and increases in this ratio with respect to the output gap could resemble the elasticity of revenue with respect to the business cycle.

Figure 3. Revenue Sensitivity to Output Gap

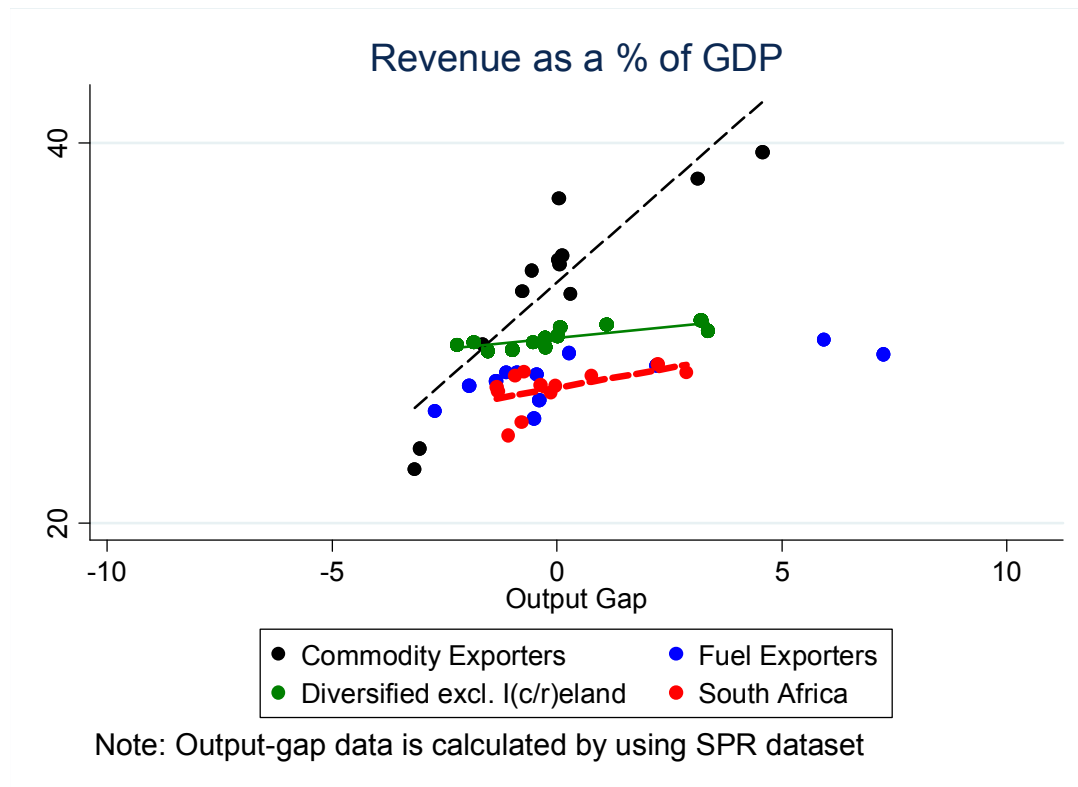


Figure 3 shows that in commodity exporters, revenue reacts more than one-on-one to the changes in the output gap, whereas in diversified economies, this effect is much smaller. South Africa, a diversified economy, though with significant metal exports, has a reaction to output gap less than that of commodity exporters but more than the diversified economies.

B. Model and Results

Based on the motivation presented in the previous sections, in this section, we model elasticity of tax revenue with respect to the output gap in a panel regression setting, as given in the equation below.

$$\begin{aligned} (\ln R_{it} - \ln R_{it}^*) = & c_i + \varepsilon_R^Y (\ln Y_{it} - \ln Y_{it}^*) + \varepsilon_R^C \left(\frac{Export}{Y} \right)_{it} + \left(\frac{Debt^D}{Y} \right)_{it} + \\ & + \left(\frac{Debt^E}{Y} \right)_{it} + \varepsilon_R^{PER} PER_{it} + \alpha I_{it}^{BankingCrisis} + v_{it} \end{aligned} \quad (1)$$

