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State-dependent fiscal multipliers and financial dynamics: An impulse response analysis by local projections for South Africa

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August 2021

Abstract

The aim of this paper is to assess South Africa's fiscal multiplier across different states of the economy, with a focus on the financial accelerator mechanism of fiscal spending shocks, by estimating impulse response functions from both linear and non-linear local projections. The model finds evidence of strong business cycle effects such that, while the average multiplier is below 0.5, it reaches 1.2 during recessions and that credit volume diminishes during periods of positive output gaps but expands otherwise. Results suggest that a fiscal spending expansion crowds out private economic activity in good times only, while it holds a positive balance-sheet effect on liquidity-constrained agents during bad times. Evidence of a state-dependent financial accelerator mechanism of fiscal expansion is confirmed by the positive response of the FTSE/Johannesburg Stock Exchange All-Share Index during times of slack.

JEL classification: C32, E44, E62

Keywords: fiscal multiplier, local projections, state-dependent multiplier, credit, South Africa

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1. Introduction[1]

Interest in both the effectiveness of discretionary fiscal policy as a counter-cyclical tool and the importance of financial markets over the business cycle has resurged in the aftermath of the global financial crisis of 2008. In advanced economies, discussions have rotated around the delicate balance between fiscal discipline and stimulus at the zero lower bound. In developing countries, attempts to fuel economic recovery have clashed with the need to preserve monetary credibility and attract foreign capital.

Since 2008, the South African economy has been slowly deteriorating. In 2019, real GDP growth plunged to 0.2% and the unemployment rate exceeded 28% (World Bank 2020). In an attempt to mitigate the slowdown, fiscal expenditure was systematically increased until reaching 30% of GDP in 2019 (ibid.). As growth fell below real interest rates and revenues contracted, budget deficits were mostly financed by foreign savings, rapidly swelling the country's sovereign debt. The latter grew from 26% of GDP in 2008 to 63% of GDP in 2019, and it is forecasted to exceed 100% of GDP by 2025 (Loewald et al. 2019). According to the IMF (2020), South Africa's economic growth is mostly constrained by supply-side factors, including bottlenecks in infrastructure and electricity provision, over-regulated labour markets, and increases in market concentration. In light of these constraints and the tight fiscal policy space, higher public spending is believed to crowd out private borrowing. Instead, debt consolidation could reverse the prevailing dynamics by lowering South Africa's risk premium and yields (Loewald et al. 2019; NT 2019; IMF 2020). By contrast, Schroeder and Storm (2020) criticise the idea that the fiscal belt-tightening proposed in South Africa's 2020 budget may be expansionary. They argue that, beyond the aforementioned microeconomic constraints, the South African economy is also performing considerably below potential due to low domestic and foreign demand, which indicates that there is considerable space for non-inflationary stimulus. Based on this, Schroeder and Storm (2020) predict that – under the current stagnation at a high unemployment rate, a negative output gap, and inflation maintained below its

[1] I am grateful to Prof Laurence Harris (SOAS, UNU-WIDER) and Dr Konstantin Makrelov (SARB) for their mentorship and guidance. I would also like to thank participants of the 2nd SAMNET virtual workshop for their invaluable comments.

middle-point target – a rigid adherence to fiscal discipline might rather contract output and deteriorate the debt-to-GDP ratio further.

Existing research presents mixed views on the effectiveness of fiscal policy, whereby the size of the multipliers depends on a number of conjunctural aspects such as the responsiveness of interest rates, the health of public finances, and the state of the business cycle (Perotti 1999; Christiano et al. 2011; Corsetti et al. 2012). More recently, the New Keynesian literature has shifted attention to the agency of financial markets in the fiscal policy transmission mechanism (Fernandez-Villaverde 2010; Makrelov et al. 2019). In particular, Makrelov et al. (2019) explore how government expenditure shocks can prompt a financial accelerator mechanism that has the ability to amplify the initial demand shock through changes in asset valuations and the external finance premium faced by firms.

Along the same lines, this paper emphasises the link between fiscal spending shocks, financial sector dynamics, and the business cycle. By estimating impulse response functions from both linear and non-linear local projections, the first contribution of this work is to shed new light on the effect of discretionary fiscal policy in stimulating output and its components in South Africa. In the case of South Africa, this paper is the first one to adopt Ramey and Zubairy's (2018) data transformation and impulse response specifications for reducing biases when estimating fiscal multipliers. Given that there is little empirical research on the financial accelerator mechanism resulting from unexpected fiscal actions, the second contribution of this work is to assess how the size of the fiscal multiplier varies by taking into account changes in financial conditions.

The following section presents a selected survey of the literature on fiscal policy that highlights the most recent and influential academic developments. Given the scope of this paper, Section 2 will also introduce the links between fiscal policy and financial markets with a focus on the balance sheet effects modelled by Makrelov et al. (2019). Section 3 summarises the modest body of studies that advance estimates of fiscal multipliers in South Africa. Section 4 presents the data, the specification of the linear and non-linear local projections, and the resulting impulse response functions. Section 5 concludes with a discussion of estimates of state-dependent fiscal multipliers in light of financial sector dynamics in South Africa.

2. Financial market dynamics and the fiscal multiplier

Standard New Keynesian models are built around an essentially neoclassical framework, whereby private consumption is governed by intertemporal optimisation, and macroeconomic policies have a short-run effect on output. As a result of the specification of agents' preferences, fiscal multipliers hardly exceed the unity due to crowding out of private activity, therefore distorting the efficient composition of aggregate expenditure. In contrast to Keynesian macroeconomics, these models have generally supported the view that output-gap stabilisation should be left to monetary policy (Monacelli and Perotti 2008).

However, the global financial crisis has spurred new research on the effectiveness of fiscal policy shocks. The research suggests that the zero lower nominal interest bound may make multipliers large during recessions. In such an event, as a recession takes hold, the central bank's policy rate reaches the lower bound of zero, and a vicious cycle of weak demand, deflationary pressures, and higher real rates slow the economy down further. Christiano et al. (2011) find that a multiplier value above 3 is possible when the output loss due to the zero lower bound (ZLB) is severe: a surge in government spending counteracts the deflationary spiral associated with the ZLB, therefore lowering real rates and eventually driving up consumption. Similarly, Woodford (2010) estimates relatively large fiscal multipliers: when the recession is perceived as persistent and the policy rate hits the ZLB, temporary increases in government purchases raise expected utility and reduce the output gap. Based on a panel of Organisation for Economic Co-operation and Development (OECD) countries, Corsetti et al. (2012) empirically confirm that, in an economy with flexible exchange rates, the macroeconomic effects of fiscal loosening are generally weak in normal times, while they are stronger during times of financial crisis. Nevertheless, historical data show that, during financial crises, countries have generally cut back government spending, presumably out of concern over debt sustainability. In fact, in the case of weak public finances (i.e. public debt higher than 100% of GDP), the impact of a fiscal policy shock on output and investment is lower than it would be otherwise.

In effect, another important argument concerning fiscal policy is that the size of the multiplier depends on the state of public finances: given the government intertemporal budget constraints, spending and taxation may respond to the country's degree of

indebtedness that will prevail after the fiscal shock. In particular, fiscal loosening that deteriorates a country's debt level and threatens a reversal consolidation in the future can potentially be contractionary. Perotti (1999) builds a model in which the correlation between private consumption and fiscal shocks changes, from Keynesian to neoclassical, depending on whether the size of public debt or deficit is low or high. Adding a dummy variable that captures bad versus good regimes, he also finds strong evidence in support of this argument. Favero and Giavazzi (2007) demonstrate that including the debt-to-GDP ratio in the vector autoregression (VAR) system of endogenous variables allows capturing the feedback effect from debt to fiscal policy. The empirical literature generally finds that high sovereign debt levels are associated with low or negative multipliers (Ilzetzki et al. 2013; Huidrom et al. 2019; Nickel and Tudyka 2014). Based on United States (US) data, Mountford and Uhlig (2009) estimate a higher output response in case fiscal shocks are caused by deficit-financed tax cuts, relative to both deficit-financed and a balanced-budget tax-financed spending expansion. In all instances, the output response is short-lived, and investment is crowded out. According to Ilzetzki (2011), tax cuts – particularly to personal income – have a stimulative and persistent effect on economic growth in developing countries, while government expenditure is more effective in high-income countries, closed economies, and fixed exchange rate regimes – including South Africa. Moreover, using Favero and Giavazzi's structural VAR (SVAR) methodology with debt-dynamics, Ilzetzki demonstrates that linear time-series methods typically overstate the effects of fiscal policy by ignoring the negative effect of excessive debt. In his model, government spending responds negatively to its own shock after five quarters, indicating a reversal towards fiscal contraction. In the case of South Africa, however, this effect is not statistically significant. Additionally, despite increases in debt levels, he does not find evidence of an interest rate rise following an increase in government expenditure. Clearly, this substantive strand of work on fiscal policy and debt has accompanied the public debate in the US and other OECD countries as policy-makers shifted from stimulus to austerity measures.

