The macroeconomics of establishing a basic income grant in South Africa[1]

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[1] Please see Discussion Document 04 for a summary of this technical paper

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Abstract[1]

This paper quantifies the effect of fiscal transfers on the trade-off between social relief and debt accumulation, and discusses the economic growth and fiscal implications of different combinations of expanded social support and funding choices. Given South Africa's already high level of public debt, the opportunity to fund a basic income grant through higher debt is limited. Using a general equilibrium model, the paper shows that extending the social relief of distress grant could be fiscally feasible provided taxes rise to fund such a programme. Implementing such a policy would, however, have a contractionary impact on the economy. A larger basic income grant (even at the level of the food poverty line) would threaten fiscal sustainability as it would require large tax increases that would crowd-out consumption and investment. The model results show that sustainably expanding social transfers requires structurally higher growth, which necessitates growth-enhancing reforms that crowd-in the private sector through, for example, relieving the energy constraint, increasing government infrastructure investment and expanding employment programmes.

Keywords: Universal basic income, DSGE, fiscal sustainability

JEL Classification: D58, E62, H63

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Executive Summary

The paper estimates the macroeconomic impacts of different basic income grant (BIG) options.

In contrast to other BIG studies, this paper applies a large multi-year macroeconomic model with six taxation and public expenditure channels, which allows for both positive and negative economic effects of higher direct transfers to households. As such, the framework captures jointly-determined feedback effects between government expenditure, taxation, household consumption, firm investment, debt, interest rates, and economic growth.

On the one hand, a BIG would decrease economic growth through three main channels: an increase in borrowing costs, an increase in taxes, and crowding-out of private and public non-transfer spending. On the other hand, it would have a positive impact on economic growth through one main channel: an increase in consumption by poor households. Overall, the results suggest that the negative economic effects of an expansion in social grants would outweigh the positive effects.

The paper considers three BIG scenarios and estimates different combinations of tax and debt funding. **Scenario 1** estimates tax and debt outcomes for different grant sizes without yet imposing any specific 'funding policy', which means that the estimated model based on historical data guide the macro-fiscal dynamics. Specifically, the scenario estimates an expansion of social transfers, ranging from converting the R350 temporary social relief of distress (SRD) grant into a permanent BIG to raising the grant to the food poverty line (R624 in current prices), the lower-bound poverty line (R890 in current prices), or the upper bound estimate of the poverty line (R1,335 in current prices). Different eligibility criteria can also be inferred. These include an eligible population of 8.3 million, eligibility of approximately the same as the current SRD grant (10.5 million people), a grant targeted at the poor (33 million), up to a universal BIG (60 million).

Converting the SRD-350 into a permanent BIG is estimated to require an increase in public debt of about 3 percentage points of GDP after 5 years, and require a marginal increase in effective indirect taxes (mainly the value added tax rate, VAT), an increase in the effective personal income tax rate (PIT) of about 2 percentage points, and an increase in the effective corporate income tax rate (CIT) of about 0.25 percentage points. Although the consumption of poor households would rise, the model predicts there would be some job losses owing to the contractionary impact on investment and growth from higher debt and higher taxes.

Table 1: Summary of results

	Grant[†]		**Cost**	**Fiscal variables**				**Social variables**	
	ZAR	*no.*		*Debt*	*VAT*	*PIT*	*CIT*	*H2M*	*Jobs*
	(pppm)	*(m)*	*(Rbn)*	*(%pt GDP)*	*(%pt)*	*(%pt)*	*(%pt)*	*(%)*	
Scenario 1: Mix of fiscal instruments									
Social relief of distress	R350	10.5	44	2.87	0.23	2.07	0.25	16.4	-69,000
Food poverty line	R585	10.5	74	7.72	0.56	5.33	0.53	43.3	-198,000
Upper-bound poverty line	R1,268	10.5	160	14.17	1.21	11.84	1.09	96.9	-455,000
Targeted at poor	R840	33	333	41.6	2.59	28.51	1.5	188.2	-914,000
Scenario 2: Tax financed (balanced budget, at Food Poverty Line)									
VAT increased by 7%pt	R585	10.5	74	0.21	7.17	4.6	3.38	50.7	84,000
VAT (+4%pt) and PIT 3.4%pt	R585	10.5	74	0.76	4.05	3.4	-0.04	46.7	-9,000
Scenario 3: Alternative policy: government investment and structural reform and balanced-budget grant									
VAT +9%pts & Gov inv	R585	10.5	74	-0.64	9.01	0.39	1.25	51.6	182,000
VAT +5%pt & Gov inv & reform	R585	10.5	74	-5.97	5.17	-0.05	5.32	52.3	1,010,000

Notes: pppm = per person per month. H2M is the consumption increase for 'hand-to-mouth' (poor) households. Scenario 1 results are based on the estimated model parameters from South African data. Scenario 2 & 3 results are based on the estimated model with an 'optimized' tax instrument response.
[†] The model is in 2020 prices, hence we model FPL and UBPL as at April 2020. Subsequently the FPL has been revised to R624 and the UBPL to R1,335. The number of recipients has been modelled at 10.5 million reflecting budgeted take-up.

Source: authors' calculations.

Introducing a grant at the food poverty line (R585 per person in 2020 prices for an eligible population of 10.5 million at a cost of R74 billion) would lead to higher debt, VAT and PIT increases, with debt rising by 7.7 percentage points of GDP, VAT by about half a percentage point and personal income by about 5.3 percentage points. The model predicts job-losses amounting to about 200,000. These come about because of the fiscal impact of a permanent increase in spending (higher taxes and higher interest rates).

The contractionary effects operate through (1) higher debt, which leads to relatively higher borrowing costs and lower long-term economic growth, (2) direct crowding-out of government expenditure in an attempt to maintain fiscal sustainability, and (3) crowding-out of private sector expenditure through higher taxes. These effects dominate any expansionary effects from higher transfers. Simply put, a large fiscal transfer that has limited direct impact on aggregate demand will result in a large contraction akin to a negative demand shock.

The largest transfer expansion considered is a grant of R840 per month for 33 million households at a cost of R333 billion. This, the model suggests, would increase debt by 42 percentage points of GDP, requiring higher VAT of 3 percentage points and PIT to rise by 29 percentage points, essentially a doubling of PIT. The contractionary impact on the economy would be estimated to lead to nearly 1 million job losses.

Scenario 2 focuses on a BIG at the food poverty line (R585 per recipient at a cost of R74 billion per year) financed by an increase in taxes (a "balanced budget" scenario). Debt would still rise marginally because the economy would slow.

Assuming that the new grant is instead funded by VAT alone, this would require an increase of 7 percentage points in the rate - from 15% currently to 22%. If funded from a combination of higher VAT and PIT, VAT would need to rise by 4 percentage points and PIT would rise by almost 3.5 percentage points. For the average taxpayer, who earns R370,000 and pays an effective rate of 21.3%, this would mean an increase in taxes from R79,000 per year to R91,500 per year. This, in turn, would lead to significant contraction in the economy, even though there would be some short-term employment gains from the large direct income effects from higher transfers.

Scenario 3 models a grant at the food poverty line financed by a combination of higher VAT but also higher economic growth. In this scenario, the assumption is that government simultaneously expands government investment by R60 billion and successfully undertakes structural reforms (such as removing constraints on electricity availability).

In this scenario, VAT would still need to rise (by 9 percentage point without structural reform, and 5 percentage points with reform) to fund the transfer expansion. This scenario is estimated to lead to job gains but only because the structural reforms permanently raise long-run growth and therefore government revenue. Moreover, by enhancing the economy's productive capacity, government investment would have long-run growth-enhancing effects.

In conclusion, by incorporating macroeconomic feedback effects in the analysis, the paper shows that the introduction of a BIG requires significant long term tax increases and would likely lead to employment losses.

The model suggests that without sustained higher economic growth, much higher social transfers could threaten fiscal sustainability.

Poverty, inequality, and unemployment are three interdependent socio-economic challenges policymakers seek to address. Addressing this 'triple challenge' in South Africa is critical for the future of the country, but an unfunded expansion of the social transfer system could lead to even worse economic outcomes — the medicine should not be worse than the disease.

Contents

List of Figures

List of Tables

1 Introduction

> " [T]he violence [the July 2021 riots] highlights tail risks to social and political stability and could affect fiscal policy... the violence underscores the risk that exceptionally high income inequality and unemployment could jeopardise social and political stability over the medium to long term." Fitch Ratings, *South African Riots Show Link Between Political and Fiscal Risk*, issued 15 July 2021.

> "No society can surely be flourishing and happy, of which the far greater part of the members are poor and miserable." Adam Smith, The Wealth of Nations, quoted in Easterly (2007, 756)

1.1 How is this study different?

South Africa's broad unemployment rate is around 44%, which is one of the highest rates in the world. At the same time, a similar proportion of South Africans are covered by social grants.

There have been calls to extend the safety net further, with a type of BIG or basic income support as the centrepiece of a near-universal income support system.

Existing analysis of the implications of extension of income support measures in South Africa, including a BIG, have focused on cost estimations, static revenue raising calculations, or distributional effects (as in computable general equilibrium (CGE) models). While each of these provide important contributions, there has not yet been any public modelling of the dynamic and long-term macroeconomic implications of different basic income support options.

The paper quantifies the effect of fiscal transfers on the trade-off between social relief and debt accumulation, and discusses the economic growth and fiscal implications of different combinations of social support policies and funding choices. The overarching research question is: *Given fiscal constraints, what is the least-cost way to implement a social relief programme aimed at reducing poverty and unemployment?* The paper goes beyond evaluating different social grant options and also considers other potential interventions.

The contribution of this paper is threefold. First, to quantify the fiscal and macroeconomic dynamics of fiscal transfers in South Africa. Second, to evaluate the costs and benefits of alternative funding options for social transfers. Third, to compare the trade-offs of different

social relief interventions to identify the policy strategy that best balances social relief and fiscal sustainability.

To contextualise the assessment of the linkages between social instability and fiscal risk, the paper presents stylised facts on socioeconomic (in)stability, growth, and risk premia in South Africa. The paper shows that, first, growth per capita has stagnated; second, unemployment, poverty and inequality are structurally high and rising; third, the fiscal system is already highly redistributive; and, finally, that the fiscus is severely stretched. A rising sovereign risk premium means that debt-service costs have risen meaningfully and already threaten long-term fiscal sustainability.

Next, the macroeconomic adjustment required to accommodate an expansion of social assistance in South Africa is estimated using a dynamic stochastic general equilibrium (DSGE) model developed for the National Treasury of South Africa.

Another unique feature of the analysis is to consider the macroeconomic implications of different funding options for these programmes, namely tax financing (i.e. higher taxes); debt financing (i.e. issuing more debt); or cutting other expenditure (i.e reducing other forms of government consumption and investment).