Where R_{it} is total revenue of country i at time t , and R_{it}^* is the structural revenue of this country. The first term on the right hand side of the equation is the country specific fixed effect. The second term is the output gap, $(\ln Y_{it} - \ln Y_{it}^*)$, measured as the deviation of real GDP from its trend level. The coefficient of the output gap, ε_R^Y , is the main statistic of interest, it is the elasticity of revenue with respect to the business cycle. The third term on the right hand side is the change in the export to GDP ratio, measuring the impact of the changes in the external demand on the fiscal accounts. The fourth and the fifth terms are the public and external debt to GDP ratios. PER is the price earnings ratio, this is intended to measure the impact of the asset prices on the fiscal accounts. $I_{it}^{BankingCrisis}$ is an indicator for banking crisis, and it is equal to 1 if time t is the starting date of a systemic banking crisis in country i . The last term on the right hand side is the error term.

In equation (1), there are three unknowns: trend value for revenue, trend value for output and the elasticity coefficients. In order to reduce the number of unknowns, following Aydin (2010), and we estimate the revenue gap and output gap through an HP filter. In order to avoid the end-point problem, we smooth the revenue and GDP series including the five year forecast projections of these variables, using a sample extended to 2015².

Again following Aydin (2010), we estimate the most efficient model of equation (1) by applying a general-to-specific model specification, where the most efficient model is chosen as the one that minimized the error variance of the regression.

² Forecast values of revenue and GDP are obtained from the April 2010 WEO publication.

Results of the reduced form regressions of equation (1) are reported in Table 2 by solving for three samples. The first sample is the cross-section of all low-income, emerging market and advanced market economies as reported in the WEO (IMF, 2010a), where data is available for a country. Estimation results solved for this sample is reported in the first column of Table 2. Second, results are reported for the regression analysis solved for a sample of emerging market economies, and these are reported in the second column of Table 2³. Last, in the third column of Table 2, results are reported for the regression analysis solved for the South African group as listed in Table 1.

Table 2: Panel Regression Results of Revenue Elasticity

Sample Selection:	Whole Sample	EME	ZAF Group
Dependent Variable:	Revenue Gap	Revenue Gap	Revenue Gap
Output gap	1.168*** (0.0880)	1.236*** (0.0876)	1.226*** (0.111)
Export GDP	0.107*** (0.0315)	0.106*** (0.0341)	0.0419 (0.0540)
bankingcrisis	0.757 (2.192)	1.172 (1.493)	1.873 (1.778)
Constant	-4.373*** (1.266)	-4.653*** (1.482)	-1.580 (2.054)
Observations	1685	733	237
R-squared	0.117	0.242	0.370
Number of i	147	65	21
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Results reported in Table 2 show that on average the elasticity of revenue to the output gap is around 1.2 percent. The change in sample selection affects the magnitude of the coefficient estimate only in the second decimal point.

³ Emerging market economy definition for a country is taken from the classification of the Strategy, Policy, and Review Department of the IMF.

As reported in Table 2, amongst all the control variables given in equation (1), only changes in the external demand, measured as the exports-to-GDP ratio, has an impact on the revenue performance, and this impact is rather small.

Even though systemic banking crisis variable does not have a significant coefficient estimate, we keep this variable in the reduced form model, since exclusion of this variable increases the error variance of the regression.

Next, as discussed in Sancak et al (2010), coefficient estimates may not be symmetric across the expansion and contraction cycles. In order to control for this effect we introduce two interaction terms separately into equation (1), as shown below.

$$\begin{aligned} (\ln R_{it} - \ln R_{it}^*) = & c_i + \beta I_{it}^{Y>Y^*} + \varepsilon_R^Y (\ln Y_{it} - \ln Y_{it}^*) + \tilde{\varepsilon}_R^Y I_{it}^{Y>Y^*} (\ln Y_{it} - \ln Y_{it}^*) + \\ & \varepsilon_R^C \left(\frac{Export}{Y} \right)_{it} + \alpha I_{it}^{BankingCrisis} + v_{it} \end{aligned} \quad (2)$$