With respect to capturing the cyclical asymmetries in multipliers, Mittnik and Semmler (2013) show that the standard linear VAR methodology is inappropriate for analysing multi-regime processes and suggest a regime-dependent VAR specification. Adopting this alternative model, the multiplier is considerably higher in a regime of low economic

activity than in a regime of high activity. Auerbach and Gorodnichenko's (2013) regime-switching VAR methodology finds Keynesian-type fiscal multipliers that reach 2.48 during economic downturns in several industrialised OECD countries, which indeed increase private spending. These empirical results challenge the mainstream belief that fiscal stimulus is ineffective unless the ZLB binds and debt is sustainable; hence, they indicate the urgency of developing new theoretical models that relax this constraint, and envisage fiscal mechanisms for crowding in private activity instead. In particular, following the outbreak of the global financial crisis, New Keynesian models have been criticised for the omission of financial sector dynamics given how decisive these are in shaping economic downturns, the sustainability of government debt, and so the effectiveness of fiscal policy.

In light of these views, Fernandez-Villaverde (2010) builds a dynamic stochastic general equilibrium (DSGE) model with financial frictions in the form of information asymmetries between lenders and borrowers. A shock to government expenditure that raises inflation expectations cuts real rates and the intrinsic cost of capital associated with asymmetric information. That, in turn, generates a feedback loop between investment and overall economic activity that outweighs crowding-out effects. Carrillo and Poilly (2013) add that the capital accumulation channel amplifies fiscal multipliers particularly during a liquidity trap, when the ZLB binds the nominal rate for a few periods. Aside from impairing the central bank's ability to take counter-cyclical actions, a constant feature of financial distress is that access to credit becomes severely restricted. In this respect, Eggertsson and Krugman (2012) build a simple model of an economy in a private debt-driven recession and a liquidity trap, where a fraction of agents is debt-constrained. They show that deficit-financed temporary fiscal spending can be an effective expansionary tool, owing to a balance sheet strengthening of liquidity-constrained debtors through the Fisher effect. In addition, their model suggests a Keynesian-type multiplier, with the size of that multiplier depending positively on the share of debt-constrained borrowers in the economy. Tax cuts and transfer payments are equally effective as long as they fall on debt-constrained agents – who would be difficult to target in the implementation stage of fiscal policy. Notably, in this model, public debt is "a solution to a problem caused by too much (private) debt" (Eggertsson and Krugman 2012: 20) only under the assumption of sustainable debt levels, such that the government is able to repay its new debt once the deleveraging

period for private sector debtors has terminated. Canzoneri et al. (2012) model an economy featuring financial intermediation costs, rather than borrowing constraints, such that the interest rate spread between deposits and loans is increasing in recessions and falling in expansions. During recessions, fiscal stimulus considerably reduces the spread that benefits financially stressed households and firms, and so the multiplier value exceeds 2.

By addressing the issue of firms' financing in the presence of financial frictions associated with a negative output gap, such as asymmetric information and credit constraints, the size of the fiscal multiplier is higher than previously found. In other words, fiscal policy is effective when credit frictions matter irrespective of the interest-rate regime, although it becomes even more potent during a liquidity trap.

Among the empirical studies that employ VAR techniques, some explore the link between fiscal policy and financial markets through a focus on sovereign debt risk. According to Ardagna (2009), better fiscal positions decrease long-term rates on government bonds and increase stock prices, while Afonso and Sousa (2012) and Agnello and Sousa (2013) show that government spending shocks have contractionary and crowding-out effects on economic activity and a negative but temporary impact on stock prices. For emerging markets, Akitoby and Stratmann (2008) find that rises in tax-financed spending lowers spreads, while debt-financed spending increases sovereign risk; in terms of tightening, revenue-based adjustment lowers spreads more than spending-based adjustment. Moreover, financial markets generally react less to cuts in investment.

Despite representing a significant advancement in macroeconomic theory, one limitation of DSGE models with financial frictions is the lack of a proper representation of the financial sector in the fiscal policy transmission dynamics. In order to allow for disaggregated balance sheet effects of fiscal actions, Makrelov et al. (2019) propose a richer representation of financial dynamics in a stock-and-flow consistent (SFC) model including various instruments and agents. The key of the model is the fact that public expenditure, by reducing the perceived probability of default of private sector debtors, strengthens their balance sheets. On one hand, positive wealth effects induce private consumption growth. On the other hand, this interaction creates financial

accelerator effects through changes in lending behaviour: stronger borrowers' balance sheets also improve the net worth of monetary institutions that will be able to extend more loans, reducing the bank lending-deposit spread. Moreover, assuming current investment is sensible to both changes in the equity to sales price ratio[2] and the real rate on loans, increases in asset valuation and inflationary expectations generate induced investment growth. Based on the features of the South African economy around the 2008 crisis, Makrelov et al.'s (2019) model shows that financial markets play a significant role in the transmission of the fiscal expenditure shock to the real economy. The model estimates that financial market dynamics amplify the multiplier during recessionary periods, when debt is sustainable and capital inflows are positive, but, under different conditions, the fiscal multiplier can even turn negative due to higher risk premia and bond yields that further crowd out the private sector.

Melina and Villa (2014) estimate the response of lending and the bank spread to a government spending expansion in a SVAR model of the US economy and provide evidence that the bank spread significantly falls in response to a government spending expansion, while lending increases.

3. Fiscal multipliers in South Africa

Reflecting the indecisiveness of the broader literature, existing estimates of fiscal multipliers in South Africa are sensitive to the modelling approach used, particularly to the extent that it captures both the structural and contingent characteristics of the South African economy.

To begin with, in the supply-constrained economy represented in Mabugu et al.'s (2013) intertemporal computable general equilibrium (CGE) model, fiscal policy actions have no immediate effect, while only interventions in public investment lead to long-term multipliers, albeit with values lower than 1, because they increase the total factor productivity of the economy. Conversely, increases in the government current expenditure will have a long-lasting effect on the debt-to-GDP ratio. Although evidence

[2] Corporate bonds are not included in the model.

of a higher investment multiplier is in line with the literature on emerging economies (Estevão and Samake 2013; Arizala et al. 2017), Mabugu et al. (2013) do not capture the effect that current spending may have on total factor productivity – including by means of the risk-taking channel – or the presence of a negative output gap. Akanbi (2013) develops a supply-side versus a demand-side macro-econometric model and finds that, when the output gap is negative, the expenditure multiplier will be higher than the tax multiplier, as previously asserted by Ilzetzki (2011). In particular, Akanbi estimates that a spending cut that is equal to 1% of GDP will decrease output by 1% over the first year if there are no supply constraints or have no impact otherwise. In a recent study by SARB, van Rensburg et al. (2021) employ a similar macro-econometric model to stress the economy's debt levels and risk premia as well as its supply constraints over time. It estimates a fiscal multiplier higher than one in 2009 and 2010 that later "gradually declines towards zero as the fiscal situation deteriorates and South Africa is faced with a series of supply shocks" (ibid.: 22).

In fact, the state of public finances also plays an important role in South Africa's fiscal policy: results from Jooste et al.'s (2013) non-linear time-varying parameter vector autoregressions (TVP-VAR) model show that the strongest multipliers were in the build-up to the 2008 global financial crisis, when South Africa run budget surpluses, and that persistent increases seem to reduce the effectiveness of spending. This is in line with Ilzetzki (2011), who follows the methodology proposed by Favero and Giavazzi (2007) to account for debt dynamics in a set of emerging economies and concludes: "only in the case of South Africa do debt dynamics appear to diminish the effects of fiscal policy, due to future policy reversals, but this effect is not statistically significant" (Ilzetzki 2011: 29). Moreover, Kemp and Hollander (2020) show that a spending shock results in a persistent deviation of debt from its steady-state level and that cuts in government consumption, combined with tax increases, present the most effective instrument for fiscal consolidation.

Jooste et al. (2013) also develop a closed-economy DSGE model and demonstrate that positive estimates in South Africa clearly depend on the state of the business cycle and the presence of a large share of liquidity-constrained consumers that are unable to save extra income (also called rule-of-thumb consumers). They also show that the output response is larger following a shock to public sector investment, while an

increase in government expenditure also increases interest rates by 0.35 percentage points, which could crowd out investments. Jooste and Nairadoo (2017) demonstrate that fiscal foresight could reduce both output multipliers and consumption, but sticky wages, non-Ricardian credit-constrained households and elastic labour supply, which are all features of the South African economy, are able to preserve key Keynesian effects despite foresight.