Lastly, the model structure allows for a comparison of the macro-fiscal trade-offs of different social relief interventions. In doing so, the paper sheds light on the policy strategy that best balances social relief with fiscal sustainability. The paper also complements the microanalysis work undertaken by Southern Africa Labour and Development Research Unit (SALDRU) (Goldman et al., 2021), which simulates options to replace the special COVID-19 social relief of distress (SRD) grant and close the poverty gap at the food poverty line.

The model implies that the 'first best' solution to these challenges would be to structurally raise growth.[2] This underlines findings in an earlier, related, study on the optimal fiscal strategy for South Africa (Havemann and Hollander, 2022). But, with growth and employment-enhancing economic reforms slow to be implemented, there are increasing pressures to expand the redistributive fiscal system further. This paper thus solves for "second best" set of policy options — a set of sustainable policies that would ensure that those in need can survive.

[2] For a review of why South Africa's growth performance is so slow, see Hausmann et al. (2022).

1.2 The macroeconomic literature on a BIG in South Africa

Previous assessments of the macroeconomic impacts of implementing a BIG in South Africa have focused on cost estimations, static revenue raising calculations, or distributional effects (DNA Economics 2021, Institute for Economic Justice 2021b, Institute for Economic Justice 2021a, Applied Development Research Solutions 2021 and Intellidex 2021). While each of these provide important contributions, there has not yet been any public modelling of the dynamic and long-term macroeconomic implications of different basic income support options. Michael Sachs, a member of the Department of Social Development (DSD) technical team recently noted that:

> *The macroeconomic modelling conducted for the DSD report was not suited to the analysis of macro-fiscal dynamics, and no attempt was made to model the consequences of basic income support for debt sustainability, interest rates, or investment behaviour. The Presidential Economic Advisory Council (PEAC) is also right to caution that the tax modelling in the DSD report is rudimentary. No behavioural responses were modelled on the tax side, and further consideration of the tax policy implications is certainly required before government acts.*

These studies do not model the dynamic effects of higher taxes, higher debt, the expenditure impacts of such a programme, or interaction between fiscal settings. Indeed, DNA Economics 2021 implies a positive impact of implementing a BIG on economic growth without an assessment of the mechanisms through which such grants and associated tax changes affect firm or individual behaviour and the macroeconomy. For example, one option put forward by Institute for Economic Justice (2021b) is to finance a BIG through a social security tax, but the study notes that its estimates do not consider the elasticity of taxable income. One of the most careful studies on the distributional impacts of the BIG, under the auspices of the Southern Africa Labour and Development Research Unit (Goldman et al., 2021), notes that "further research on the wider macroeconomic impacts of both the grant expenditures, and the financing mechanisms used to fund them is important to better understand the implications of each of the grant options."

Table 2 summarises the estimated impact of instituting a BIG in South Africa, benchmarked to the current SRD level, the food poverty line (FPL) of R585 per month, to upper bound poverty line R1268 per month in 2020 rands.[3] These studies focus mainly on the costing of

[3]For context, the old age grant, received by over 3.5 million, is R1860 per month in 2020 rands, while the child support grant is R440 and is received by almost 13 million recipients, according to National Treasury (2020) and South African Social Security Agency (2020).

BIG options. By way of comparison, the SRD grants currently costs between R25 to R30 billion (about 0.3% of GDP), while expansion to universal coverage could cost over 2.5 trillion rand a year (30% of GDP).

One of the few existing macroeconomic modelling exercises is van Seventer et al. (2021). They undertake a CGE analysis of the impact of a set of policy options including a grant.

The study is an important contribution, has several limitations that are worth pointing out. First, it estimates the impact of the scenarios over a *one-year* period (from the fourth quarter of 2020 to the third quarter of 2021). This does not allow for any long-term implications of options. For example, the first scenario is that the intervention is financed by "reducing government savings". This, naturally, means a one-year increase in government debt. However, the model (by construction) does not consider the implications of such a large debt increase in subsequent years. Nor does it consider the *cumulative* effect of a *recurring* increase in government spending. This does not negate their short-run findings — indeed, the van Seventer et al. (2021) model is arguably particularly well-suited to doing a *short-run* analysis of both the COVID-19 shock and policy options to mitigate it. It is less well-suited to long-term analysis and derivations.

A second limitation of the paper relates to the limitations of CGE models. They do not typically include a monetary policy block and have limited ability to deal with interest rates, yield curves or general inflation, with their focus being on relative price changes.

The third, related limitation, is that the investment response to these changes is not assessed. van Seventer et al. (2021) notes that the reduction in government savings "may or may not be offset by increased domestic non-government savings". Also, investment is taken as exogenous. Any response of investment to change in total savings is not considered, i.e. from our understanding this does not allow for an analysis of crowding-out effects. Again, these limitations are not fatal for what van Seventer et al. (2021) aim to model — a set of economic interventions in the midst of a sudden COVID-19 shock. That said, it is our view that the results should not be generalised and used as a long-run economic impact of an increase in the grants system.

Several studies assume a BIG will pay for itself. Applied Development Research Solutions (2021) assumes that taxes rise to cover increased spending, assuming no change in the deficit-GDP or the debt-GDP ratios. They argue that since the poor have relatively higher marginal propensity to consume, a BIG would lead to higher economic growth, and they estimate that a universal BIG would reduce income inequality by 11 to 17.6%.[4]

[4]Their scenario also assumes economic growth would average 5.3% between 2020-2025 and that unemploy-

Deloitte (2021) use a static social accounting matrix to estimate consumption multipliers across the income distribution and assess what transfers and tax changes would imply for consumption and effective tax rates. Their estimates vary depending on eligibility and grant values between R350 to R1268. Depending on the macroeconomic background assumed, the costs vary between 2.8 to 10.4% of GDP (or 11.4% to 40.8% of total tax revenue). To illustrate the magnitude of the cost: if funded through personal income tax (PIT) only, universal BIG is estimated to raise effective tax rates between 8.2 to 30% across taxable income bands depending on the grant level, with effective tax rates increasing by between 12.6 and 45.6% for top income earners (over R1.5 million).[5] Deloitte (2021) suggest the income per capita Gini coefficient would fall from 0.61 to 0.49 and imply a 0.5% boost to GDP over 4 years and 4% to employment.

Institute for Economic Justice (2021b) table a large number of tax and expenditure changes to raise financing for a BIG (depending on grant value between R518 to R1268 to R3500), expecting R330 billion per year (almost 30% of current tax take) could be raised by a combination of higher taxes. They estimate that effective rates under their tax proposals would rise by between 4 and 7 percentage points for individuals earning R500 000 and R1million a year, respectively.[6]

The Expert Panel on Basic Income Support (2021) estimate that a universal grant would cost between R137 and R534 billion and present various summaries of options for financing grants, with a R350 grant level requiring a 3 percentage point increase in personal income tax rates across all bands, for example. They present CGE-based estimates of the impact on growth which depend on assumed macroeconomic impacts and financing choices, ranging between -0.9 to 1.2% change in GDP in 2021 and -7% to 6.2% long term, turning positive if the scenario finances some of the increased transfers from productivity improvements and investment expenditure rises. Their scenarios generally have unemployment increasing from negative GDP growth impacts of the programme.[7]

Intellidex (2022) argues that sustainable expansion of transfers would not be fiscally sustainable without expansion of the tax base and that expenditure reprioritisation at the required scale is unfeasible. Intellidex (2022) estimates that a BIG would lead to be between a 6 per-

ment would fall to 26.71%.

[5] Intellidex (2021), for example, estimates that the costings of Deloitte (2021) and Institute for Economic Justice (2021b) imply increases in the effective rate of taxation on personal income from about 30% to between 34 and 46%, depending on the value of the grant, while effective tax rates on the top 1% of earners (those earning approximately R1.5 million or more) would rise from 43% to potentially as high as 65% for the BIG thresholds considered in the table.

[6] See Intellidex (2021) for a discussion of realism of the assumptions in this study, and a critique of the lack of explicit assessment of the interaction of tax and expenditure levels and the funding strategy.

[7] The panel report notes that the universal and means-tested social grants would have broadly similar impacts on poverty and inequality, reducing the Gini coefficient to 0.54 from 0.65.

centage point increase in debt to GDP in an optimistic growth scenario with tax financing and 30 percentage point increase in the public debt to GDP ratio under debt financing. Their 'viable' BIG option, requires either accelerated economic growth and economic reforms, or a modest R50 to R100 billion expansion in transfer through higher taxes. They estimate that raising R50 billion in extra revenue would require a minimum 9% increase in personal effective tax rates (2.5 percentage points at each tax bracket) and R100 billion would require a minimum 19% increase in effective tax rates (almost 5 percentage points at each tax bracket).[8]

The macroeconomic implications of a BIG will depend on the approach to funding it. Given the substantial changes required in fiscal settings to meet such large increases in transfers, a key gap in the existing assessments is the lack of endogeneity in the relationship between fiscal policy, interest rates, and growth. While a BIG would provide poverty relief and economic opportunities to a large number of people, the fiscal sustainability of such a scheme needs to be assessed, as well as the macroeconomic impacts need to incorporate general equilibrium assessments of the interaction between growth, fiscal settings and debt. The paper considers the funding options outlined by Intellidex (2022) for a range of fiscal strategies.

This study explicitly models the general equilibrium implications of funding a BIG on consumption, investment, growth, debt and interest rates to assess whether a BIG could be sustainably financed and welfare-enhancing. The paper distinguishes itself from the preceding literature by quantifying the effect of fiscal transfers on the trade-off between social relief and debt accumulation, and discussing the economic growth and fiscal implications of different combinations of social support policies and funding choices. To assess the materiality of costs and benefits associated with basic income support, this study explicitly incorporates a channel through which social support can have beneficial impacts on macroeconomic stability.

To contextualise the assessment of the trade-off between social expenditure and fiscal risk in the model, five tylised facts on socioeconomic (in)stability, growth, and risk premia in South Africa are presented.

[8] If raised through higher VAT, these increases would be at least a 2 percentage points and 4 percentage points, and for company tax, a minimum 7 percentage point and 13 percentage point increases, respectively. If raised through a combination of these tax types, they estimate that a minimum R50 billion increase would require 1.2 percentage points higher PIT, 1.5 percentage points on CIT and VAT by 0.75 percentage points.

Table 2: Summary of existing estimates of cost and impact of universal BIG in South Africa

Study	Cost	Grant Value	Funding	Impact
Department of Social Development (2021)	R200B	R585	10% point PIT	
Deloitte (2021)	R143-R521B	R350-R1268	T,G,D	0.5% point GDP boost & 4% to employment
Institute for Economic Justice (2021b)	R239B-R519B-R1.4T	R518-R1268-R3500	T,G,D	
Expert Panel on Basic Income Support (2021)	R137B-R534	R350-R1300	T,D	-7% to 6.2% long term
Applied Development Research Solutions (2021)	R408-R985B	R350-R1268		Positive impact on growth & employment
van Seventer et al. (2021)	R29-R84B		T,G,D	-0.7 to 2% points on growth
Intellidex (2022)	R252B-R2.5T	R350-R3500	T,G,D	Negative impact on GDP

Note: In Column two, 'B' denotes Rand Billion and 'T' Rand Trillion. In Column four, 'T' denotes higher taxes, 'G' denotes lower government expenditure, 'D' denotes higher debt, 'PIT' denotes personal income taxes. Grant values are per person per month.