Where $I_{it}^{Y>Y^*}$ is an indicator variable equal to 1 when real GDP is higher than the potential in country i .

$$\begin{aligned} (\ln R_{it} - \ln R_{it}^*) = & c_i + \beta I_{it}^{2003-07} + \varepsilon_R^Y (\ln Y_{it} - \ln Y_{it}^*) + \tilde{\varepsilon}_R^Y I_{it}^{2003-07} (\ln Y_{it} - \ln Y_{it}^*) + \\ & + \varepsilon_R^C \left(\frac{Export}{Y} \right)_{it} + \alpha I_{it}^{BankingCrisis} + v_{it} \end{aligned} \quad (3)$$

Where $I_{it}^{2003-07}$ is an indicator variable equal to 1 from 2003 through 2007, in order to control for the global economic upturn.

Regression results of equations (2) and (3) are reported in Table 3. These models are solved for using the sample of South Africa comparison group. Results reported in this sample show that elasticity of revenue with respect to the business cycle is asymmetric. During economic downturns, the elasticity of revenue with respect to the output gap is around 1. However, revenue is much more responsive to the business cycle during expansion periods, and the elasticity of revenue to the output gap during economic expansions is around 1.8.

As shown in Table 3, the coefficients estimated for the output gap and the interaction term of economic upturn with the output gap yield similar results across the second and the third columns of this table. However, comparison of the R^2 indicates that the model described in equation (2) has a better explanatory power.

Last, the two control variables on financial crisis and external demand lose their significance when we introduce asymmetric business cycles into these equations.

Table 3: Panel Regression Results of Revenue Elasticity Controlling for Business Cycle Asymmetry

Sample Selection:	ZAF Group	ZAF Group	ZAF Group
Dependent Variable:	Revenue Gap	revenue gap	revenue gap
Output gap	1.226*** (0.111)	0.901*** (0.117)	0.977*** (0.107)
Export GDP	0.0419 (0.0540)	-0.0142 (0.0394)	0.0464 (0.0502)
Bankingcrisis	1.873 (1.778)	-0.0722 (1.298)	2.453 (1.624)
Positive Output Gap Dummy		-2.034*** (0.733)	
Dummy*Output Gap		0.931*** (0.0667)	
2003-07 Dummy			-0.224 (0.634)
Dummy*Output Gap			0.803*** (0.117)
Constant	-1.580 (2.054)	0.117 (1.501)	-1.887 (1.871)
Observations	237	237	237
R-squared	0.370	0.673	0.486
Number of i	21	21	21
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Motivated from the results shown in Figure 3, first, we will explore whether resource exporters have a different elasticity of revenue with respect to the output gap. Second, we will analyze whether the elasticity of revenue with respect to the business cycle is different for South Africa.

In order to measure the impact of the business cycle for resource exporters and for South Africa, we will add an interaction term separately for each specification to equation (1), as shown below.

$$\begin{aligned} (\ln R_{it} - \ln R_{it}^*) = & c_i + \varepsilon_R^Y (\ln Y_{it} - \ln Y_{it}^*) + \tilde{\varepsilon}_R^Y I_{it}^{ResourceRich} (\ln Y_{it} - \ln Y_{it}^*) + \\ & \varepsilon_R^C \left(\frac{Export}{Y} \right)_{it} + \alpha I_{it}^{BankingCrisis} + v_{it} \end{aligned} \quad (4)$$

Where, $I_{it}^{ResourceRich}$ is an indicator variable equal to 1 for natural resource exporters.

$$\begin{aligned} (\ln R_{it} - \ln R_{it}^*) = & c_i + \varepsilon_R^Y (\ln Y_{it} - \ln Y_{it}^*) + \tilde{\varepsilon}_R^Y I_{it}^{ZAF} (\ln Y_{it} - \ln Y_{it}^*) + \\ & + \varepsilon_R^C \left(\frac{Export}{Y} \right)_{it} + \alpha I_{it}^{BankingCrisis} + v_{it} \end{aligned} \quad (5)$$

Where, I_{it}^{ZAF} is an indicator variable equal to 1 for South Africa.