Using a variety of identification approaches to reduced-form model specifications, Kemp (2020) finds that, overall, government spending multipliers are positive but always lower than 1, and larger during recessionary states. In general, consumption responds positively and investment negatively to a government spending shock. By extending the framework, he also finds that, when the spending shock is associated to higher interest rates, the response of output and consumption will be milder. Jooste et al.'s (2013) structural vector error correction (SVEC) model shows that, while tax increases distort private consumption, an expenditure shock increases both consumption and GDP per capita. Similarly, Nuru (2019) proposes a SVAR model to identify the joint effect of monetary and fiscal policy action in South Africa between 1994 and 2014. He obtains a government spending multiplier of a rather small magnitude that peaks at 0.40 after nine quarters, whereas the tax multiplier is almost zero on impact and statistically insignificant.

Overall, the evidence suggests that fiscal multiplier estimates are lower in South Africa than in OECD countries, consistent with research on emerging markets that stresses the presence of large informal sectors, inefficiency in public expenditure and revenue administration, and positive output gaps due to supply constraints (Estevão and Samake 2013; Arizala et al. 2017). Exceptionally high estimates of the South African fiscal multiplier come from closed input-output models, which capture the flow of money across industries in a closed economy under the assumption of no supply-side constraints. Burrows and Botha's (2013) model only accounts for direct, indirect, and induced consumption effects of a demand shock and calculates a multiplier that declines over time – from 1.82 in 1980 to 1.60 in 2010. Using the same methodology but allowing both induced consumption and investment effect, Schroeder and Storm (2020) estimate a multiplier equal to 1.87 in 2018, therefore subject to conditions of a negative output gap and high unemployment. However, other aspects are neglected –

such as South Africa's increasing propensity to import, debt dynamics, and the response of monetary policy – which can substantially weaken the multiplier effect. For example, Kemp and Hollander (2020) extend a fiscal DSGE to an open-economy framework and show that spending multiplier values are indeed lower in open-economy settings. The same finding was made by Jooste et al. (2013) in a SVEC model that was extended to include an uncovered interest parity condition.

Moreover, in contrast to emerging market economies, the South African economy features a very well-developed financial sector and high tax compliance. In an attempt to account for all aforementioned aspects in an SFC model, Makrelov et al. (2019) further emphasise the investment growth induced by budgetary shocks through liquidity effects. As a result, inflows of foreign capital relax the constraint imposed by the large domestic savings–investment gap and, thus, bolster credit extension and boost asset prices, amplifying the fiscal expansion. Makrelov et al. (2019) provide the largest estimates of fiscal multipliers in South Africa: under the conditions of a large and negative output gap, a well-functioning financial sector, and relatively low government debt levels, the fiscal multiplier takes a value of 2.5 after three years from the fiscal policy shock.

Table 1: Fiscal multiplier estimates for South Africa

Authors (date)	Methodology	Peak (horizon)	Sample
Akanbi (2013)	Macroeconometric model	1% (one year, recession)	1970–2011
Burrows and Botha (2013)	Input-output model	1.82 (1980); 1.60 (2010)	1980; 2010
Jooste et al. (2013)	SVEC model	> 1 (Q2)	1970–2010
Jooste and Naraidoo (2017)	DSGE	≤ 2 (Q3)	
Kemp (2020)[3]	Baseline SVAR model local projections	0.36 (Q4) 0.58 (Q4, recession)	1970–2018
Kemp and Hollander (2021)	DSGE	0.6 (Q4, investment)	1994–2018
Mabugu et al. (2013)	CGE model	0.49[4]	2005
Makrelov et al. (2019)	SFC model	2.5 (Q12, recession)	2001–12
Nuru (2019)	SVAR model	0.4 (Q9)	1994–2014

[3] Kemp (2020) also calculates present-value fiscal multipliers (discounted by the average policy rate of the sample) that, for the sake of comparison, are not reported here.

[4] This multiplier estimate refers to public investment spending only.

Schroeder and Storm (2020)	Input-output model	1.87	2018
van Rensburg et al. (2021)	Macroeconometric model	1.5 (2010)	2009–2019

Source: Author's elaboration.

4. Econometric methodology

4.1 Linear and non-linear model specification by local projections

In order to empirically assess the effect of fiscal policy shocks on real and financial variables under different regimes of the economy, I employ impulse response functions (IRFs) estimated by the local projections (LPs) method. This was introduced by Jordá (2005) and has recently been applied to estimate state-dependent fiscal multipliers (Auerbach and Gorodnichenko 2013; Ramey and Zubairy 2018; Kemp 2020). The model requires *ordinary least squares* (*OLS*) estimation of a series of regressions for each horizon h and each variable. The linear version of the model is described by Equation (1):

$$\mathrm{y}_{t+h} = \alpha_h + \Pi_h(L)x_{t-1} + \beta_h shock_t + \mathrm{u}_{t+h} \qquad h = 0, 1, \dots, H-1 \qquad (1)$$

where y is the dependent variable, α_h is the constant, x_{t-1} denotes the vector of lagged control variables described in the following section, and $shock_t$ represents the exogenous shock. The slope β_h reflects the response of variable y at horizon h to the $shock_t$'s variable impulse happening at time t. The impulse responses relative to y are then all constructed from all estimated values of β_h. As in Jordá (2005), the Newey-West correction is employed to predict robust standard errors that account for the serial correlation in u_{t+h}. Linear LPs and VAR models estimate the same impulse responses when the lag structures are unrestricted, even when the true data-generating process is non-linear, which implies that impulse responses estimated from finite samples and with finite lag lengths are similar at short and medium horizons but disagree at longer ones (Plagborg-Møller and Wolf 2021). Auerbach and Gorodnichenko (2012) discuss the advantages of the LP estimation method over standard VAR analysis, such that it reduces the number of parameters by estimating a single equation for the variable of interest, and that it does not impose dynamic constraints inherent to structural VARs on the shape of the IRFs. Given that the shock vector in Equation (1) must be identified from a linear VAR (as described in Section 4.2), the LPs approach does not overcome

the problem of identification.

LPs can easily be accommodated to estimate non-linear models[5] where the system of endogenous variables switches across two regimes or states of the economy, expansions ("E") and recessions ("R") – according to a logistic probability function $F(z_t)$ that enters the model with one lag, as in the following equations (2) and (3):

$$F(z_t) = \frac{e^{(-\gamma z_t)}}{1+e^{(-\gamma z_t)}} \quad \text{and} \quad \gamma > 0 \qquad (2)$$

$$\mathrm{y}_{t+h} = F(z_{t-1})[\alpha_{E,h} + \Pi_{E,h}(L)x_{t-1} + \beta_{E,h}shock_t] + (1 - F(z_{t-1}))[\alpha_{R,h} + \Pi_{R,h}(L)x_{t-1} + \beta_{R,h}shock_t] + \mathrm{u}_{t+h} \qquad (3)$$

In Equation (2), z_t is a standardised variable that determines the two regimes. In this case, the switching variable measures the state of the economy in terms of positive or negative output gap regimes – in line with Makrelov et al. (2019) – and so it is the cyclical component of real GDP computed by the Hodrick-Prescott filter.[6] The parameter γ in Equation (2) defines the smoothness of the regime transition, such that a higher value of γ corresponds to periods of economic slack. While Kemp's (2020) calibration, where $\gamma = 4$, is consistent with South Africa's business cycle durations since 1970, the current application sets $\gamma = 3$ to reflect smaller recessionary regimes after 1994.[7] The resulting logistic probability function is plotted in Figure 1 (on the solid line) together with the output gap (on the dotted line): $F(z_t)$ is higher, the lower the output gap.

