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Tax Tilting and Tax Smoothing: Evidence from South Africa and Turkey

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This paper examines the existence of tax smoothing hypothesis in two emerging economies: South Africa and Turkey. To test the tax smoothing hypothesis, we use the relationship between the budget surpluses and government expenditures. Before testing the hypothesis, we determine and filter the effect of tax tilting. Due to importance of seigniorage revenues in emerging economies, we add these revenues to tax receipts in order to cope with inflationary taxation. The results of our study show that tax tilting is common both in South African and Turkish fiscal policies. More importantly, our overall findings lend evidence against the existence of tax smoothing in South Africa and Turkey.

Keywords: Tax Smoothing, Tax Tilting, South Africa, Turkey.

JEL Classification: H3

1. Introduction

A rapid expansion of government expenditures, in the absence of a proportional increase in tax revenues, resulted in very high budget deficits in 1970s in many countries. Although temporary or cyclical deficits would be easily explained and even supported in Keynesian models, persistent and large deficits have required new explanations. In a seminal paper, Barro (1979) indicates that it would be an optimal policy to have budget imbalances in order to minimize excess burden of taxation by smoothing taxes. Therefore, an explanation and framework, other than Keynesian discretionary stabilization or countercyclical policies, have been provided for budget imbalances. In essence, the idea of tax

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smoothing suggests that a government should keep tax rates stable and hence to have budget imbalances in some periods rather than frequently raising or lowering tax rates. Another implication of tax smoothing is that a government should change tax rates as a response to changes in the government permanent spending while temporary changes should be mainly financed by adjusting the government debt stock accordingly. Although Barro (1979) develops the tax smoothing hypothesis in a partial equilibrium model, later studies, such as Lucas and Stokey (1983), Aiyagari (2002) and Schmitt-Grohe and Uribe (2004) show that it also holds within more general settings. For example, Schmitt-Grohe and Uribe (2004) find that the random walk behavior of tax rates is optimal in a dynamic stochastic general equilibrium model with sticky prices.

In an important study, Ghosh (1995) indicates that tax smoothing would not be the only reason for a government to run budget imbalances and highlights tax tilting as another motivation or cause. Budget imbalances can arise from the desire to have a flat time profile for taxes and/or to shift the burden of taxation from present to future or vice versa. The former (latter) refers to tax smoothing (tax tilting). In other words, a government can adjust tax rates, thereby changing budget balance, for reasons other than aiming to smooth taxes. For example, a government can have a low tax rate and budget deficits in early periods then can raise it over time to service its accumulating debt, depending on the government’s subjective discount rate compared to effective interest rate that government faces. If a government discount rate is lower than the effective interest rate, then the government can have high tax rates and run budget surpluses early on and, afterwards, reduce tax rates over time. Moreover, several studies, such as Cashin et al. (1999), Pasten and Cover (2015), investigate the relationship between tax-tilting and political risk/instability. Since emerging economies relatively suffer more from the lack of sound fiscal structure and strong institutions, tax tilting motivation would be stronger in these countries.

This study contributes to the existing literature by investigating the tax smoothing hypothesis in South Africa and Turkey. Following Ghosh (1995) and Rocha (2001), we make a distinction between the tax smoothing and tax tilting and add the revenues stemming from seigniorage to the tax receipts. Although studies on the tax smoothing hypothesis usually ignore the effect of inflationary taxation, we include seigniorage revenues because governments in emerging economies frequently finance government expenditures by increasing money supply leading to the so called inflation tax on money balances. Our results imply that tax tilting is very common in South Africa and Turkey. Most importantly, our findings lend substantial evidence against the existence of tax smoothing in both countries.

2. Literature Review

A large number of studies investigate whether the tax smoothing hypothesis is valid or not in accounting for the conduct of actual fiscal policy by means of unit root tests, cointegration tests and/or VAR approach. On the one hand, Barro (1981) for the US; Kingston and Layton (1986) for Australia; Serletis and Schorn (1999) for Canada, France, the US and the UK; Pasten and Cover (2011) for Chile; Kurniawan (2011) for Indonesia; Padda (2014) for Pakistan and Sri Lanka provide evidence in support of the tax smoothing hypothesis. On the other hand, Sahasakul (1986) for the US; Trehan and Walsh (1988) for the US; Padda (2014) for India; Karakas et al. (2014) and Turan et al. (2014) for Turkey report evidence against the tax smoothing hypothesis.