1.3 The question that you ask matters

Our approach implicitly poses an optimisation question — what is the optimal size of a redistributive cash payment? This differs from the majority of the debate in which the BIG is "binary" choice — either there should be basic income support or not. The answer to the BIG might be more of a 'Goldilocks' question — the grant should be not too large to bankrupt the country and not too small to be meaningless in the lives of millions.

This highlights the need to identify what the optimisation problem is. If the government is optimising *solely* for income distribution, then a high tax-high redistribution-low growth regime might be preferred. If the government is optimising for a "growth at all costs" approach, then a 'low tax-low redistribution-high growth approach would be preferred. Along the lines of the discussion above, this is also endogenous — more unequal countries may democratically choose to redistribute.

An extensive discussion on the theories of redistribution (and of redistributive justice) is beyond the scope of this paper. Nevertheless, some thought to different theories of redistribution is important to contextualise some of the deeper questions facing South African policymakers as they grapple with extraordinarily high levels of inequality, stagnant growth and rising social distress.

Helpman (1974) conveniently presents the different theories of redistribution in terms of an optimisation question, naming the different optimisation outcomes according to the social thinkers that are associated with different schools of thought.[9]

The "Bentham point" is where unweighted sum of the utilities of the rich and the poor together are greatest, i.e. where shifting money from those with wealth / income to without can maximise society's utility. The "Nash point" is where the product of utilities is maximised, the Nash equilibrium in a two player game of the rich and the poor. The "Rawls point"is the optimal redistribution that follows the arguments advanced by Jeremy Rawls in *A Theory of Justice*, as being located where the individual whose earning income potential is the least is maximised. Then the "Elitist point" is where the utility of the most able is maximised. The "Democratic point" is where the utility of the median voter is maximised. the "Egalitarian point" minimises the Gini coefficient based on a net income definition. Finally, the "GNP point" maximises gross national product, essentially the average income.

This is an elegant (if somewhat oversimplistic) way of turning what is macroeconomic modelling question (what outcome is the macroeconomic model optimising for) into a series of

[9] See also Mankiw and Weinzierl (2010) for a thought experiment on the politics of redistribution.

questions about political philosophy generally and redistribution more specifically. What is South Africa's political philosophy around questions of redistribution? Are we aiming to reduce inequality through raising the income of the poorest and reducing the income of the richest so that all earn the same? Or are we simply aiming to ensure that those without income have enough to eat?

Each study in the existing literature implicitly answers to optimisation question, but does not explicitly disclose it. It is, however, not difficult to derive the implicit optimisation. For example, the work commissioned by business naturally follows a "GNP point" maximisation or an "Elitist point" maximisation, consistent with the view from business that growth should be pursued almost at nearly all costs. In contrast, the studies commissioned by the aptly named Institute for Economic Justice tend to take a Rawlsian view consistent with *A Theory of Justice*. This assessment is independent, aimed not to advance a particular ideological view or "corner". That said, the optimisation question remains normative.

The model aims to find the point at which redistribution can be maximised at the least cost to growth. We do not pretend that this is "The Answer". It is only one of a possible set of optimisation answers. The model could just as easily be asked to optimise for zero inequality (the Rawlsian approach) or for maximum economic growth.

1.4 Inequality, growth and sovereign spreads

The paper addresses the interaction between inequality, economic growth and sovereign spreads in South Africa. If a more re-distributive fiscal policy stance were to raise growth and reduce spreads, it would likely pay for itself. On the contrary, if a more re-distributive stance were to be unaffordable over the long-term, it could weigh on growth, as interest rates ratchet up and contribute to fiscal sustainability risk. This would not be welfare-enhancing for the citizens of the country.

The cross-country literature has grappled with the question of the relationship between inequality, growth and risk, but definitive answers are hard to find. Indeed, in their assessment of the relationship between inequality and growth, Banerjee and Duflo (2003) note that it is "amongst the hardest [questions] to answer" and that "the most provocative answers end up being the bravest and most suspect". This observation could apply similarly to the relationship between inequality and many other variables including the fiscal stance long-run risk premia.

One channel that we consider is the relationship between sovereign risk and inequality.

The evidence suggests a positive association. For middle income countries, Berg and Sachs (1988) show a link between income inequality and debt rescheduling, suggesting a link between inequality and sovereign risk. The channel they propose is political — countries with high levels of inequality are under extreme pressure to redistribute income. This demand for redistribution can often only be met through foreign currency borrowing, which in turn, raises the likelihood of a debt crisis. A more recent contribution, Andreasen et al. (2019) finds similar results. They use a DSGE model with heterogenous agents, and show that countries that are more unequal tend to experience more default events. This would provide a reason for a higher risk premium. They also provide a political angle, noting that in unequal countries, political constraints may influence a country's "willingness to pay". Aizenman and Jinjarak (2012) investigate the relationship between inequality, the size and shape of the tax base and sovereign spreads. They find that these interactions may be quite large. They do not come to strong conclusions on causality, but note some associations. They suggest a one percentage point increase in the Gini coefficient is associated with a smaller tax base of 2% of GDP and a sovereign risk premium increase of around 45 basis points.

1.5 The political economy of redistribution

There is also an endogeneity problem — countries that are unequal may choose policies that lead to slower growth and/or increased probability of defaults. In a seminal paper, Alesina and Rodrik (1994), for example, argue that voters in highly unequal societies may choose higher taxes and more redistribution, with the result that democratic and unequal countries may grow slower than more equal countries. It is, of course, interesting that their result requires a democratic process for the selection of tax rates — more autocratic regimes may be able to raise growth without having to resort to redistribution. Then there is a time inconsistency issue — a democratic state that attempts to maintain high growth levels without redistribution will inevitably, at some point, be forced through the democratic process to increase redistribution.

While this is an elegant theoretical result, consistent with a median voter type model, the data does not completely fit this characterisation. De Mello and Tiongson (2006) show that more unequal societies spend *less* on redistribution, positing capital market imperfections as the reason.[10] Benabou (2000) argues that greater inequality may indeed lead to less redistribution.

[10] The extreme ends of the spectrum demonstrate this. The United States is relatively unequal, wealthy and has a limited redistribution system. Western European countries are quite equal, quite wealthy and have extensive social safety nets. South American countries, which are also quite unequal have a variety of different levels of spending on social assistance (see also Figure 2).

In this respect, this paper is also novel in the context of the international literature on the macroeconomic effects of grants. In an early contribution to the macroeconomics of the BIG, Woolard (2003) argues that fiscal measures to reduce inequality may be long-term growth-enhancing, and that these growth impacts may outweigh the negative consequences from the fiscal expansion.

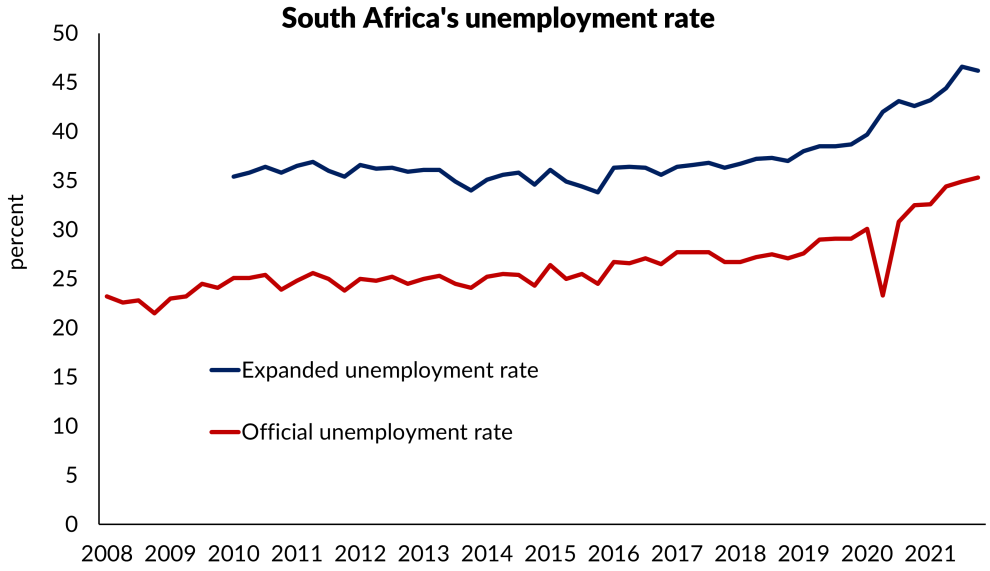
A possible mechanism explaining the resistance to redistribution was modeled by Benabou (2000), showing conditions under which greater inequality would result in less government spending on redistribution because the consensus for ex ante efficient redistributive policies breaks down. This result was confirmed by De Mello and Tiongson (2006), finding that more unequal societies do spend less on redistribution. The goal is to test directly the impact of greater income inequality on the tax base, and to evaluate the ultimate impact of income inequality on sovereign risk.

2 Stylised facts on socioeconomic developments and the fiscal framework

2.1 Stylised fact 1: South Africa has high levels of poverty, inequality, and unemployment

South Africa stands out globally for its high rate of unemployment and its high level of income inequality. South Africa's unemployment rate is over 35%, while the expanded unemployment rate, which includes discouraged work seekers and those not actively looking for work, is around 45% (Figure 1). Among 15 to 24-year-olds, the expanded unemployment rate is near a staggering 75%.