Regression results of equation (4) and (5) are reported in Table 4. Similar to the previous analysis, these models are solved for using the sample of South Africa comparison group.

Confirming the results presented in Figure 3, results show that natural resource exporters have a higher elasticity of revenue with respect to the business cycle. Again confirming the results in this figure, the interaction term for South Africa, as shown in the third column of Table 4, is not significant. In other words, the revenue elasticity with respect to output gap for South Africa is similar to that of the diversified economies.

Similar to the results shown in Table 3, financial crisis and external demand control variables lose significance in these models as well.

Table 4: Panel Regression Results of Revenue Elasticity Controlling for Natural Resource Exporters and South Africa

Sample Selection:	ZAF Group	ZAF Group	ZAF Group
Dependent Variable:	Revenue Gap	revenue gap	revenue gap
Output gap	1.226*** (0.111)	0.961*** (0.0762)	1.216*** (0.111)
Export GDP	0.0419 (0.0540)	-0.0416 (0.0367)	0.0384467 (0.0541)
Bankingcrisis	1.873 (1.778)	1.327 (1.197)	1.857 (1.777)
Resource-rich* Output Gap		0.866*** (0.0539)	
South Africa* Output Gap			0.5014159 (0.494)
Constant	-1.580 (2.054)	1.518 (1.395)	-1.45339 (2.057)
Observations	237	237	237
R-squared	0.370	0.716	0.703
Number of i	21	21	21
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Last, we solve equation (2) by excluding external demand and financial crisis control variables from the regression equation, and we solve the new model only for the diversified economies in the South African comparison group. Results of this regression analysis are reported in Table 5.

Similar to the results reported in Table 3, elasticity of revenue with respect to the business cycle is asymmetric for the diversified economies. Again similar to the results reported in Table 3, revenue has unit elasticity with respect to the output gap during the business downturns.

Table 5: Panel Regression Results of Revenue Elasticity Controlling for Business Cycle Asymmetry and Excluding Resource Exporters

Sample Selection:	ZAF Group excluding Resource Exporters
Dependent Variable:	Revenue Gap
Output gap	1.049*** (0.120)
Positive Output Gap Dummy	-1.718** (0.727)
Dummy*Output Gap	0.663*** (0.116)
Constant	-0.198 (0.305)
Observations	188
R-squared	0.751
Number of i	16
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

However, unlike the results reported in Table 3 and Table 4, the elasticity of revenue with respect to the business cycle increases less in diversified countries during economic expansions, again confirming the findings presented in Figure 3.

VII. CAVEATS

There are caveats in estimating economic cycles. Use of different methodologies may yield differences in estimating potential output, such as use structural models versus the HP-filter. Additionally, existence of structural breaks would also cause shifts in the potential output estimates. These caveats are discussed more in detail in Aydin (2010).

VIII. CONCLUSION

This paper analyzes the cyclicity of the fiscal balances in South Africa from a cross country perspective. Results show that South Africa had an outstanding revenue performance during the global growth years of the mid-2000s, and its revenue as a share of GDP had increased on average more than the rise in revenue of its peer economies.

During the global financial crisis, even though South Africa had experienced a loss in revenues, this decline was the least compared to other advanced and emerging market economies.

Results on the elasticity of revenues with respect to the output gap show that, South Africa has indicators similar to that of diversified advanced and emerging market economies. Results from this section show that South Africa has a lower elasticity of revenue with respect to the output gap than that of resource exporters. Further, this elasticity is asymmetric with respect to the business cycle: the increase in revenue collection in good times is larger than the revenue loss in bad times.

Based on these findings, the results show that as the South African economy recovers, revenues will improve; however, in a slower pace compared to the recovery expected in commodity and fuel exporters.

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