An important contribution to the literature coming from Huang and Lin (1993) and Ghosh (1995) criticizes random walk tests of tax smoothing in the earlier studies such as Barro (1981), and Sahasakul (1986). In this context, Huang and Lin (1993) highlight the problems related to the decomposition of the relevant series into permanent and temporary components while Ghosh (1995) emphasizes two reasons to explain why random walk tests would not be enough to reach a definite or robust conclusion on the validity of the tax smoothing hypothesis. He indicates the difficulty of the rejection of null hypothesis of random walk for many economic time series and more importantly suggests that even if tax rate series follow random walk, this does not necessarily indicate that governments smooth taxes. Because changes in tax rates could be unpredictable or follow a random walk due to some reasons other than the implementation of tax smoothing policy. Based on the approach of Campbell (1987), Huang and Lin (1993) and Ghosh (1995) suggest a new and creative empirical method for testing the tax smoothing hypothesis in a VAR framework by focusing on the path of budget surplus rather than tax rates. This approach utilizes the close relationship between budget balances and government expenditures. Tax smoothing implies that budget surplus should be equal to present discounted value of the change in government expenditures. If a government expects a rise in its expenditures at some future period, it should give a budget surplus starting from current period by immediately increasing tax rates. In doing so, the government will not have to raise the tax rate sharply when the increase in the expenditures actually takes place. By using this implication of the tax smoothing hypothesis, first a theoretical or optimal budget surplus series are estimated and then compared with the actual surplus series. Under the tax smoothing hypothesis, these two series should be nearly identical. In other words, if these two series differ from each other by more than a sampling error, this implies that the tax smoothing hypothesis fails. Furthermore, as pointed out in many studies (see, Ghosh (1995) and Reitschuler (2010)), the notion of tax smoothing suggests that the budget balance should Granger-cause changes in government expenditures.

Using the US data, Huang and Lin (1993) report evidence against the tax smoothing hypothesis for the full period of their study but fail to reject the presence of tax smoothing for a sub-sample starting from 1947. Ghosh (1995) finds that the tax smoothing hypothesis holds for the US and Canada. Following Huang and Lin (1993) and Ghosh (1995), a limited number of studies employ the approach based on budget surpluses for testing the tax smoothing hypothesis. For example, Olekalns (1997) rejects tax smoothing for the case of Australian data for 1964-1995 period. Adler (2006) presents some evidence for the existence of tax smoothing hypothesis in Sweden. Reitschuler (2010), examining the impact of Maastricht fiscal rule on the tax smoothing behavior, concludes that the tax smoothing hypothesis cannot be rejected for only 4 out of 15 EU countries. In another study, Reitschuler (2011) refutes the existence of the tax smoothing hypothesis for 5 out of 12 new member countries of EU. A number of studies also examine budget surpluses to test the tax smoothing hypothesis for developing countries. Cashin et al. (1998), using Indian data for the period between 1951 and 1997, report that the tax smoothing hypothesis holds for central government but not for regional governments, while Cashin et al. (2003) support the tax smoothing hypothesis in the case of Pakistan for 1956-1995 period. Rocha (2001), for Brazilian data over the period 1970-1994, finds evidence against the tax smoothing hypothesis for the full sample.

The model, suggested by Ghosh (1995), is also the first study making a clear distinction between two possible reasons for running budget deficits or surpluses: Tax smoothing and tax tilting. Following Ghosh (1995), several studies such as Olekalns (1997), Rocha (2001), Cashin et al. (1998, 2003), Reitschuler (2010), estimate the tax tilting parameter while testing the tax smoothing hypothesis. As Ghosh (1995), Cashin et al. (1998, 2003) find that the tax tilting motive is significant, Rocha (2001) and Olekalns (1997) conclude the opposite.

3. Methodology

The tax smoothing hypothesis is tested with different models within distinct contexts. The methodology used in Gosh (1995) is a novel approach that we follow in our study since it allows us to detect and filter the effect of tax tilting while checking the existence of tax smoothing for emerging economies whose governments frequently use tax tilting in their fiscal policies. This approach also lets us to generate hypothetical budget surplus series and ensures an optimal policy recommendation. In addition to that, his method has some policy implications. For example, it lets us to determine that how much budget surplus the government should provide to smooth taxes. But, this procedure is rarely used in empirical research because of its detailed and difficult nature.

According to Gosh (1995), a government optimizes taxes to finance expenditures and the objective function of the government becomes:

$$V = \max\left(-\frac{1}{2}\right)\sum_{i=0}^{\infty}\beta^{i}E\{\tau_{t+i}^{2}\,|\Omega_t\} \qquad 0<\beta<1 \qquad (1)$$

where the square of tax rate (τ) is assumed to be proportional to the distortionary costs and β is the subjective discount rate of the government. $E\{\cdot\,|\Omega_t\}$ is the government's expectation conditional on the information set at time t.