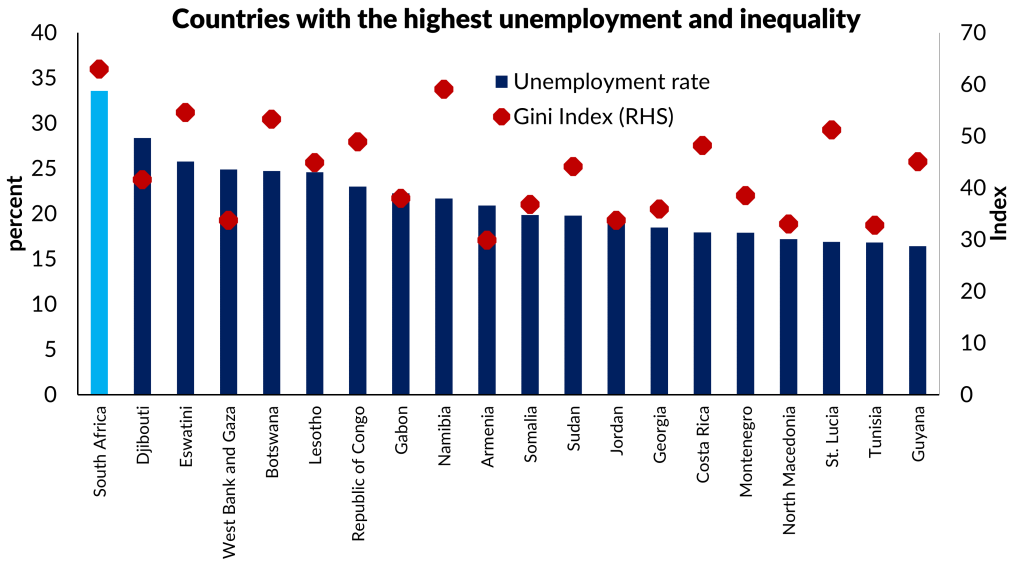
Figure 1: South Africa's unemployment rate



Source: Statistics South Africa, EconData. Both series expressed as proportion of labour force aged 15 to 64 for both sexes.

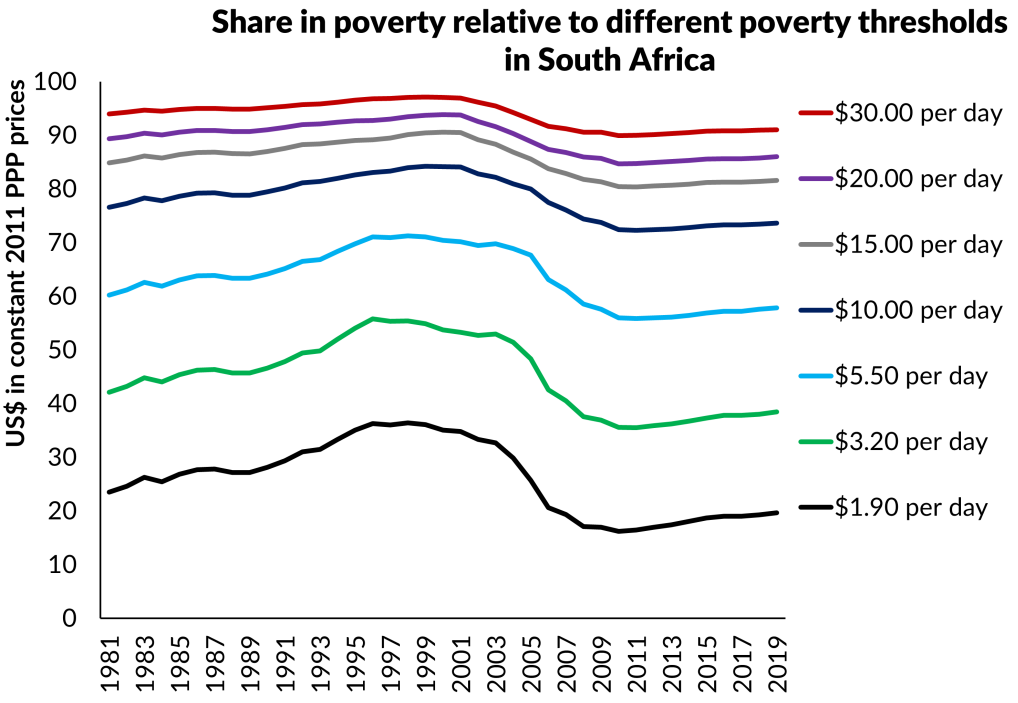
Unsurprisingly, such high levels of unemployment map to high levels of both poverty and inequality. Figure 2 shows that South Africa stands out globally for its high level of income inequality. There is also a strong link between a lack of employment and poverty in South Africa. Figure 3 shows the share of the population living in poverty in South Africa for various daily income thresholds. Poverty in South Africa fell in the late 1990s and early 2000s, from almost 35 % Africans living in extreme poverty (by the World Bank definition of USD1.90 per day) to 17 % by 2008. However, poverty rates began to rise again after the global financial crisis. South Africa's population is also highly unequal compared to other middle-income economies, as over 90 % of the population earn less than USD30 per day. The challenge in a South African context is that in 2015, 25% of the population were below the FPL, and over 50% below the upper bound poverty line (Statistics South Africa 2017).

Figure 2: Inequality comparison



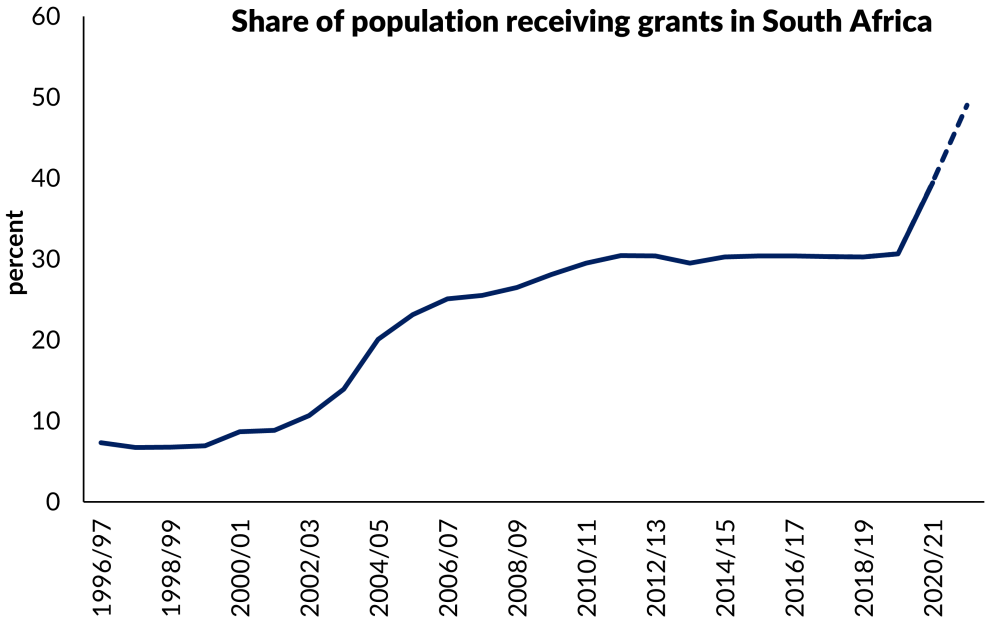
Source: World Bank, ILO. Latest data. Unemployment rate is percent of total population ages 15-64. Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality. St. Vincent and Libya not shown as Gini index estimates are not available.

Figure 3: Poverty threshholds



Source: PovCal (2021), Our World in Data.

Figure 4: Social grant recipients



Source: National Assembly Internal question paper number 50-2020, SASSA 2020/21 Annual Report, SASSA March 2021. Includes COVID-19 grant recipients, which may overstate the 2021/22 figure.

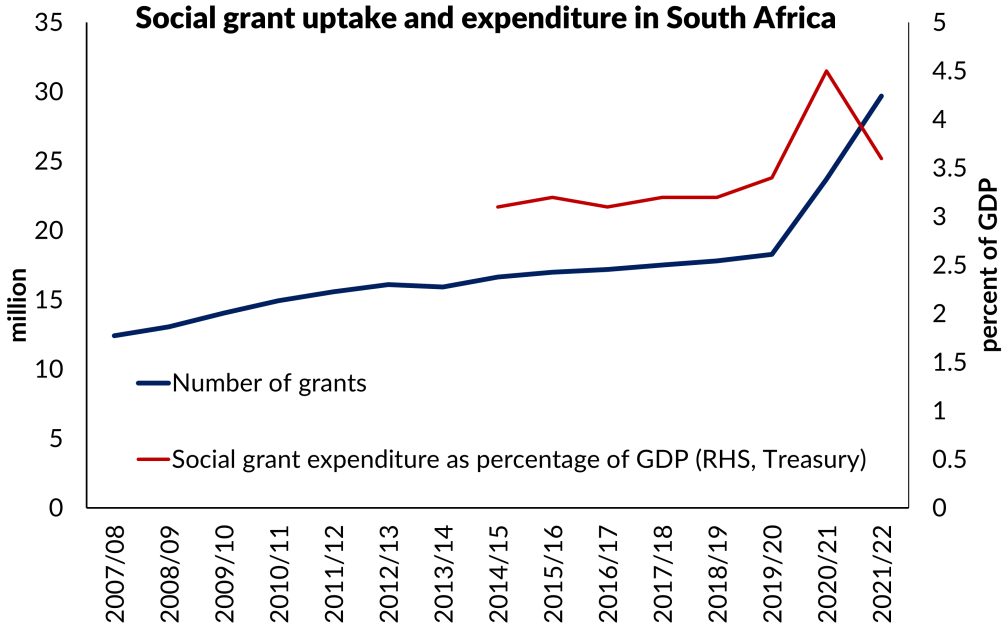
2.2 Stylised fact 2: South Africa has a highly redistributive fiscal system

Another structural feature of South African policy regime is that the fiscal system is extensive and highly redistributive and serves to mitigate the extent of inequality. South Africa has corporate and personal tax rates that are high compared to most emerging market economies and upper middle income economies (National Treasury 2022). In South Africa, taxes are levied at steeply progressive rates and at a comparably low income level compared to major economies in South Africa (OECD 2022).

South Africa's fiscal expenditure is also highly progressive. The proportion of South Africans receiving some form of government grant rose from 7% in 1996 to over 30% by 2019/20 (Figures 4 and 5). Including the COVID SRD, over 30 million South Africans receive a grant of some form, representing almost 50% of the population (see also Table 3).[11] In terms of regular number of recipients, the child support grant is still the largest type of grant at over 13 million recipients. The old age grant is the largest by fiscal cost, because although it goes to a relatively small number of people (less than 4 million).

[11] Note that available figures on grants distributed may overstate the 2021/22 number of individual recipients as some recipients may receive more than one grant. The September SASSA 2021 report suggests that as of the end of Sept 2021, 18.5 million grants were distributed to 11.4 million recipients.

Figure 5: Social grant recipients and expenditure



Source: SASSA 2020/21 Annual Report, SASSA March 2021, National Treasury Budget Reviews. Recipient numbers include COVID-19 grants.

Table 3: The South African grant system

Grant	**Recipients**	**% population**	**Cost (R bn)**	**% spending**	**%GDP**
Child support	13.2	22.1%	73.32	3.5%	1.1%
Old age	3.7	6.3%	86.49	4.2%	1.3%
Disability	1.0	1.7%	23.58	1.1%	0.4%
Foster care	0.3	0.5%	4.34	0.2%	0.1%
Care dependency	0.2	0.3%	3.66	0.2%	0.1%
SRD-350	10.5	17.6%	31.56	1.5%	0.5%
Total	28.9	48.4%	222.94	10.7%	3.5%

Source: National Treasury (2020), authors' calculations

As mentioned earlier, South Africa has one of the most unequal societies in the world (as reflected in a high Gini coefficient). Compared to our peers, South Africa is one of the emerging markets that spends the most of social assistance, at around 3.5% of GDP (Figure 6). As mentioned, the largest components of our social assistance are unconditional cash transfers and social pensions. Together, South Africa spends about 5.5% of GDP on social expenditures, which has been successful at reducing inequality, though many European countries achieve larger reductions through transfers and taxes (Figure 10).