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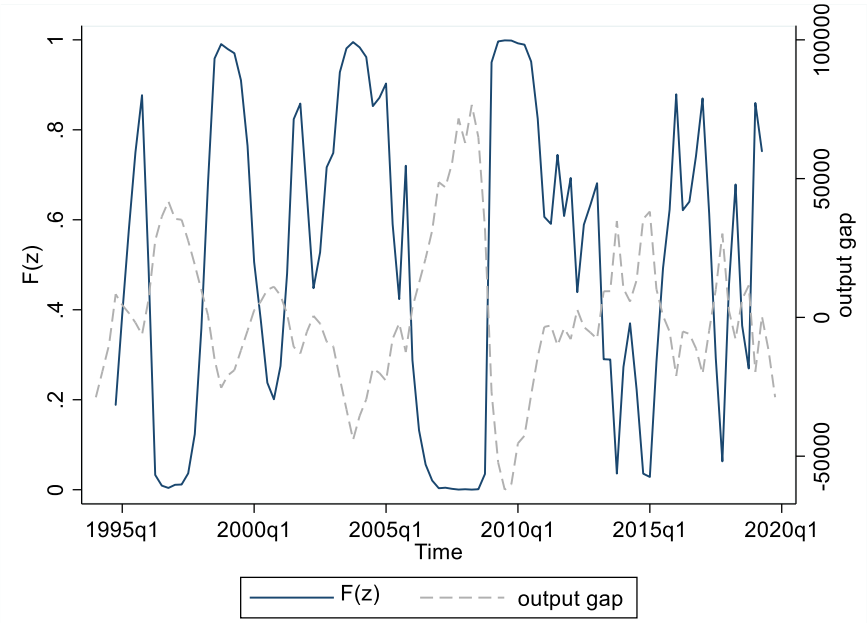
5 For a deep explanation of the non-linear features of the model, see Auerbach and Gorodnichenko (2013).

6 An alternative for the switching variable is the 7-quarter moving average of real output growth, which better captures expansionary and recessionary phases of the business cycle.

7 Auerbach and Gorodnichenko (2013) and Ramey and Zubairy (2018) set γ equal to 1.5 and 3, respectively.

Figure 1: Time series of the output gap and the logistic probability function $F(z_t)$



Source: Author's calculation based on SARB (2020).

4.2 Data

Given that the LPs method only estimates the equations relative to dependent variables of interest (e.g. GDP), the number of parameters to be estimated is significantly lower than in VAR models. For this reason, a system of eight variables is considered that includes GDP, government expenditure, tax revenues,[8] total credit volume extended to the private sector, private consumption and investment, the South African Reserve Bank (SARB) repurchase rate, and the debt-to-GDP ratio. In particular, government expenditure includes both current expenditure (on wages and on goods and services of a non-capital nature) and gross capital formation by the general government and public corporations.

All national accounts variables are in real terms, seasonally adjusted, and measured as a ratio over real potential GDP, which is computed using the traditional Hodrick-Prescott filter. This last transformation, which follows Ramey and Zubairy (2018), avoids using the natural logs of the variables and so rescaling the estimated IRFs from

[8] Total tax revenues are the sum of personal income tax, corporate income tax, tax on goods and services, and other direct and indirect taxes.

elasticities to currency units-equivalent multipliers. For example, converting the output response of log-output to a fiscal spending shock requires multiplying the elasticity of output by the ratio of the sample mean of the impulse variable over the response variable. In the current dataset, the ex-post conversion factor that multiplies the elasticity of a variable to a fiscal impulse is sensible to the sample period: the ratio of the output-spending sample averages takes a value as low as 1 in the period 1969q2–94q2 and a value as high as 3.9 in the period 1994q2–2019q4. As such, the multiplier (estimated through log-transformed variables, which is the prevailing method in the South African literature) is highly distorted by the time span chosen. This bias may be even more acute in non-linear models (see Ramey and Zubairy 2018 for a detailed explanation on the issue of calculating multipliers).

To capture the unanticipated effect of fiscal actions on GDP, government spending shocks are identified through the view proposed by Blanchard and Perotti (2002) that government spending is unable to react to output and other unexpected shocks within a quarter due to implementation and decision lags typical of the fiscal measures.[9] This is equal to imposing a Cholesky identification scheme in a SVAR model with four lags each of real government spending, tax revenues, and GDP. The reduced form innovations of government spending will then be used as an instrument for the unobservable structural shocks. The resulting series of fiscal spending shocks relative to the period 1970Q1–2019Q4 is plotted in Figure 2: it is evident that fiscal shocks were more volatile and frequent during the apartheid regime and that the evolution of shocks changed in the early 1990s. The following figure plots shocks relative to total fiscal spending and its components – consumption spending and investment spending – in a reduced sample that starts in 1994Q2 to exclude the structural changes from the previous period. Figure 3 shows that while consumption shocks are highly correlated to total spending shocks, investment shocks are relatively stronger.

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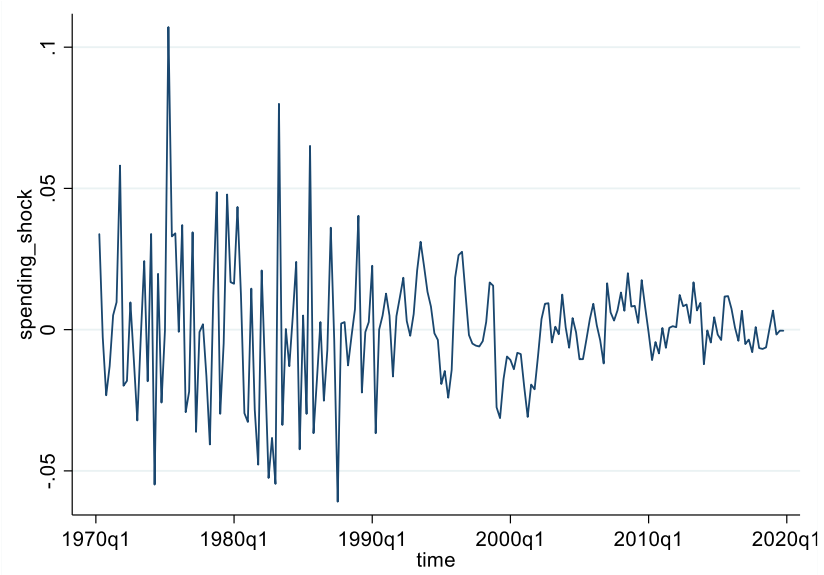
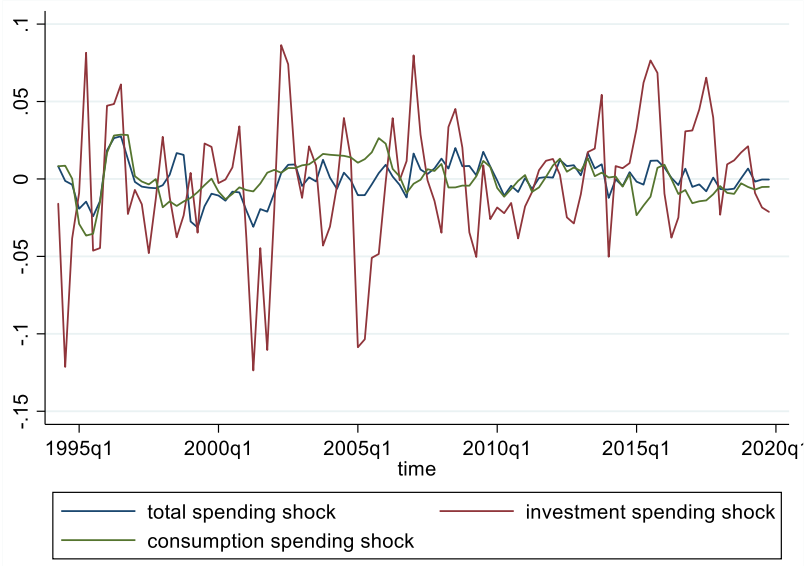
[9] A more accurate identification method is the Ramey-Shapiro narrative approach that accounts for a broader definition of fiscal foresight (i.e. based on historical documents that report imminent fiscal expansions, such as military events) and so enlarge the information set to measure anticipations to fiscal shocks in expectations-augmented VARs (Ramey 2011). This method has not been employed by the South African literature yet.

Figure 2: Time series of the fiscal spending shock



Source: Author's calculation based on SARB (2020).

Figure 3: Time series of total spending, consumption spending, and investment spending shocks



Source: Author's calculation based on SARB (2020).

The dataset – sourced entirely from the SARB (2020) – begins in the second quarter of 1969 and goes through the last quarter of 2019, but it is restricted to account for the fall of the apartheid regime in 1994, which generated substantial structural changes in the South African economy that may bias estimation, as shown in Figure 2.

4.3 Impulse response functions

The most common way to quantify fiscal multipliers from IRFs is to calculate the ratio of the output response at peak to the government spending increase at horizon zero.[10] According to Ramey (2019), this methodology is inappropriate to capture the dynamic effects of fiscal policy on output, because it does not account for "the multi-year path of spending" (2019: 94). This paper therefore proposes using both the traditional and the alternative method developed by Mountford and Uhlig (2009). These authors suggest the computation of cumulative multipliers. At any given horizon h, the multiplier corresponds to the cumulative output response relative to the cumulative government spending up to that horizon:

$$multiplier_h = \frac{\sum_{j=0}^{h} y_{t+j}}{\sum_{j=0}^{h} g_{t+j}} \quad (4)$$

To derive linear and state-dependent multipliers, four lags are included, and 16-quarter-ahead impulse responses of y are estimated from Equations (1) and (3).