The government's problem is the maximization of objective function with respect to dynamic budget constraint:

$$D_{t+1} = (1+r)D_t + G_t - \tau_t Y_t$$

where D is stock of government debt, G is government expenditure, r is real interest rate, and Y is output. The dynamic budget constraint can be written in terms of GDP:

$$(1+n)d_{t+1} = (1+r)d_t + g_t - \tau_t \qquad (2)$$

where n is output growth rate and lowercase letters denote corresponding variables expressed as a fraction of GDP. The intertemporal budget constraint also implies that the present value of government expenditures equals to the present value of tax revenues, net of any initial indebtedness. Assuming government expenditure is exogenous trough the time, one can express this fact mathematically as:

$$\sum_{i=0}^{\infty} \frac{G_{t+i}}{(1+r)^i} = \sum_{i=0}^{\infty} \frac{\tau_{t+i} Y_{t+i}}{(1+r)^i} - (1+r)D_t$$

or similarly;

$$\sum_{i=0}^{\infty} g_{t+i} \left[\frac{1+n}{1+r}\right]^i = \sum_{i=0}^{\infty} \tau_{t+i} \left[\frac{1+n}{1+r}\right]^i - (1+r)d_t \qquad (3)$$

The problem of the government becomes solving Equation 1 subject to the constraint defined in Equation 2. When no-Ponzi game condition given in Equation 3 is utilized, the optimal tax rate in each period is:

$$\tau_t = \gamma(1-R)\sum_{i=0}^{\infty} R^i E\{g_{t+i}|\Omega_t\} + (1+r)d_t\gamma\{1-R\}$$

$$= \gamma(1-R)\left\{(1-R)\sum_{i=0}^{\infty} R^i E\{g_{t+i}|\Omega_t\} + (r-n)d_t\right\} \qquad (4)$$

where $R = (1+n)/(1+r)$ and $\gamma = [\frac{1-\left(\frac{R}{\beta}\right)R}{1-R}]$. Note that the effective real interest rate $1/R = (1+r)/(1+n)$ that government faces is slightly different from the market interest rate $(1+r)$. Whenever the economy has positive growth, the effective real interest rate that government faces becomes smaller than the market real interest rate. γ is tax tilting component and the government compares its subjective discount rate β to R to decide whether tax tilting is appropriate for fiscal policy or not. If $\beta < R$, then the government has a discount rate higher than the market rate and, thus, it begins to adopt lower tax rates earlier and accumulates debt. Tax rates are increased later over time to service the debt. On the other hand, if $\beta > R$, then the government levies higher taxes to build up assets and implements tax reductions in future. Whenever $\beta = R$, tax tilting component equals to 1 and the government does not seek to change tax rates. In this case, tax rates are kept to be constant over time and the public authority runs budget deficits when expenditures are high. The debts arising from the budget deficits are paid at times when expenditures are low.

Equation 4 implies that when tax rates are set optimally, they should follow a random walk:

$$\begin{aligned} \tau_t - \tau_{t-1} &= \\ &= (1-R)\sum_{i=0}^{\infty} R^i E\{g_{t+i}|\Omega_t\} + (r-n)d_t - (1-R)\sum_{i=0}^{\infty} R^i E\{g_{t+i-1}|\Omega_{t-1}\} + (r-n)d_{t-1} \\ &= (1-R)\sum_{i=0}^{\infty} R^i E\{g_{t+i}|\Omega_t\} + (r-n)d_t - \{(1-R)\sum_{i=1}^{\infty} R^{i-1} E\{g_{t+i-1}|\Omega_{t-1}\} + (r-n)d_t\} \\ &= (1-R)\sum_{i=0}^{\infty} R^i [E\{g_{t+i}|\Omega_t\} - E\{g_{t+i}|\Omega_{t-1}\}] \end{aligned} \quad (5)$$

Since $(1-R)\sum_{i=0}^{\infty} R^i [E\{g_{t+i}|\Omega_t\} - E\{g_{t+i}|\Omega_{t-1}\}]$ cannot be predicted by means of the available information at the time t-1, it can be identified as an error term stemming from the expectation process. The tax smoothing hypothesis is frequently tested according to this random walk property. However, such a test has its own weaknesses, since it assumes that the only existing factor is the tax smoothing policy giving rise to random walk in tax rates. Nevertheless, such an assumption is vague in its nature. First of all, tax rates can follow random walk without specifically aiming to minimize distortionary effects. Secondly and more importantly, among many other factors, it is possible that even the data generating process of GDP can be effective on the randomness of tax rates. In other words, random walk property may not only be associated directly with the existence of tax smoothing policy. Thus, we follow a different and robust way based on budget surpluses to investigate the tax smoothing behavior.

Government expenditures and revenues usually are non-stationary series. According to Gosh (1995), it is proper to establish the budget surplus equation by transforming Equation 4 with the dynamic budget constraint given in Equation 2:

$$\begin{aligned} SUR_t &= (1+n)(d_t - d_{t-1}) \\ &= \tau_t - g_t - (r-n)d_t \\ &= (1-R)\sum_{i=0}^{\infty} R^i E\{g_{t+i}|\Omega_t\} - g_t \\ &= (1-R)\sum_{i=0}^{\infty} R^i \left\{\sum_{j=1}^{i} E\{\Delta g_{t+j}|\Omega_t\}\right\} \end{aligned}$$

$$= (1-R)\sum_{j=1}^{\infty}\{\sum_{i=j}^{\infty} R^i\}E\{\Delta g_{t+j}|\Omega_t\}$$
$$= (1-R)\sum_{j=1}^{\infty}\frac{R^j}{1-R}\,E\{\Delta g_{t+j}|\Omega_t\}$$
$$= \sum_{j=1}^{\infty} R^j\,E\{\Delta g_{t+j}|\Omega_t\} \qquad (6)$$