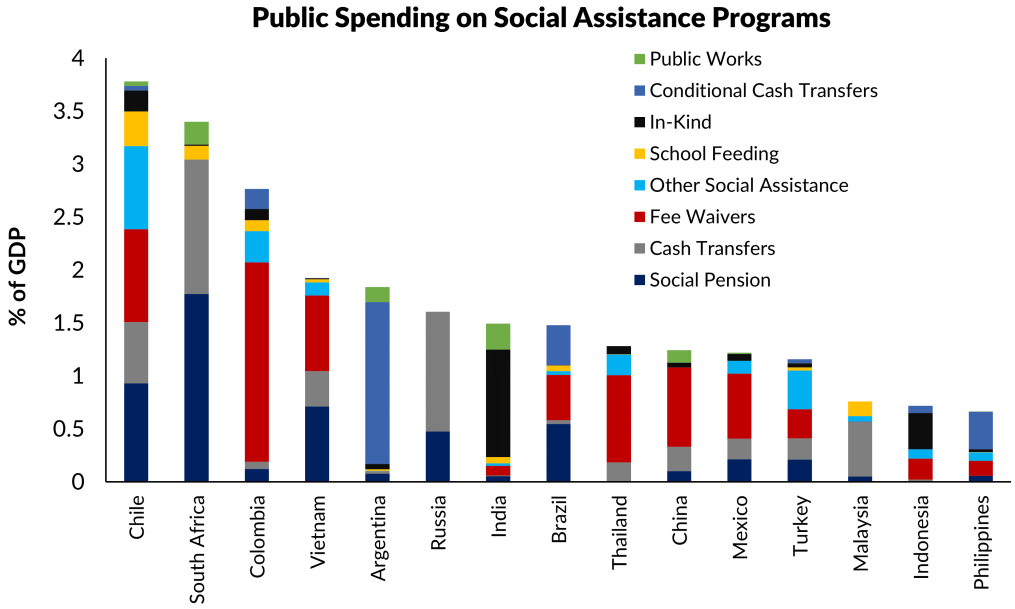
Social assistance transfers in South Africa are also relatively generous and strongly supportive of consumption amongst the poorest quintile. According to the World Bank, the value of such transfers is relatively high in terms of beneficiaries' expenditure (referred to as adequacy in Figure 7). South Africa's social assistance also significantly reduces poverty levels for the total population, achieved at a relatively favourable benefit-to-cost ratio by international standards (Figure 8).[12]

In Figure 9, estimates from Chatterjee et al. (2021) on the impact of the fiscal system on inequality are presented. For the bottom half of income earners, the effect of the fiscal system is to raise their share of national income from 3.7% to 10.6%. This may seem remarkable – in particular, the significant reduction in the pre- and post-tax share of total national income that the current fiscal system achieves. Chatterjee et al. (2021) estimate that those in the top 1% of the income distribution experience a reduction in their share of national income from 26.8 to 19.2%. However, this is not particularly surprising, considering that earners (earning over R1.5 million per year) account for almost 30% of total personal income tax receipts.

Despite South Africa's relatively comprehensive social protection, the working age unemployed generally have very little social protection in South Africa. Against this background, the paper evaluates the range of options set out in Goldman et al. (2021), which provide a set of possible extensions to the grant system to deal with widespread poverty, inequality and unemployment.

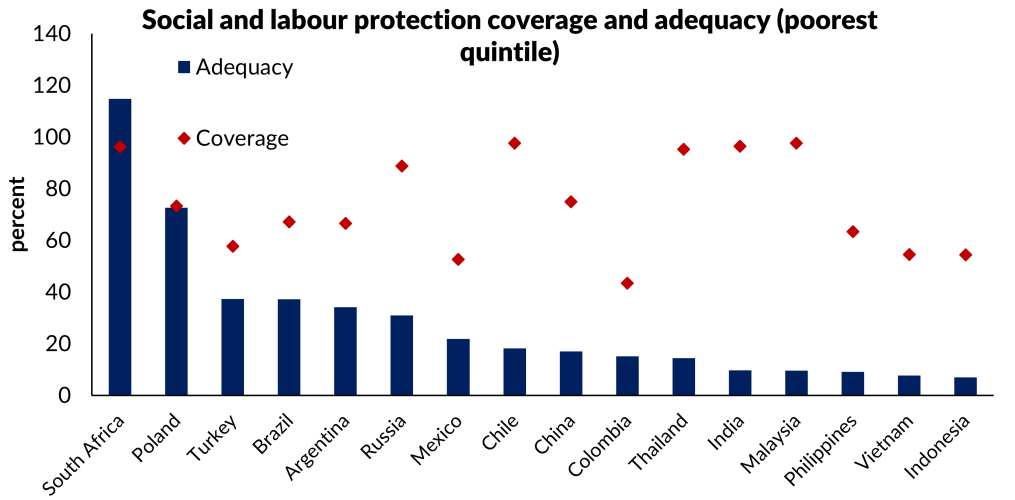
[12] Note that these estimates are higher than would be obtained using South Africa's Living Conditions Survey, but these are based on a common cross-country methodology and so ensures comparable global estimates.

Figure 6: Spending on social assistance in selected economies



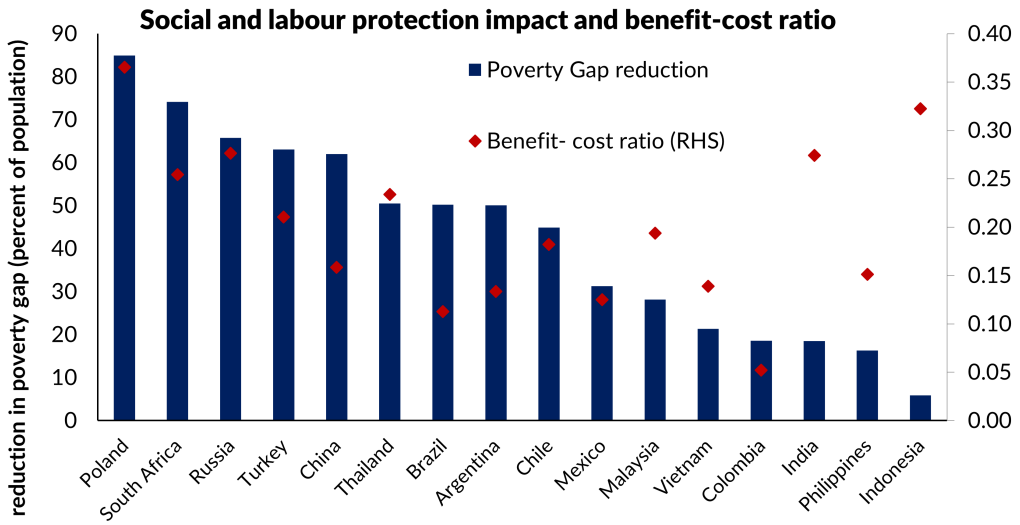
Source: World Bank, Aspire dataset. Latest data for each country.

Figure 7: Coverage and adequacy of social protection in selected economies



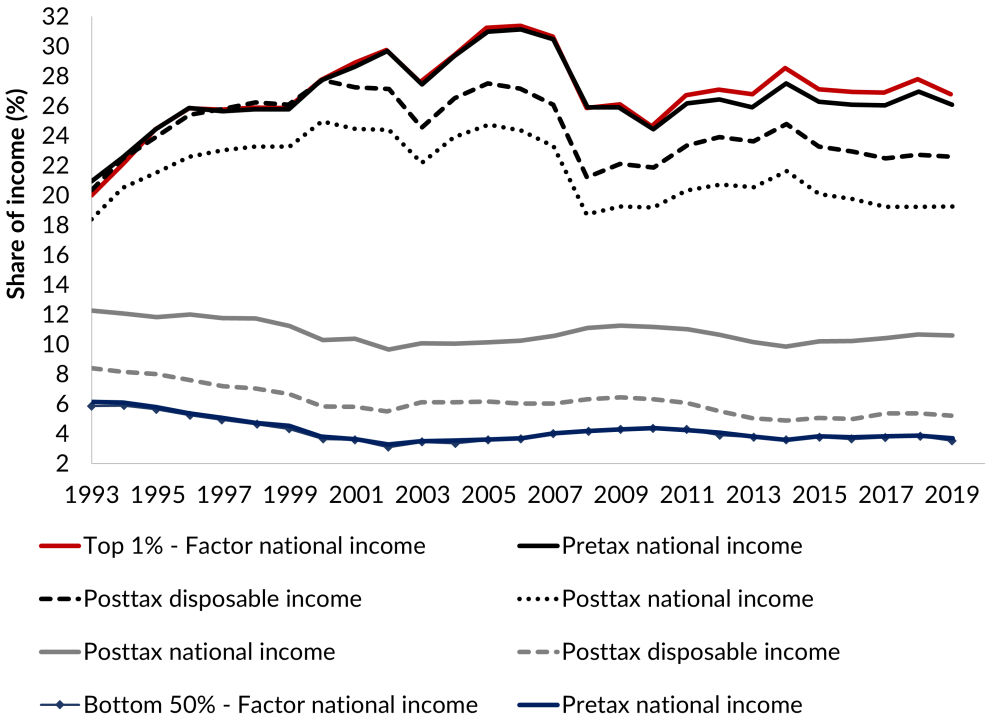
Source: World Bank ASPIRE, World Social Protection Report 2020–2022, ILO, World Bank World Development Indicators. Estimates for latest available year (2014 for South Africa) and calculated post transfer. Coverage reflects the percentage of population participating in Social Protection and Labor programs (includes direct and indirect beneficiaries). The indicator is reported for the entire population and for the poorest quintile of the post-transfer welfare distribution. Specifically the indicator is computed as (Number of individuals in the quintile who live in a household where at least one member receives the transfer)/(Number of individuals in that quintile). Adequacy refers to the total transfer amount received by all beneficiaries in a quintile as a share of the total welfare of beneficiaries in that quintile. The indicator includes both direct and indirect beneficiaries and is reported for all population and the poorest quintile.