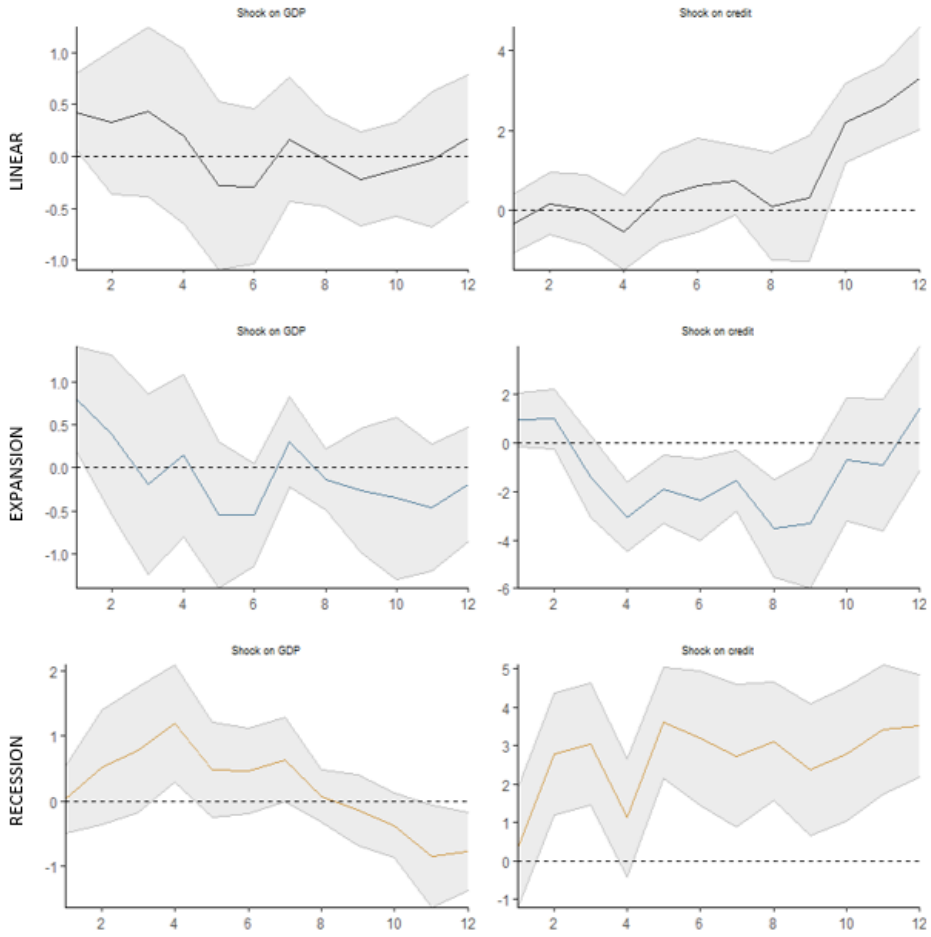
4.3.1 Fiscal multiplier (1994q2–2019q4)

The results are depicted in Figure 4. It shows the rand-response of GDP and credit volume to a one-rand government spending shock in the linear case (first row) as well as during periods of economic expansion and recession (second and third rows, respectively). The first row IRFs estimated from linear LPs do not incorporate information on the dynamic state dependent behaviour of variables. Therefore, if expansions are more common than recessions, they treat the observations for recessionary periods as outliers, producing incorrect parameter estimates and larger confidence intervals. The shaded area shows the 90% confidence bands. Both output and credit responses to a spending shock are positive and persistent during recessionary states: output increases for eight quarters while credit keeps rising for 16 quarters. According to Table 2, which reports cumulative multipliers derived using

[10] Then, this number shall be multiplied by the ad-hoc conversion factor to derive currency-unit multipliers, as explained in Section 4.1.

Equation (4), the fiscal multiplier peaks at 1.2 in the sixth quarter after the shock, and credit reaches its maximum in the ninth quarter. During an expansion, the fiscal multiplier at impact is significantly positive but has a temporary effect and the value is lower than 1, while credit diminishes in response to a one-rand increase in government spending.

Figure 4: IRFs from linear and state-dependent LPs – GDP and credit volume



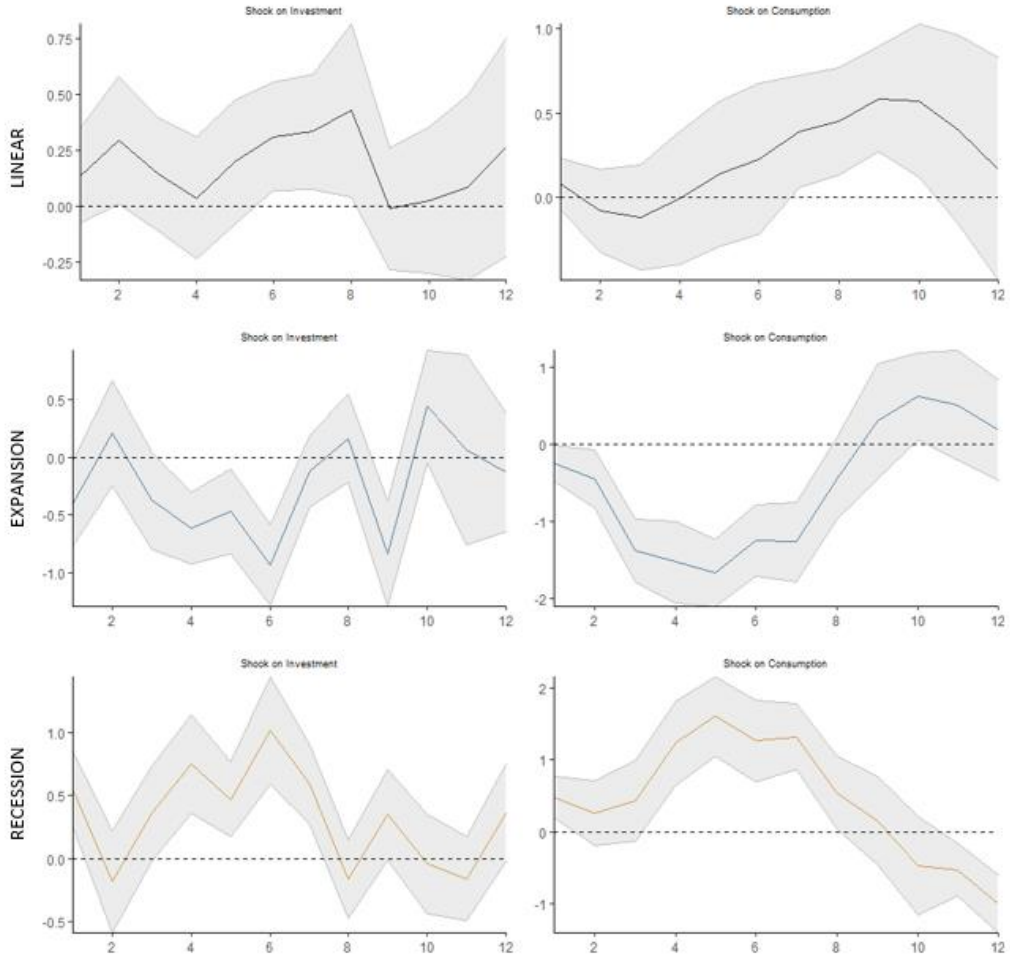
Source: Author's calculation using data from SARB (2020).

Table 2: Cumulative multipliers at different horizons – GDP and credit volume

Model	Response variable	Q1	Q3	Q6	Q9	Q12
Linear	GDP	0.43	0.40	0.19	0.14	0.12
	Credit volume	-0.32	-0.05	0.06	0.68	1.57
Expansion	GDP	0.80	0.29	0.01	0	-0.18
	Credit volume	0.95	0.16	-1.72	-2.76	-2.58
Recession	GDP	0.02	0.52	1.20	1.08	0.34
	Credit volume	0.33	2.42	4.91	6.03	5.52

Source: Author's calculation based on Equation (4) and IRFs in Figure 1.

Figure 5: IRFs from linear and state-dependent LPs – private consumption and private investment



Source: Author's calculation using data from SARB (2020).