where $\Delta g_{t+j} = g_{t+j} - g_{t+j-1}$ is the backward difference. Actually, Equation 6 provides the optimal budget surplus that we will call SUR_t^* henceforth. According to Equation 6, the government raises (decreases) taxes whenever it expects higher (lower) government expenditure. Theoretically, it is sufficient to compare optimal budget surplus ($SUR_t^* = \sum_{j=1}^{\infty} R^j\,E\{\Delta g_{t+j}|\Omega_t\}$) with the actual budget surplus ($SUR_t = (1+n)(d_t - d_{t-1})$) to determine whether the tax smoothing hypothesis hold. But, it is difficult to generate the right-hand side of the Equation 6. A government has complete information set over its expenditures, but we are not able to capture this information in a full extent because of institutional and political factors. Nonetheless, all the information regarding the future government expenditures is implicitly embedded in current budget surplus. Any government smoothing taxes to minimize distortionary effects has to adjust budget surplus in such a way so that budget surplus Granger-causes changes in government expenditures. Campbell (1987) states that SUR_t should Granger-cause Δg_t under the tax smoothing hypothesis unless SUR_t is an exact linear function of current and lagged changes in government expenditures. Taking this proposition as the basis of our approach, we proceed using an unrestricted vector autoregression (VAR) in Δg_t and SUR_t where SUR_t is defined using tax tilting component as $SUR_t = \frac{1}{\gamma}\tau_t - [g_t + (r-n)d_t]$:

$$\begin{bmatrix}\Delta g_t \\ SUR_t\end{bmatrix} = \begin{bmatrix}\psi_1 & \psi_2 \\ \psi_3 & \psi_4\end{bmatrix}\begin{bmatrix}\Delta g_{t-1} \\ SUR_{t-1}\end{bmatrix} + \begin{bmatrix}u_{1t} \\ u_{2t}\end{bmatrix} \qquad (7)$$

or simply defining $Z_t = [\Delta g_t\, SUR_t]'$, the equation becomes $Z_t = \psi Z_{t-1} + U_t$. The optimal k period ahead forecast for any Z_{t+k} can be determined from Equation 7 as $E_t Z_{t+k} = \psi^k Z_t$. Thus, Equation 6 can be expressed by:

$$[0 \quad 1]Z_t = \sum_{i=1}^{\infty} R^i \psi^i [1 \quad 0]\, Z_t \qquad (8)$$

Assuming both Δg_t and SUR_t are stationary, the infinite sum in Equation 8 converges to:

$$SUR_t^* = [1 \quad 0]R\psi[I - R\psi]^{-1}Z_t = \Lambda Z_t = [\lambda_1 \quad \lambda_2]Z_t = \lambda_1 \Delta g_t + \lambda_2 SUR_t \qquad (9)$$

If the tax smoothing hypothesis holds, the estimated coefficient on Δg_t has to be equal to zero and the estimated coefficient on SUR_t must be unity according to Equation 9.

3. Data and Empirical Results

Data employed for the analysis of South Africa comes from the South African Reserve Bank. We use nominal GDP, real GDP, total national government expenditures, national government interest expenditures, national government tax revenues, national government debt, and M1 money supply for the period 1977-2014. For Turkey, data is limited to the central government and retrieved from various sources for the period 1980-2014. Nominal and real GDP data are obtained from Turkish Ministry of Development and Turkish Statistical Institute, M1 money supply data is retrieved from the Central Bank of Turkey, data on central government expenditures and tax revenues are taken from Turkish Ministry of Finance while central government debt stock series are from Turkish Statistical Institute and the Undersecretariat of Turkish Treasury.

To investigate the tax smoothing hypothesis, we first examine the magnitude of tax tilting effect on the fiscal policy. If there exists no tax tilting behavior, the tax tilting component is assumed to be unity since government's subjective discount rate is similar to market interest rates. Although we rarely encounter to the issue of tax tilting in developed countries, governments' subjective discount rates in emerging economies generally tend to quite differ from the market rates partly because of undeveloped domestic credit markets. Developing country governments usually cannot find adequate funds in domestic markets to harmonize their discount rates with market rates. Thus, they are forced to borrow from abroad and shift taxes with respect to their subjective discount rates. Inflationary pressures may also cause governments to apply excessive tax tilting since, being a persistent problem in developing countries, inflation generates uncertainty and impairs expectations of all economic agents. When the expenditures related to social welfare issues such as health, education, and infrastructure are at stake in an inflationary period, governments necessarily keep their subjective discount rates higher compared to the other economic agents. As the subjective discount rates become higher than market rates, governments apply lower tax rates and accumulate debts to cover government expenditures. Conversely, whenever subjective discount rates are lower than market rates, governments rely on higher taxes and accumulate assets to spend later.