Figure 8: Benefit-cost and impact of social protection in selected economies



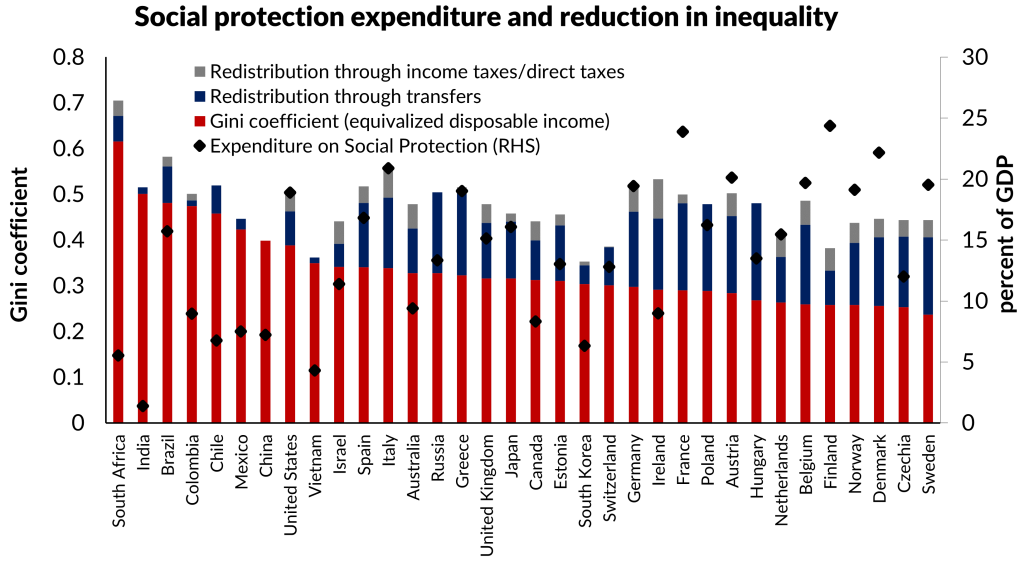
Source: World Bank ASPIRE, World Social Protection Report 2020–2022, ILO, World Bank World Development Indicators. Estimates for latest available year (2014 for South Africa) and calculated post transfer. Poverty Gap reduction attributable to social protection and labour programs as % of pre-transfer poverty gap. Poverty Gap reduction is estimated as (poverty gap pre transfer- poverty gap post transfer) / poverty gap pre transfer. Benefit-Cost Ratio is the % reduction in poverty gap obtained for each $1 spent in social protection and labour programs. Benefit-cost ratio is estimated as (poverty gap pre-transfer - poverty gap post-transfer)/ total transfer amount.

Figure 9: Share of income, pre and post tax



Note: In shades of red, the figure presents the pre- and post-tax share of national factor income for the top 1% of income earners. In shades of blue, the figure presents the share for the bottom 50% of income earners. For the bottom 50%, the effect of the taxation system is to raise their share from 3.7% to 10.6%. Source: Chatterjee et al. (2021).

Figure 10: Social protection expenditure and reduction in inequality



Source: World Social Protection Report 2020–2022, ILO, World Bank World Development Indicators. Estimates for 2020 or latest available year. Public social protection expenditure excludes health. The Gini coefficient is calculated for the complete population.

2.3 Stylised fact 3: The COVID SRD grant has reached a quarter of adults and reduced poverty

Okun's famous "leaky bucket" analogy is applicable to the choice of redistribution instruments (Woolard, 2003). In Okun's analogy, money moves from the rich to the poor in a bucket which leaks. The more leaky the bucket, the less efficient the programme and the less resources are transfered. While job creation programmes or welfare-to-work type programmes may *conceptually* deliver better outcomes they may come with significant direct costs (e.g. administration costs, means testing costs) and indirect costs (e.g. a "work-for-welfare" scheme may be more susceptible to corruption, because it requires an official in a rural area to hand out jobs).

Uptake of the SRD grant has been relatively broad (Table 3), but early analysis shows that the grants were significantly pro-poor in their targeting (Bhorat and Köhler 2020) but under-coverage is regressive in those who did not receive the grant tend to come from poor households (Köhler and Bhorat 2021). Bhorat and Köhler (2020) also suggest that COVID-19 grant receipt tended to increase the probability of job search.

Table 4: Poverty and inequality effects of the COVID-19 grant

	Household income		**Change in inequality or poverty (%)**
	Excl. COVID-19 grant	*Incl. COVID-19 grant*	
Inequality			
Gini coefficient	0.693	0.684	-1.282
Poverty measures			
FPL (%)	38.43	36.38	-5.334
LBPL (%)	50.04	49.25	-1.579
UBPL (%)	62.01	61.57	-0.71

Note: FPL = food poverty line. LBPL = lower bound poverty line. UBPL = upper bound poverty line.

Source: Bhorat and Köhler (2021)

Köhler and Bhorat (2021) examine the benefit to cost ratios of alternative social assistance policies, and suggest that the ratio is highest for extension of the current SRD package (at 307), compared to 236 for a targeted BIG (to those not currently receiving grants, with a grant of R585) and 187 for a public works programme. In related work, Bhorat and Köhler (2021) note that without the grant, poverty would have been 5.3% higher. They estimate that approximately 23% of adults in the poorest 10% of households received the grant. They also estimate that the SRD-350 has reduced the Gini coefficient marginally, from 0.69 to 0.68 (Table 4).

2.4 Stylised fact 4: South Africa has a small tax base

Personal income tax

South Africa has a relatively small tax base. The total number of individuals on the tax register is 22.9 million (SARS and National Treasury 2021). Of these, 15.1 million declare an income. Of these individuals, 7.4 million earn over the income tax threshold of R91,000. Out of this group, the 600,000 taxpayers that earn above R750,000 account for 52.7% of all personal income tax paid.

Given the income distribution in South Africa, it may be argued that it is this appropriate fiscal policy – the small pool of relatively high-earning individuals contribute through tax to redistribution. However, because it is a small number of taxpayers, the cost of any social programme can become very expensive per taxpayer. As shown in the macroeconomic modelling exercise in the next sections, the literature on tax multipliers shows that this reduces tax collections.

Table 5 presents a hypothetical exercise of allocating the cost of the current SRD-350 across

personal income taxpayers. These "simple sums"show that on average, spread across 7.4 million personal income taxpayers, this is just short of R6,000 per year or R500 per taxpayer per month. The average taxpayer earns just over R370,000 per year, or about R31,000 per month, and pays about R6,500 per month. This does not arguably represent a huge shift in resources. The positive benefits (reduced inequality, stability etc.) may be well worth it. Naturally, the incidence of such a resource shift falls more on higher income tax payers.

The sum can be done another simpler way — there are 7.4 million taxpayers, and 10.5 million SRD-350 recipients, meaning about 1.5 grant recipients for every taxpayer. Thus each taxpayer needs to contribute 1.5 times the value of the grant to balance the budget.

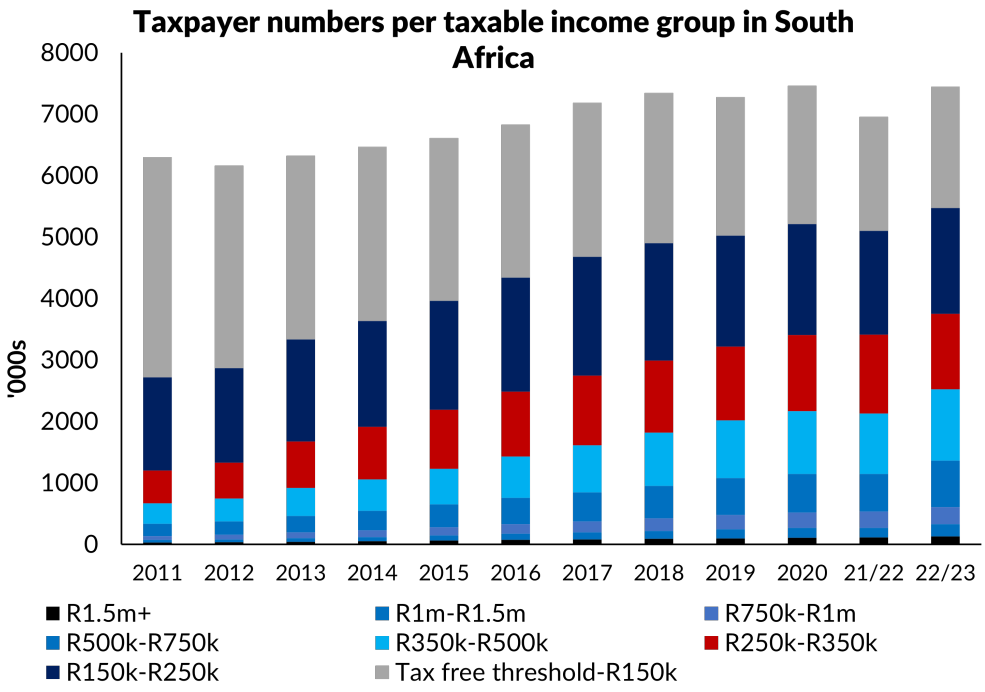
Table 5: Distribution of cost of R1,000 BIG across different tax brackets

Tax bracket	**Current income tax**	**Share PIT paid (%)**	**Taxpayers (number)**	**Average tax**	**Additional tax required**			
					Total	*Per taxpayer*		*increase*
					R billion	*per annum*	*per month*	*%*
R0 - R91								
R91 - R150		2.5	1,973,185	7,404	3.13	1,587	132	21.4%
R150 - R250	26.8	4.6	1,717,760	15,584	5.74	3,340	278	21.4%
R250 - R350	48.3	8.2	1,231,672	39,174	10.34	8,396	700	21.4%
R350 - R500	83.6	14.2	1,158,117	72,212	17.92	15,476	1,290	21.4%
R500 - R750	104.6	17.8	756,629	138,284	22.42	29,637	2,470	21.4%
R750 - R1 000	66.3	11.3	274,963	241,123	14.21	51,676	4,306	21.4%
R1 000 - R1 500	75.3	12.8	199,837	376,707	16.13	80,737	6,728	21.4%
R1 500 +	168.4	28.7	133,230	1,264,280	36.10	270,962	22,580	21.4%
Average	**587.9**	**100.0**	**7,445,393**	**78,963**	**126.00**	**16,923**	**1,410**	**21.4%**

Source: authors' calculations.