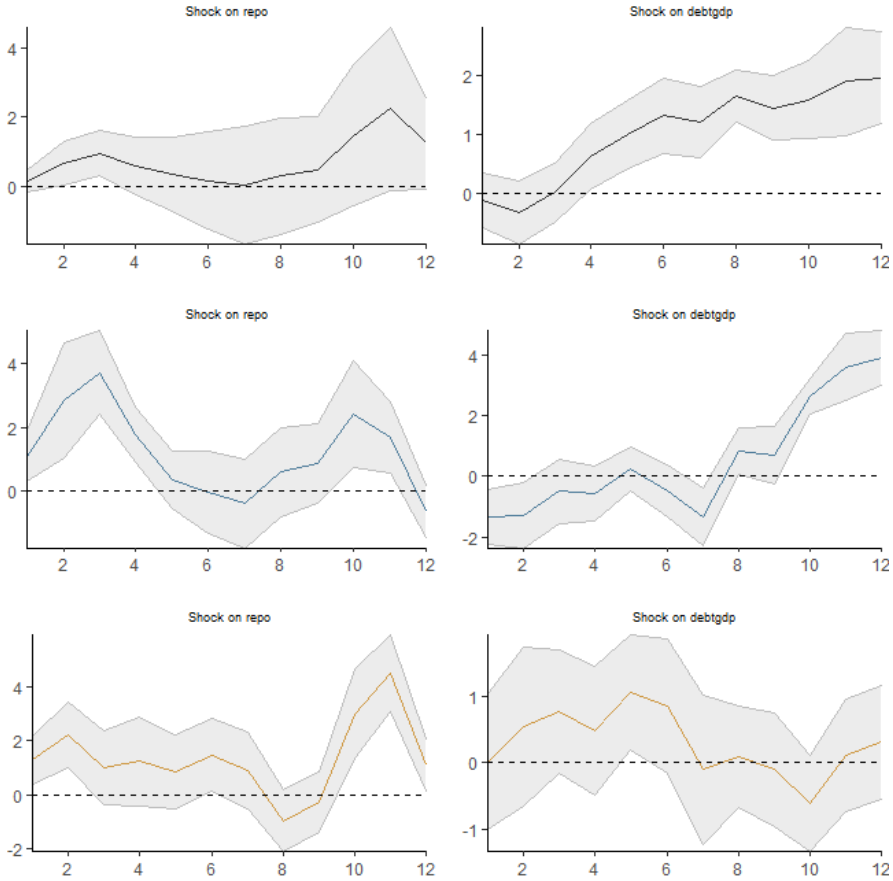
A fiscal stimulus is thought to be less effective in an expansion, because at full capacity it crowds out private economic activity, whereas during periods of slack, the additional resources allow credit-constrained agents to borrow for smoothing their consumption and investment levels. The response of private consumption and investment to a government spending shock is reported in Figure 5. Clearly, the linear model in the first row hides state-dependent effects, and both consumption and investment responses are almost symmetrically opposite between states of expansion and recession.

Table 3: Cumulative multipliers at different horizons – private consumption and private investment

Model	Response variable	Q1	Q3	Q6	Q9	Q12
Linear	Consumption	0.13	0.19	0.25	0.38	0.36
	Investment	0.08	-0.04	0.06	0.35	0.46
Expansion	Consumption	-0.40	-0.16	-0.65	-0.61	-0.50
	Investment	-0.24	-0.60	-1.38	-1.44	-1.10
Recession	Consumption	0.55	0.28	1.03	1.01	0.67
	Investment	0.48	0.46	1.83	1.97	0.91

Source: Author's calculations based on Equation (4) and IRFs in Figure 2.

Figure 6: IRFs from linear and state-dependent LPs – repurchase rate and debt-to-GDP ratio

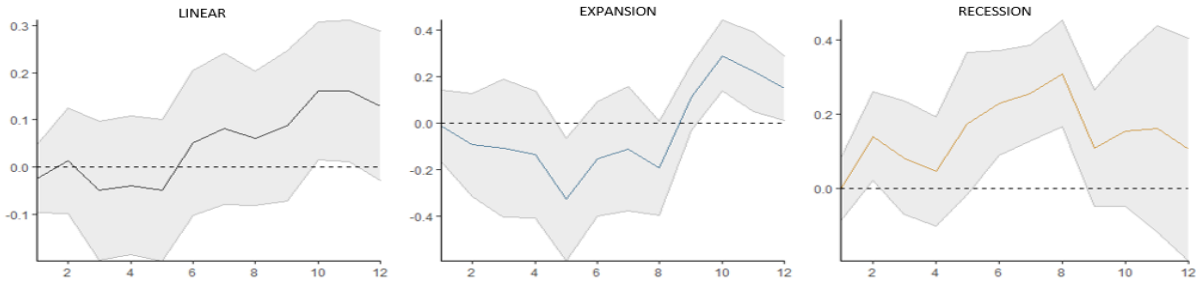


Source: Author's calculation using data from SARB (2020).

The degree of monetary accommodation to fiscal shocks is another key component of the transmission of fiscal policy, as lower interest rates would accommodate higher demand for credit and so allow financial market dynamics to amplify the fiscal multiplier effects on output, as described in Section 2. By contrast, Figure 6 reveals a lack of coordination between fiscal and monetary policy, such that spending shocks tend to be accompanied by increases in the SARB's repo rate, particularly during

expansionary states. In the same model, a one-rand increase in government spending is shown to raise the debt-to-GDP ratio permanently, particularly during periods of slack. Replacing credit volume with the bank lending spread – computed as the difference between the nominal effective lending rates (weighted for both short-term and long-term loans) and the SARB's repo rate – does not deliver significant results.

Figure 7: IRFs from linear LPs – FTSE/JSE All-Share Index



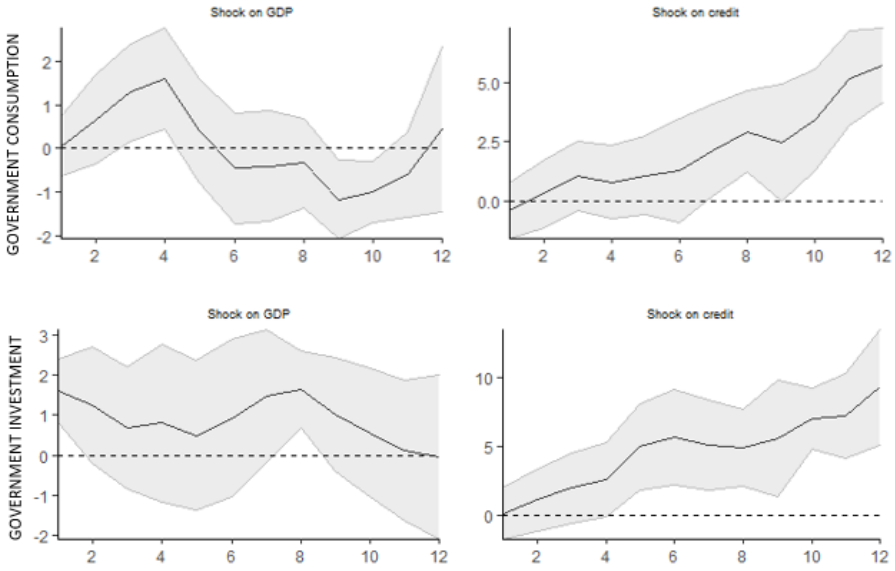
Source: Author's calculation using data from SARB (2020).

Figure 7 shows IRFs of the Financial Times Stock Exchange (FTSE)/Johannesburg Stock Exchange (JSE) All-Share Index: under recessionary states, a government spending shock has a positive effect on stock prices of companies listed on the JSE that peaks at 0.3 after two years.

4.3.2 Fiscal multiplier by instrument

To assess which component of fiscal spending has a greater multiplier effect, reduced-form innovations are again derived from a VAR (4) and used as instruments of the shocks of public investment and public current spending (following the same methodology as described in Section 4.1). Linear LPs are then used to estimate the dynamic impact of the shock in one specific component on both GDP and credit volume. Resulting IRFs are shown in Figure 8: while both components have positive effects, a fiscal stimulus that targets investment has a more pronounced and persistent effect on GDP and a stronger effect on credit volume.

Figure 8: IRFs from linear LPs – shock on government consumption and investment

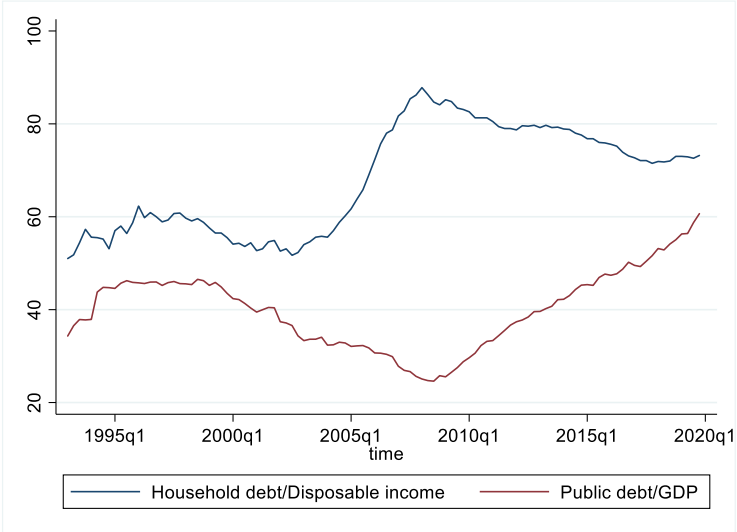


Source: Author's calculation using data from SARB (2020).