In the case of tax tilting, actual government surplus becomes:

$$SUR_t = \frac{1}{\gamma}\tau_t - [g_t + (r - n)d_t] \qquad (10)$$

where γ is tax tilting component. If τ_t and $g_t + (r - n)d_t$ series are integrated of order one (I(1)), then theoretical budget surplus should become an I(0) series under the tax smoothing hypothesis. If tax smoothing is adopted by the governments in their fiscal policies, actual budget surplus series should be very similar to theoretical budget surplus series possessing random walk properties. In fact, Equation 10 defines a cointegrating regression since both tax rate series and government expenditure series including interest payments are observed to be I(1) in a great deal of empirical studies. Thus, we are able to find the tax tilting component by regressing τ_t on $g_t + (r - n)d_t$. To proceed further, it is necessary to check whether these series are stationary or not. In addition to that, the first differences of these series should not contain any unit roots for the tests ahead. Therefore, we have to be able to generate an actual budget surplus series that is I(0) for further assessments of the tax smoothing hypothesis.

An important issue in the context of emerging economies is inflationary taxation. Even though developed countries avoid inflationary taxation by stabilizing money supply, developing countries prefer to rely on inflation as a sort of indirect taxation by increasing monetary aggregates. Thus, one should determine and include the effect of loose monetary policy of emerging countries to government tax revenues. To cope with this issue, we add the change in M1 money supply into tax revenues and calculate tax rates including seigniorage revenues. Therefore, our study sheds lights on the unobserved part of taxation in developing countries and uses it to capture more accurate results for South Africa and Turkey.

Table 1 presents unit root tests on government expenditures excluding interest payments (g_t), government expenditures including interest payments (g_t^*), tax revenues including seigniorage (τ_t), and actual budget surplus (SUR_t) for South Africa and Turkey. Although g_t, g_t^*, and τ_t series contain unit roots in levels for both countries, their first differences are stationary. According to the theoretical model, Equation 6 requires the stationarity of SUR_t even if g_t is not stationary. To check this theoretical necessity, we calculate series for SUR_t and test the budget surplus data for stationary. It is clear that SUR_t is I(0) and possesses random walk properties.

Table 1: Unit Root Tests

Country	**South Africa**		**Turkey**	
Series	**ADF Test Statistic**	**PP Test Statistic**	**ADF Test Statistic**	**PP Test Statistic**
g_t	-1.023	-1.160	-1.018	-1.169
Δg_t	-6.281***	-6.274***	-4.967***	-4.977***
g_t^*	-0.607	-0.737	-0.427	-0.170
Δg_t^*	-6.333***	-6.323***	-6.700***	-6.837***
τ_t	0.221	0.601	0.416	0.922
$\Delta \tau_t$	-7.861***	-8.585***	-9.383***	-9.230***
SUR_t	-3.767***	-3.722***	-3.004**	-3.073**

Notes: H_0 for ADF (Augmented Dickey-Fuller) and PP (Phillips-Perron) tests is that the variable contains a unit root. *, **, *** show significance at 10%, 5%, and 1%, respectively. For τ, specification with no constant is used.

After checking theoretical requirements, we proceed to estimate tax tilting component. Regressing τ_t on $g_t + (r - n)d_t$, we find that γ for South Africa is 0.874 and it is 0.584 for Turkey. Also, tax tilting parameters, which are calculated as $1/\gamma$, are 1.145 and 1.712 for South Africa and Turkey, respectively. It is clear that there is excessive implementation of tax tilting in these two countries, since tax tilting parameters are quite different from unity. Actually, higher tax tilting parameters are associated with higher subjective discount rates for governments compared to market interest rates. Thus, South Africa and Turkey tend to shift the burden of taxation away from present while running considerable budget deficits. In other words, both countries accumulate debt to cover government expenditures earlier in time and, later in future, they levy higher taxes to pay debts. Turkey is especially more prone and dependent on tax tilting compared to South Africa.

After it is shown that the series satisfy theoretical requirements, the structure of the VAR model is determined between Δg_t and SUR_t by means of Akaike, Hannan-Quinn, and Schwarz Information Criteria. Table 2 reports optimal number of lags for the VAR models for South Africa and Turkey. All criteria except Akaike Information Criterion for the VAR model of Turkey imply that optimal lag length is 1.

Table 2: VAR Model Selection

Country	**South Africa**			**Turkey**		
VAR Order	**AIC**	**HQIC**	**SIC**	**AIC**	**HQIC**	**SIC**
1	**-10.411**	**-10.349**	**-10.235**	-8.461	**-8.4**	**-8.28**
2	-10.323	-10.2	-9.967	-8.465	-8.344	-8.099
3	-10.375	-10.191	-9.836	-8.317	-8.136	-7.762
4	-10.094	-9.85	-9.368	-8.385	-8.145	-7.637
5	-9.943	-9.64	-9.027	**-8.47**	-8.174	-7.527

Table 3 reports the parameter estimates and Lagrange multiplier tests of the VAR models for South Africa and Turkey. According to the results of Lagrange multiplier tests, the VAR models do not suffer from the first and second order autocorrelation. The coefficients on SUR_{t-1} are not significant in the equation for Δg_t for South Africa and Turkey. Only significant estimated coefficients are those on SUR_{t-1} in the equation for SUR_t for both countries. This implies that SUR_{t-1} does not Granger-cause Δg_t providing evidence against the tax smoothing behavior in South Africa and Turkey. It is important to note that this analysis is preliminary and not sufficient for a final decision on the existence of the tax smoothing behavior.