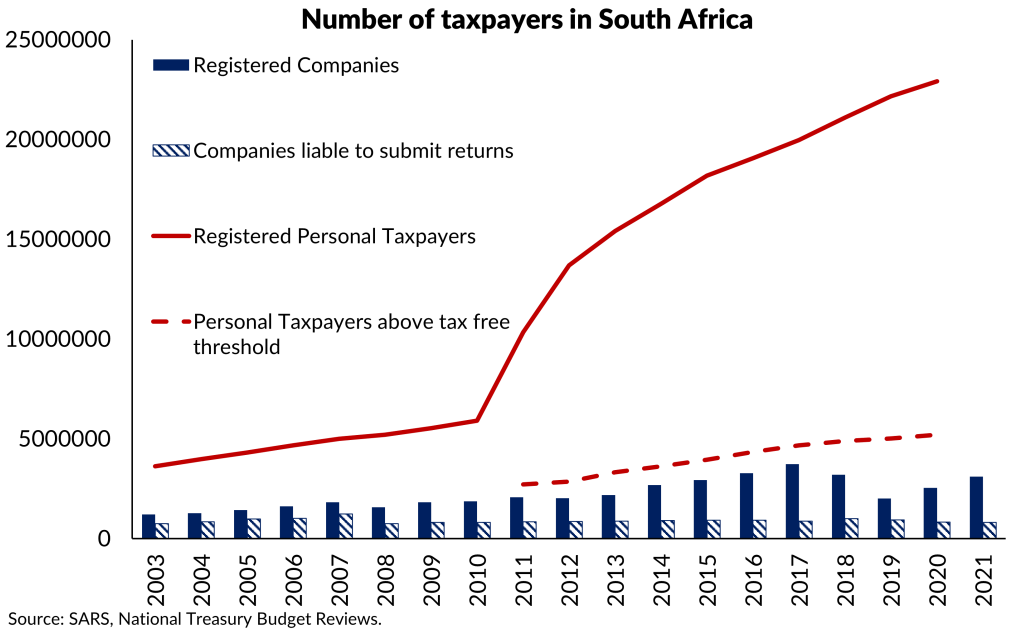
The number of taxpayers have risen by slightly over a million over the last 10 years to just below 7.5 million expected in 2022/23. Our tax system is highly progressive: roughly 330 000 people (around 0.5% of the population) who earn over R1 million contribute over 40% of personal income tax (Figure 11). The tax base in South Africa is therefore small: there are only around 800 000 companies liable to file tax returns and slightly over 500 000 individuals above the tax free threshold (Figure 12).

Figure 11: Number of taxpayers



Source: National Treasury, SARS, Budget Reviews, excluding tax free threshold at R150k. Taxable income groups not adjusted for inflation.

Figure 12: Number of PIT and CIP taxpayers



Source: SARS, National Treasury Budget Reviews.

Table 5 shows that a BIG of R1,000 per month would cost a total of R126 billion. This translates into the average taxpayer paying an additional R16,923 per year. For the average taxpayer, this is 21.4% increase in tax. For those in the biggest tax bracket by number (R500,000 to R750,000), the average taxpayer in this bracket will pay R29,637 per year more in tax.

These are the static effects. Potential dynamic effects would include the reduction in overall tax income resulting from an increase in tax (the tax elasticity). The model applied has been used extensively for tax elasticity calculations (see Kemp (2019, 2020b); Kemp and Hollander (2020). These effects are considered in greater detail below.[13]

Value-added tax

The value-added tax base is also relatively small and provides limited opportunities for tax increases. A simple static calculation of the impact of a VAT increase is to take the projected collection for VAT in 2021/22, of R383.7 billion. To pay for a BIG of R1,000 costing R126 billion per year, VAT collected would have to rise by 32.8%. This is equivalent to a rate increase of 5 percentage points. This is a static estimate. The impact on consumption spending (particularly amongst the poor) would be reasonably large. The modelling section below shows that the VAT rate increase would need to be in the order of 7 percentage points.

2.5 Stylised fact 5: South Africa has a relatively high sovereign risk premium related to a weak fiscal position

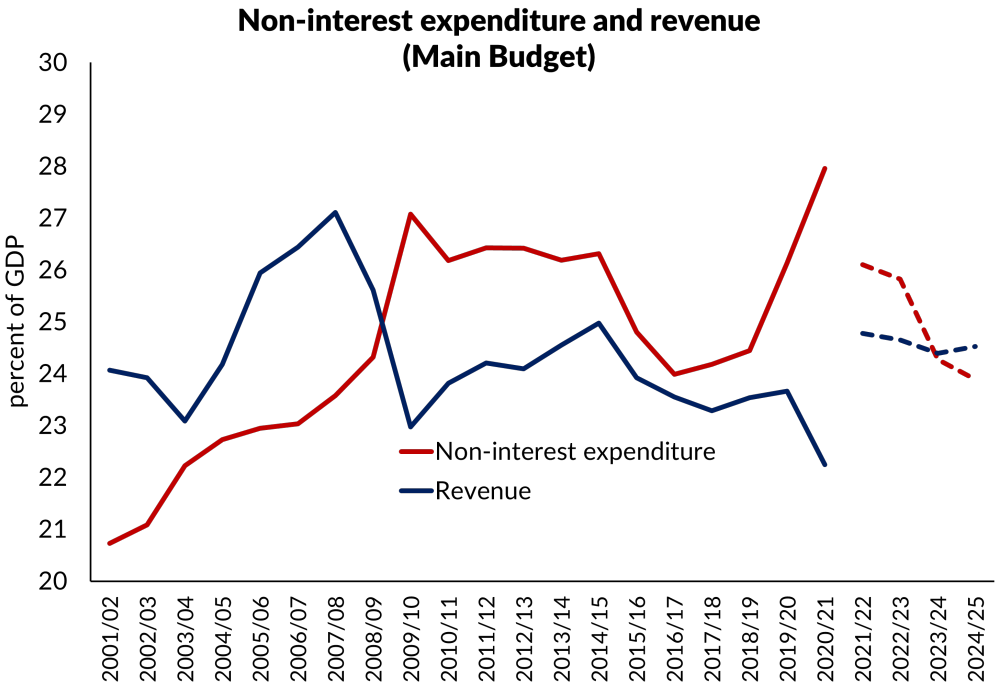
South Africa's public debt has steadily deteriorated since 2009 as a consequence of a structural expansion in the budget deficit: expenditure consistently exceeding revenue (Figures 13 and 14).[14] The implication of the deterioration in South Africa's public finances is that

[13] The failure of the introduction of a new top rate to raise the expected quantum of new revenues the Budget Review (National Treasury, 2020) explains, is because taxpayers responded to the increase in a manner that slowed the rate of growth of taxable income at the top of the income distribution. Thus, while total taxable income of people earning more than R1.5 million had been growing by nearly 9% a year in real terms before the increase in rates, in the immediate aftermath of the change in the top rate, income growth above R1.5 million dropped to under 4% in real terms. Importantly, this drop was not matched by a drop in the growth in incomes between R1.25 million and R1.5 million, suggesting that the change in the top rate affected taxpayer behaviour, rather than reflecting some other macroeconomic factors. More generally, a review of historical data by Kemp (2019) found that a one percentage point increase in the top marginal rate resulted in a 0.4 percentage point decline in taxable income among the highest earning taxpayers.z He estimated that the revenue maximising top rate for the top 10% of taxpayers was 40%.

[14] Recent data changes and recovery from the COVID-19 pandemic has however helped to improve the trajectory of public debt. A large part of this increase in debt was unexpected: over the last 12 years, National Treasury's projection of where the debt-to-GDP ratio will stabilise has drifted steadily higher (Figure 26 in the Appendix). There was, however, a meaningful improvement in the debt profile between the 2021 and 2022

fiscal space to deal with expected shocks (like the COVID-19 pandemic) has been increasingly constrained, and that debt servicing costs have increasingly crowded out other forms of spending.

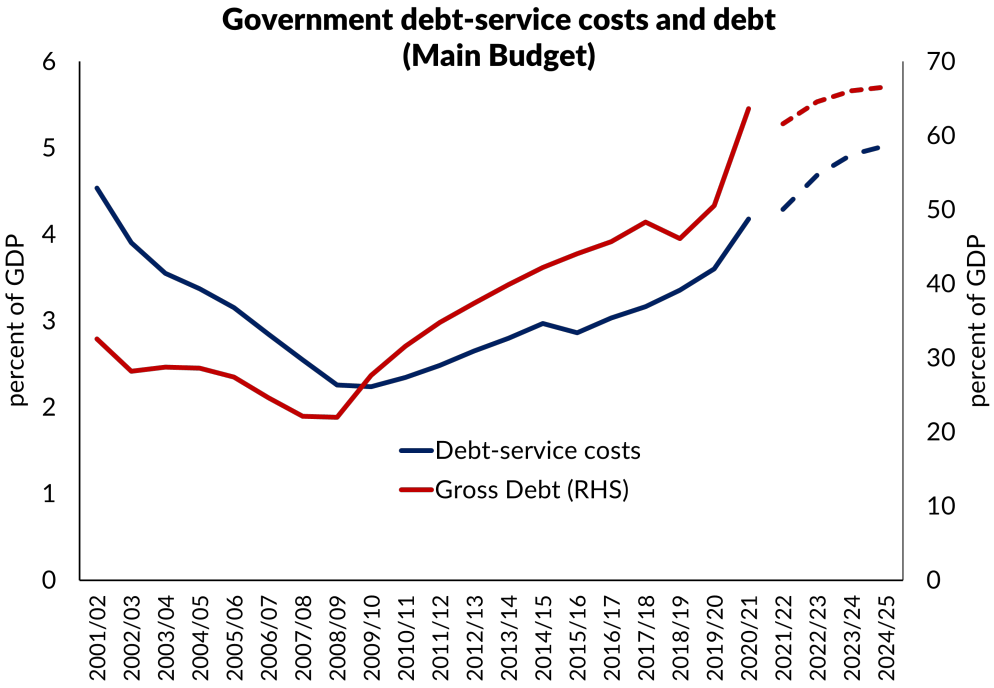
Figure 13: Government budget components



Source: National Treasury Budget Review. Dotted lines indicates projections.

Budget Reviews. An important contributor to this improvement was the upward revision to the level of South Africa's GDP (by 11% in 2020, for example), something naturally enhanced the government's perceived creditworthiness. It is important to note that South African public debt data excludes debts of state-owned companies or contingent liabilities of local governments, extra-budgetary institutions and state-owned companies.

Figure 14: Government debt and debt-service costs



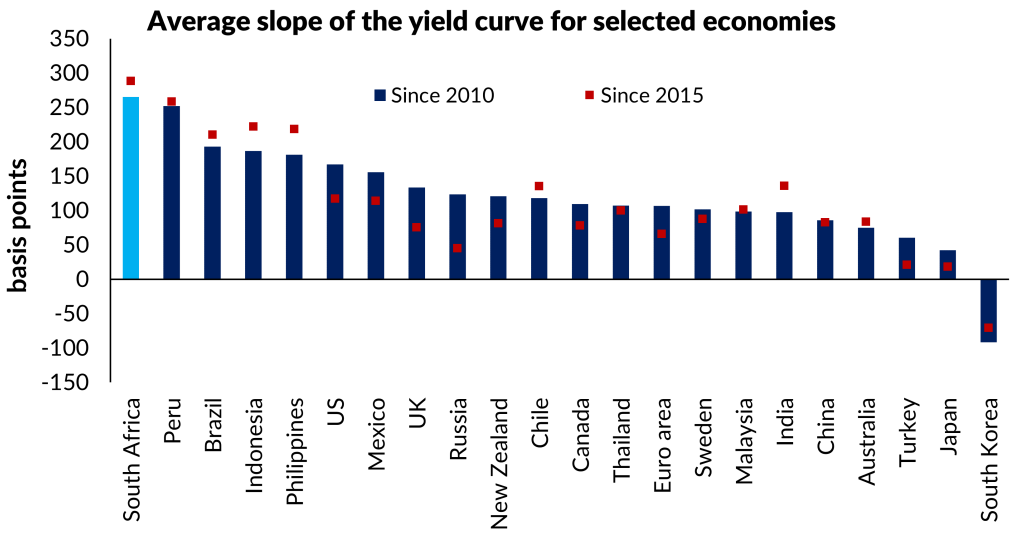
Source: National Treasury Budget Review. Dotted lines indicates projections.