4.3.3 Fiscal multiplier and sovereign debt

Historically, the sovereign debt-to-GDP ratio in South Africa has been low and sustainable, except for two periods, (i) 1990–94 and (ii) 2010–present, during which it soared swiftly – as plotted in Figure 9. Figure 9 also shows that, since the early 2000s, public debt has followed a trajectory that is symmetrically opposite to the evolution of private debt.

Figure 9: Household debt/Disposable income ratio and public debt-to-GDP ratio over time

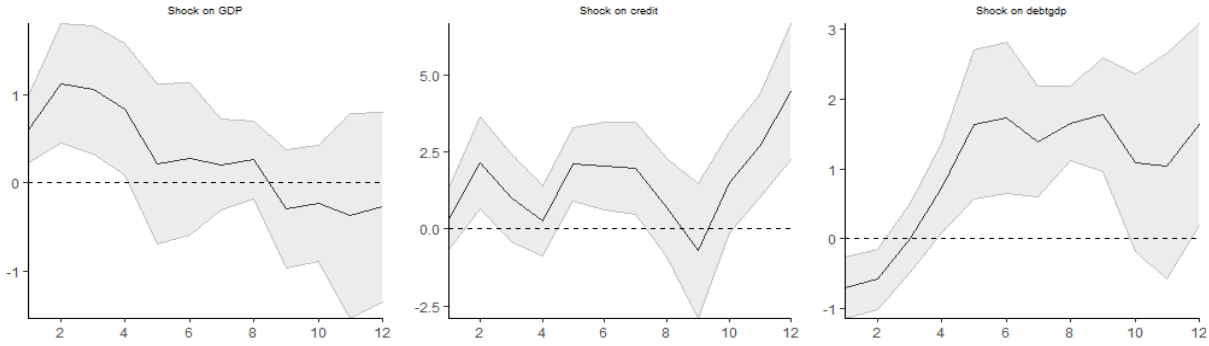


Source: Author's calculation using data from SARB (2020).

In light of the fact that South Africa's public debt has been generally low except for relatively short periods of time, estimating Equation (3) under different debt regimes does not reveal any significant non-linearity. Similarly, separating the sample between low- and high-debt regimes is simply not feasible, as the number of observations in the higher-debt regime (e.g. debt-to-GDP ratio > 40%) would be too small.

The next figure shows IRFs from the benchmark model with a shorter sample size that goes through to the last quarter of 2009: this reduced sample (1994q2–2009q4) should allow us to, on one hand, overlook South Africa's last decade of public debt build-up and, on the other hand, account for the households' increasing liquidity constraints that preceded the 2008 financial crisis. By comparing IRFs in Figure 10 (reduced sample) with Figures 4 to 6 (full sample), it can be seen that both the output and the credit response to a fiscal spending shock are stronger, while the debt response is still positive but weaker than previously found. This result validates existing evidence by showing that, in the last decade, the fiscal multiplier effect may have not only substantially weakened, but also contributed to the public debt accumulation.

Figure 10: IRFs from linear LPs – reduced sample size (1994q2–2009q4)



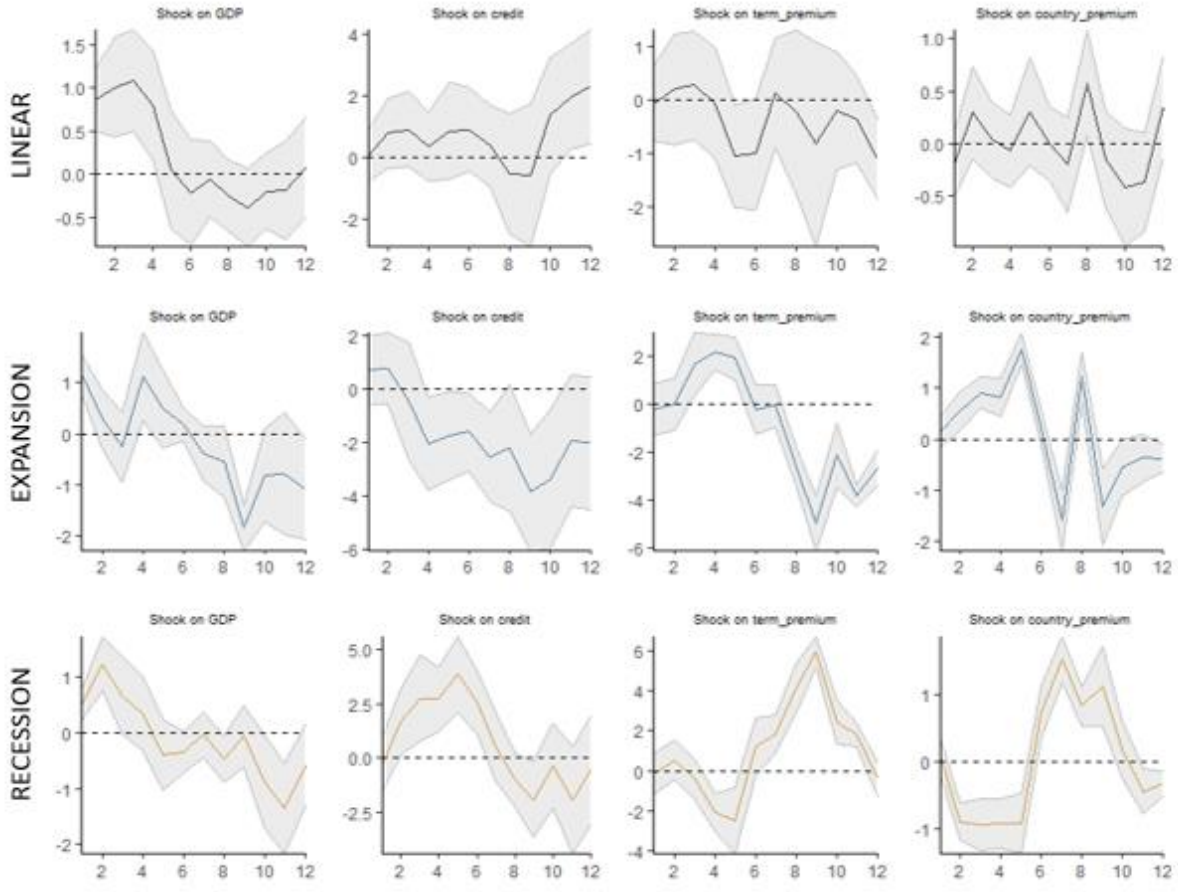
Source: Author's calculation using data from SARB (2020).

4.3.4 Fiscal multiplier and risk premia

Given that fiscal expansions have been predominantly financed with sovereign bond issuance rather than increased tax revenues, government spending shocks could also be propagated via a term premium channel that is activated with increases in supply of sovereign bonds of different maturity. Similarly, van Rensburg, de Jager and Makrelov (2021) show the important role played by relationships between sovereign indebtedness and country risk premium in the transmission of fiscal shocks: when debt

is high, the increased compensation for risk required from financial markets could put an additional downward pressure on output through the country risk premium channel. To these purposes, the model described in Equations 1 and 3 is extended to account for South Africa's term and country risk premia. The term premium is measured by the difference between 10-year government bond yields (adjusted by inflation expectations) and the real repo rate. The country risk premium is proxied by the EMBI+ index, which is the weighted average of the difference between the daily returns of sovereign debt instruments of South Africa and the return of US Treasury securities of the same maturity. All data is sourced from SARB.[11]

Figure 11: IRFs from non-linear LPs – risk premia (1994q2–2019q4)



Source: Author's calculation using data from SARB (2020).

[11] The set of control variables of this version of the model includes: real GDP, credit volume, fiscal spending, tax revenues, repo rate, debt-to-GDP ratio, CPI inflation, term premium, and country risk premium.

In the last two columns of Figure 11, one can observe the average and the state-dependent responses of the term premium and the country risk premium to a one-rand fiscal spending shock. While IRFs from linear LPs in the first row are not statistically significant, state-dependent IRFs show that the two measures of risk premium react similarly to a fiscal spending shock. More specifically, during expansionary states, both the term premium and the country risk premium increase in the first six quarters before diminishing substantially. With respect to the benchmark version of the model depicted in Figure 3, the volume of credit shrinks to a lower extent, whereas output rises relatively more but largely declines after six quarters. Intuitively, by controlling for the risk premia's negative effects on output and credit, the fiscal multiplier swells and the drop in credit volume is milder.