Table 3: VAR Models

Country	South Africa		Turkey	
Dependent Variables	Δg_t	SUR_t	Δg_t	SUR_t
Δg_{t-1}	-0.05	0.407	-0.154	0.257
	(0.162)	(0.547)	(0.169)	(0.487)
SUR_{t-1}	0.045	0.786***	0.028	0.866***
	(0.031)	(0.104)	(0.032)	(0.091)
Lagrange Multiplier Test				
Lags	**Chi Square**	**Probability**	**Chi Square**	**Probability**
1	6.288	0.179	7.36	0.118
2	1.279	0.865	0.394	0.983

Notes: *, **, *** show significance at 10%, 5%, and 1%, respectively. Standard errors are in parentheses.

For a further step to determine the existence of tax smoothing behavior in South Africa and Turkey, we apply Granger causality tests using lags from 2 to 5. Table 4 shows the results of the tests for South Africa and Turkey. On the one hand, we fail to reject the null hypothesis that SUR_t does not Granger-cause Δg_t for all lags from 2 to 5 for Turkey. On the other hand, the null hypothesis is only rejected in the formal test with 2 lags for South Africa. The existence of causality running from SUR_t to Δg_t is partially relevant to the tax smoothing behavior in South Africa, but there is a need for further assessment to prove the validity of tax smoothing hypothesis.

Table 4: Granger Causality Tests

Country	South Africa		Turkey	
Lags	**F Statistic**	**Probability**	**F Statistic**	**Probability**
2	3.15	0.057	0.5	0.615
3	1.34	0.281	0.5	0.686
4	4.81	0.308	0.85	0.512
5	1.19	0.346	1.01	0.442

As discussed in the theoretical model; under the tax smoothing hypothesis, Equation 9 requires λ_1 and λ_2 to be equal to zero and unity, respectively. In fact, this requirement can be easily tested by means of the VAR model:

$SUR_t^* = [1 \quad 0]R\psi[I - R\psi]^{-1}Z_t$ and $SUR_t = [0 \quad 1]Z_t$

If tax smoothing hypothesis holds, then SUR_t^* should be theoretically equal to SUR_t:

$$[1 \quad 0]R\psi[I - R\psi]^{-1}Z_t = [0 \quad 1]Z_t$$

Post-multiplying by $[I - R\psi]$ and adding $[0 \quad 1]R\psi$ yields:

$$[1 \quad 0]R\psi + [0 \quad 1]R\psi = [1 \quad 1]R\psi \qquad (11)$$

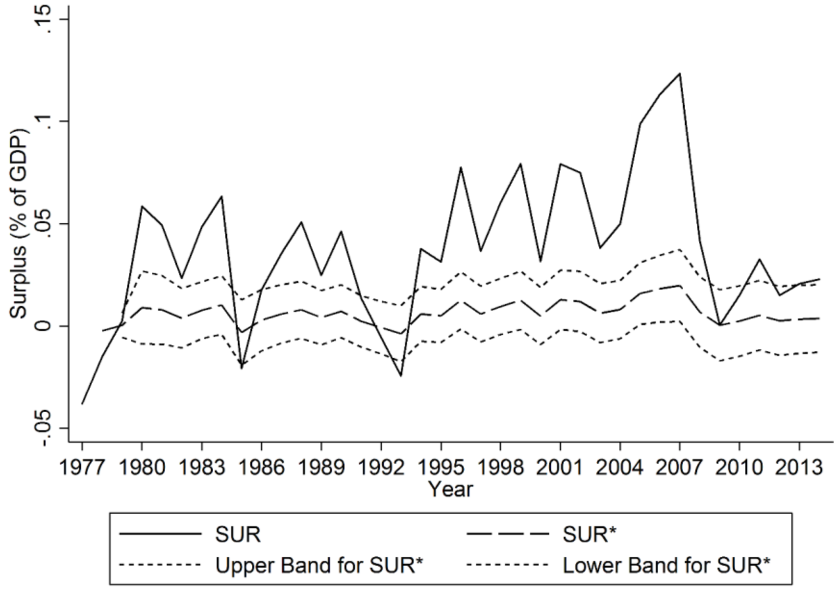
As stated, if the tax smoothing hypothesis is valid, λ_1 should be equal to zero. Then, the sum of the elements in the first column of $R\psi$ has to be approximately zero i.e. $R(\psi_1 + \psi_3) = 0$. Also, under the tax smoothing hypothesis, λ_2 has to be unity. This fact implies that the sum of the elements in the second column of $R\psi$ should be approximately equal to unity i.e. $R(\psi_2 + \psi_4) = 1$. In Table 3, the coefficients on Δg_{t-1} for South Africa add up to 0.357 and $R(\psi_1 + \psi_3)$ equals to 0.333. Testing $H_0: R(\psi_1 + \psi_3) = 0$ against the alternative $H_A: R(\psi_1 + \psi_3) \neq 0$, we fail to reject the null hypothesis $[\chi^2_{(1)} = 0.5]$. The sum of coefficients on SUR_{t-1} for South African case is 0.831 and $R(\psi_2 + \psi_4)$ equals to 0.721. By testing $H_0: R(\psi_2 + \psi_4) = 1$, we come to the conclusion that $R(\psi_2 + \psi_4)$ is significantly different from unity $[\chi^2_{(1)} = 6.42]$. These results lend substantial evidence for the non-existence of tax smoothing in South Africa.

Based on the findings given in Table 3, the sum of coefficients on Δg_{t-1} equals to 0.103 and $R(\psi_1 + \psi_3)$ is 0.095 for Turkey. Applying the Wald test, we determine that $R(\psi_1 + \psi_3)$ is not significantly different from zero $[\chi^2_{(1)} = 0.04]$. The coefficients on SUR_{t-1} add up to 0.894 for the Turkish case. $R(\psi_2 + \psi_4)$ equals to 0.822 and the result of the Wald test on the null hypothesis $H_0: R(\psi_2 + \psi_4) = 1$ points out that $R(\psi_2 + \psi_4)$ is significantly different from unity $[\chi^2_{(1)} = 4.35]$. Likewise, South Africa, our results reveal the non-existence of tax smoothing in Turkish fiscal policy.

At the last step, we generate both actual and theoretical budget surplus series and illustrate the series on the same graph. Actual budget surplus series is generated from $SUR_t = \frac{1}{\gamma}\tau_t - [g_t + (r-n)d_t]$ excluding the tax tilting effect. Theoretical budget surplus series is calculated with respect to $SUR_t^* = [1 \quad 0]R\psi[I - R\psi]^{-1}Z_t$ and it also excludes the effect of tax tilting. Theoretical series indicates the required level of budget surplus in order to have the valid tax smoothing hypothesis. Any significant divergence of actual series from the theoretical series points out that the tax smoothing hypothesis is violated. Figure 1 shows the actual budget series (SUR) and theoretical budget series (SUR^*) for South Africa. In addition, upper and lower bands for theoretical budget series are calculated utilizing sample standard deviations. Upper and lower bands show the data points having a distance of 3 sample standard deviations from theoretical series. Based on upper and lower bands, we are able to check whether actual budget surplus series differs from theoretical budget surplus series by a sampling error. The probability of any datum point being outside the area limited by upper and lower bands is extremely low if it is coming from the data generating process of theoretical budget surplus series. Thus, whenever we encounter with such data points, we can easily conclude that they are from a different data generating process.

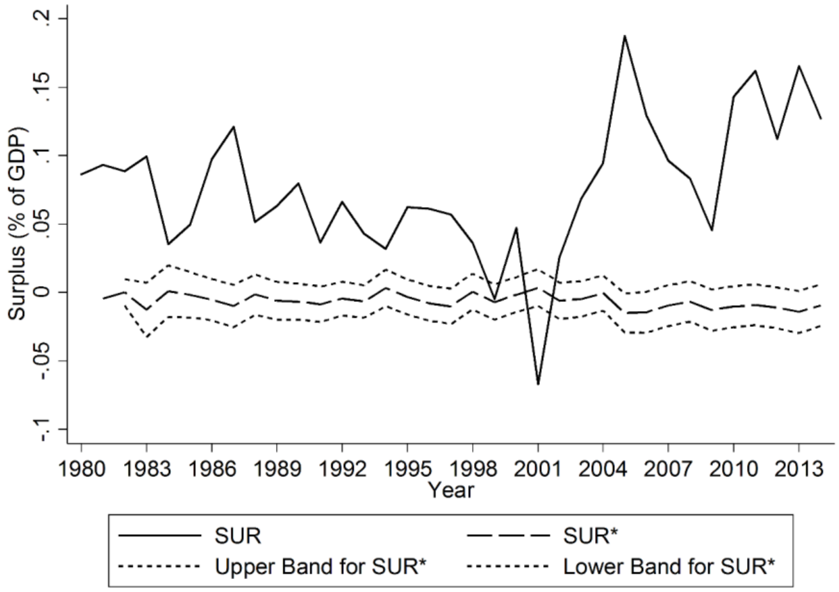
Theoretical budget surplus series illustrated in Figure 1 is often slightly above zero level for South Africa. Conversely, actual budget surplus series frequently follows a path substantially above zero level and displays excessive volatility. With a few of exceptions, data points of actual budget surplus series are mostly outside the area limited by upper and lower bands. It is clear that the data generating process of actual budget surplus series is different from the process of theoretical surplus series. In plain terms, actual budget surplus series differs from theoretical budget surplus series by more than a sampling error. Since actual and theoretical budget surpluses have to follow similar paths under the tax smoothing hypothesis, this graphical finding lends significant evidence against the existence of tax smoothing in South Africa.