During recessions, the term and country risk premia follow a roughly symmetric pattern, whereby both variables initially decline and surge significantly only after six quarters from the positive spending shock. The responses of output and credit volume during recessions are less persistent than in Figure 3, indicating that the feedback effect of a higher cost of funding that arises after five or six quarters has a negative impact on the fiscal multiplier in the medium run.

4.3.5 Contractionary fiscal shocks

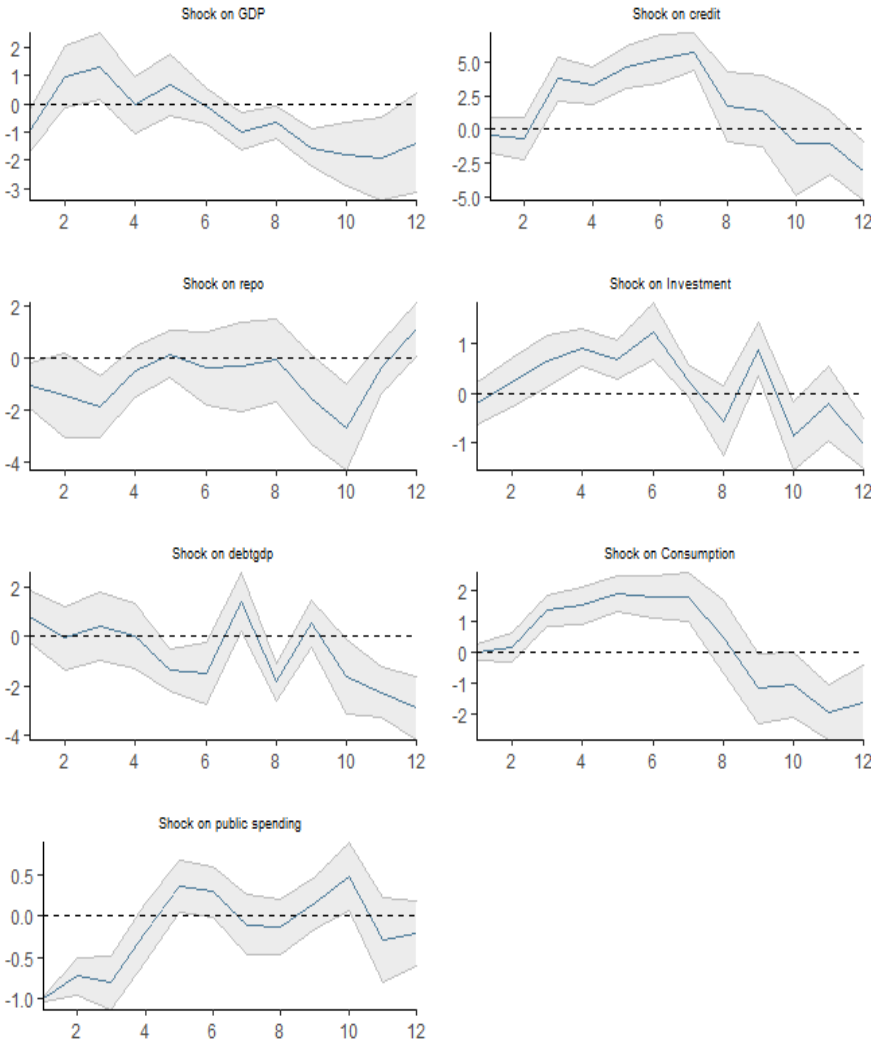
Figure 12 reveals dynamic responses of the variables of interest to negative, or contractionary, fiscal spending shocks. IRFs are derived from non-linear local projections defined through a simple dummy approach as in Equation 5. First, a dummy variable D_t is identified that takes value 1 when the fiscal shock is negative and 0 otherwise; and second, it will replace the logistic probability function in equation (3), such that two states are possible – fiscal contraction (FC) and fiscal expansion (FE).

$$\mathrm{y}_{t+h} = D_t[\alpha_{FC,h} + \Pi_{FC,h}(L)x_{t-1} + \beta_{FC,h}shock_t] + (1 - D_t)[\alpha_{FE,h} + \Pi_{FE,h}(L)x_{t-1} + \beta_{FE,h}shock_t] + \mathrm{u}_{t+h} \quad (5)$$

A one-rand unexpected decrease in public spending triggers an immediate one-rand reduction in real GDP. This contraction is soon offset by an accommodative response of the repo rate and a stabilisation of the debt-to-GDP ratio. As a result of the feedback effect from debt and monetary dynamics, the contractionary fiscal shock, albeit short-

lived (see IRF in the fourth row of Figure 12), causes credit volume, private investment and consumption to increase.

Figure 12: IRFs from non-linear LPs – contractionary fiscal spending shocks (1994q2–2019q4)



Source: Author's calculation using data from SARB (2020).

5. Conclusions

The key question of this paper is whether in South Africa, the fiscal multiplier depends on the state of the economy, with a focus on private credit conditions. The average value of the multiplier since 1994 is found to be below 0.5, suggesting substantial import leakage, crowding-out effects, or supply constraints. However, it is important to differentiate between periods of negative output gaps, where the average multiplier peaks at 1.2, and positive output gaps, where the highest multiplier is 0.8 at impact.

The difference in fiscal multiplier estimates across the two regimes of the economy is better reflected by estimates of the cumulative multipliers that capture the persistence of the shock on the variables of interest.

The business cycle effect is even more pronounced in the response of private credit volume to a spending shock. IRFs show that while credit volume diminishes in response to spending shocks during periods of positive output gaps, it expands otherwise. Evidence of a state-dependent financial accelerator mechanism of fiscal expansion is confirmed by the positive response of the FTSE/JSE index during times of slack. Furthermore, the fiscal multiplier appears to be Keynesian, crowding in both consumption and investment, on average and in recessions. This finding should be interpreted in conjunction with the contractionary response observed in the SARB repurchase rate and the fact that monetary policy never accommodates a fiscal shock, especially during expansions. Overall, these results suggest that only procyclical fiscal expansion crowds out private credit and economic activity, while it generates stimulative effects during bad times, which resemble the positive balance-sheet effect on liquidity-constrained agents stressed by Makrelov et al. (2019).

While these results are in line with the rest of the literature on South Africa, it is important to note that previous estimates of fiscal multipliers based on log-transformed variables could be biased (and inflated) by using the ex-post conversion factor, a measure that is inevitably and extremely sensitive to the data sample (as discussed in Section 4.2). For instance, employing log-transformed data for estimating the local projections in this paper produces identically shaped IRFs. However, when multiplying the log-elasticities of the different variables of interest by the ex-post conversion factor, the estimated value of the fiscal multiplier expressed in currency units differs from this paper. For example, in Figure 4, output peaks at 0.8 during expansions, but that same value would be 1 if the log-output elasticity were converted into rand-units. Similarly, while in Figure 4 the credit response value reaches 3 in the second quarter after a shock in recessions, it would be 6 otherwise.

In addition, this paper has found that spending multipliers depend on the instrument used: in particular, public investment has a positive and more persistent effect on output than current spending. If the fiscal shock is driven by gross capital formation,

then the output response will never turn negative (as happens with other types of fiscal shock). On the other hand, a shock to government current spending triggers relatively more debt and less credit expansion.

Finally, the transmission of fiscal shocks depends on the country's indebtedness and cost of funding. The fiscal multiplier effect on output and credit is stronger until 2010, corroborating the fact that the fiscal multiplier in South Africa has weakened during the last decade due to deteriorating public finances. Furthermore, spending shocks can reduce the multiplier effect during recessions through the risk premia channels. The feedback effect of rising public debt and higher compensation required for investing in sovereign bonds of different maturities could also be the cause of the negative reversal of the output response from 6–8 quarters after the shock.

Overall, this paper reinforces the evidence that the fiscal multiplier in South Africa does not have a unique, constant value but that the effectiveness of fiscal expansions depends on a series of contingencies: the output gap, the monetary policy stance, the fiscal instrument, the level of debt, and risk premia, which all have a role in relaxing or tightening the liquidity constraints of private lenders. Given that South Africa's last decade has been characterised by worsening public finances and lowering household liquidity constraints, the current fiscal spending multiplier is likely to be lower than 1. This consideration becomes particularly strong in the case South Africa's output is close to potential output. Alternatively, assuming GDP growth has been largely demand-constrained, then public investment spending has space for expansionary and crowding-in effects on output.

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