Figure 1: Actual and Theoretical Budget Surplus Series for South Africa



Actual and theoretical budget surplus series for Turkey are illustrated in Figure 2. In contrast to the case of South Africa, theoretical budget surplus series for Turkey is often slightly under zero level. However, actual budget surplus series generally follows a path on the upper side of the graph where budget surpluses take high positive values. Except in years 1999 and 2001, in which Turkey experienced very deep and intense domestic economic crises, actual budget surplus series are outside the area limited by upper and lower bands of theoretical budget surplus series. It is obvious that actual budget surplus series differs from theoretical budget surplus series by more than a sampling error. Thus, these findings also do not support the existence of tax smoothing in Turkish fiscal policy.

Figure 2: Actual and Theoretical Budget Surplus Series for Turkey.



There are at least three important aspects of the series on the graphs in Figures 1 and 2, which need to be highlighted. First of all, our derived series clearly indicate that both South African and Turkish governments use tax tilting excessively. The estimated tax tilting parameters above unity also support this conclusion. The estimated parameter for Turkey is especially very high indicating the extreme tax shifts in fiscal policy. For these economies, the tax tilting behavior partly stems from the undeveloped financial markets where governments are not able to adjust their discount rates to domestic market rates by borrowing adaquate funds. They thus initially depend on foreign funds to finance current government expenditures and, later, shift taxes to the future when payback period comes. Moreover, long periods of high inflation in South Africa and Turkey are associated with higher levels of uncertainity that prevents governments from forming rational expectations on their subjective discount rates. As uncertainity in the economy increases, governments actually begin to overestimate their subjective discount rates. As a result, the more the discount rates of the governments differ from market rates, the more tax tilting occurs. In the same vein, South African and Turkish governments prefer to spend "now" through borrowing funds from abroad and then choose to raise the tax rates when the due dates of the debt payments come.

Secondly, actual budget surplus calculations frequently mean the persistent budget deficits in these countries and contradict with our graphical representations. In the figures, both South Africa and Turkey often seem to have large budget surpluses since the effect of tax tilting is determined and filtered in our budget surplus calculations and the impact of seignorage on government revenues is reflected to taxation.

Finally, theoretical budget series suggest slightly positive or negative budget balances as optimal for both countries. Our estimated surplus series show that these two countries have much less budget deficits than implied by our calculations.

4. Conclusion

We examine the validity of existence of tax smoothing hypothesis in South Africa and Turkey by examining the relationship between budget surpluses and government expenditures. This approach is not dependent on random walk tests and does not necessitate any decomposition of the available data into permanent and temporary components. Besides, our study also employs a novel approach that allows us to determine and filter the effect of tax tilting while we examine the tax smoothing hypothesis.

We carry out several tests in order to investigate the existence of tax smoothing hypothesis. The results from our VAR model do not favor the tax smoothing hypothesis for both countries. However, Granger causality tests slightly support the tax smoothing behavior in South Africa but not for the case of Turkey. Then, restrictions on the coefficients are imposed in line with the tax smoothing hypothesis. Our findings for both countries invalidate the existence of tax smoothing. Finally, and the more importantly, we generate theoretical budget surplus series under the tax smoothing hypothesis and illustrate these series with the actual budget surplus series. Unlike the predictions of the tax smoothing hypothesis, our graphs for both countries reveal that actual budget surplus series are substantially different from the theoretical ones. With the exception of the results in the first step of our analysis and the weak results from Granger causality tests for South Africa, our overall results robustly indicate that both the South African and Turkish governments do not follow tax smoothing in their fiscal policies.

The potential explanations behind the non-existence of tax smoothing in both South Africa and Turkey are rather complicated and various. First, being emerging economies, South Africa and Turkey lack advanced financial markets during especially initial parts of examined period, implying shifting taxes without considering the distortionary effects. Second, inflation has been a persistent problem in these countries, impairing expectations. Simply because of increased uncertainty caused by inflationary pressures, government's subjective discount rates tend to be much higher compared to market rates and this phenemenon gives rise to excessive implementation of tax tilting in fiscal policies. Third, institutional factors, particularly related to government spending and revenue decisions and policy making process, would be important in explaining the deviations from optimal fiscal policies. Consequently, it would be helpful to make structural reforms to enrich financial markets, to provide price and financial stability, and to establish and promote strong institutions. Although, we are well aware of that making these reforms is easier said than done, this is the only way to go forward. Finally, we think that these policy implications and suggestions are not only relevant or restricted to South Africa and Turkey but also other emerging economies facing with similar problems in terms of financial markets, uncertainty and institutional quality.

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