Another key impact of rising debt has been higher risk premia and sovereign funding costs. South Africa has one of the steepest sovereign yield curves among large emerging markets, and it has steepened meaningfully in lock-step with the worsening in public finances (Figure 15). Soobyah and Steenkamp (2020b) show that the term premium embedded in South Africa's sovereign bond has been rising over the last 5 years, reflecting a higher liquidity and sovereign credit risk premia, and more recently, a higher inflation risk premium. They also estimate that a 100 basis point term premium shock weakens economic growth by around 0.6 percentage points, demonstrating that sovereign debt accumulation has likely weakened growth in South Africa over recent years. Figure 16 plots this measure for South Africa alongside another measure of sovereign risk, the credit default swap (CDS) rate on sovereign bonds.[15] A key factor in the steepening of South Africa's yield curve has been the deterioration in its fiscal position. Figure 17 shows that higher debt levels (or more deteriorated fiscal balance) have tended to be associated with a steeper yield curve. This is in line with the findings of Hollander (2021) for South Africa.[16]

[15] Soobyah and Steenkamp (2020a) show that that an increase in perceived South Africa specific sovereign credit risk has driven higher South African sovereign credit default swap spreads following the onset of the pandemic. Figure 27 in the Appendix plots these metrics of sovereign risk alongside the spread measure applied in this paper, as well as the 5 year CDS spread for the South African sovereign over the last two decades.

[16] Hollander (2021) shows that tax-driven fiscal stimulus tends to be contractionary as government transfers and government consumption spending typically lead to crowding-out of private spending and raise debt, and therefore long-term interest rates from a higher risk premium. Investment-driven fiscal stimulus produces more favourable outcomes for fiscal sustainability.

Figure 15: Comparative yield curve slope



Source: Bloomberg, Codera Analytics. Yield curve slope measured using the difference between monthly 10 year government bond and 3 month Treasury bill yields. Russian yields for 2022 sourced from Russian Central Bank. Turkish 3 month Treasury bill yields taken from Investing.com and missing values are excluded from the calculation. Vietnam and Colombia do not have 3 month Treasury bill rates available over the sample.

Figure 16: Sovereign risk

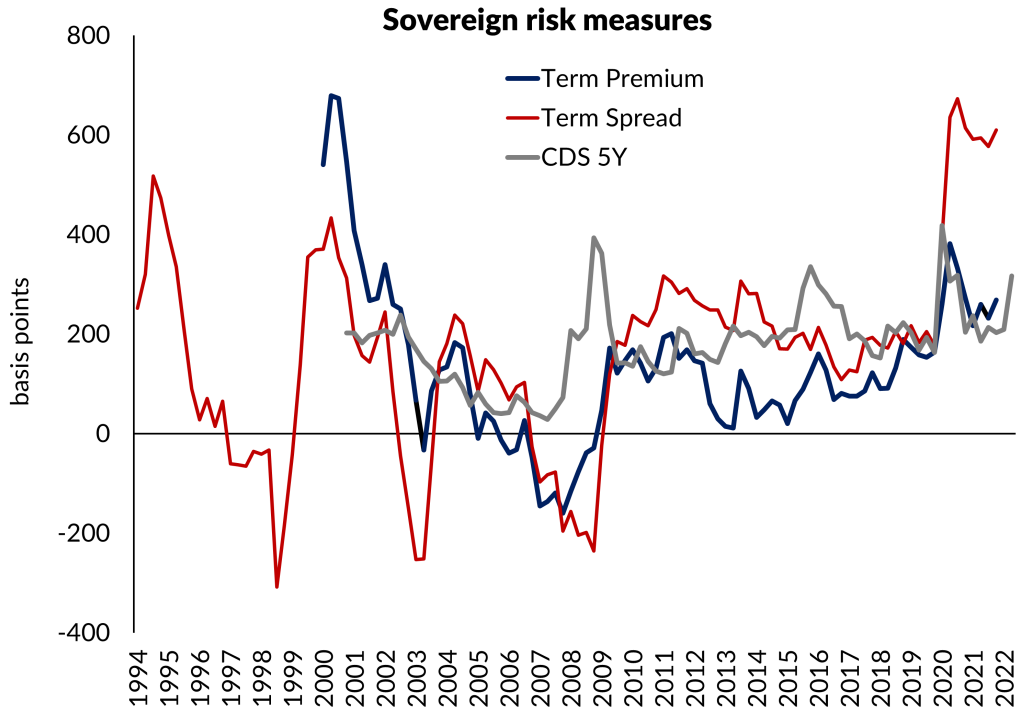
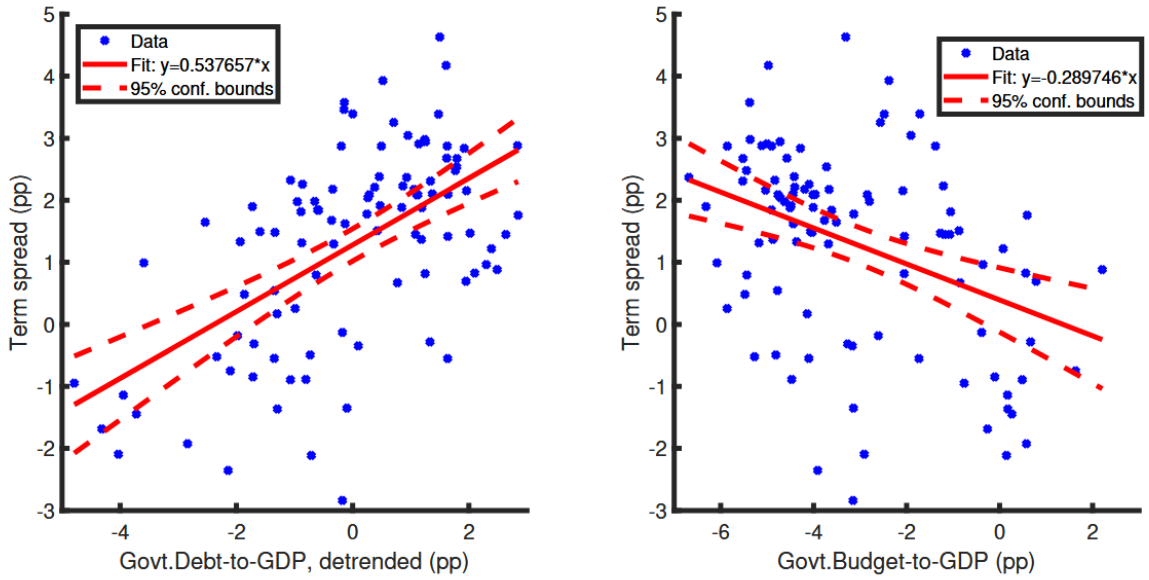


Figure 17: Government debt and interest rates



3 Approach

3.1 What we model: income support measures under alternative fiscal scenarios

The debate around the introduction of a BIG has been around for a number of years. The initial proposals were a R100 BIG, equivalent to approximately R275 in 2022 rand terms (see, for example, the discussion in the 2002 Committee of Inquiry into a Comprehensive Social Security System for South Africa (Taylor 2002, the "Taylor Committee"). Although the BIG was not implemented, in the intervening years, the social security system has been expanded significantly. As demonstrated in Figure 5, with the introduction of the SRD-150, the number of social grant beneficiaries has risen to nearly half the total population. The debate in 2002 was about introducing a BIG into a relatively underdeveloped social security system. Twenty years later, the debate is about introducing a BIG on top of a relatively comprehensive grant system that accounts for 10.7% of all government spending and costs 3.5% of GDP.

These two contexts highlight that estimates of the impact of a BIG must distinguish the *marginal* cost of a BIG versus the *absolute* cost. This distinction requires one to capture the additional cost over and above the current *expected* fiscal path. For example, when modelling the impact on the sovereign risk premium, one must assume that market participants have a baseline assumption about the fiscal trajectory that includes their expectations about

the decision on basic income support. If, for example, market participants assume that the SRD grant will be retained indefinitely, then announcing that it will be extended indefinitely will have no 'announcement effect' on bond yields. However, announcing a R240 billion BIG pegged at the minimum wage may have a significantly adverse 'announcement effect'.[17]

The paper compares several scenarios benchmarked to current public proposals. As summarised in Tables 2 and A.3, BIG proposals vary widely. For the purposes of this analysis, it is assumed in the baseline that the income support is extended permanently over a horizon of 5-years, after which allowance is made for model dynamics to stabilise to their steady states. This approach is adopted to capture how a permanent increase in transfers, under alternative funding and economic scenarios, impact the economy over an extended horizon, and to understand how the economy responds if this permanent increase ends. Extending the BIG beyond 5 years simply extends (unboundedly) the projected path observed over the period 2022Q1 to 2027Q1. The core scenarios discussed in more detail are those that relate to expanding social transfers at the food poverty line, for the 'best-case' tax funding options, which ultimately illustrates the necessity of private sector growth for long-run macro-fiscal sustainability.

The macro-fiscal implications of each of three fiscal strategies, together with three funding strategies (that is, tax financing, debt financing, and/or cutting expenditure) are considered. Since a policy of significant expenditure reduction to make room for the BIG is not expected at this time, it is assumed that government consumption and investment expenditure follow their historical reactions to changes in output and debt. Unless otherwise stated, allowance is also only made for tax buoyancy effects for all scenarios (i.e., how effective tax rates respond to the business cycle – i.e., output not debt). Both assumptions are important for fiscal projections to better capture the actual behaviour of macroeconomic and fiscal variables in response to shocks. Ignoring this would unrealistically treat fiscal policy (and therefore the government's balance sheet) as an independent feature of the economy.

Herewith follows a summary of the three scenarios listed in Table 6:

- Scenario 1 allows for tax- and debt-financing according to the estimated structural parameters based on historical data. The main purpose of this scenario analysis is to highlight the benefits of a targeted grant to the poor over that of a universal BIG.
- Scenario 2 compares tax-funding approaches only. Here, the tax funding instrument mix is optimised to minimise the costs of higher debt and the losses of lower output such that the debt-to-GDP ratio is stabilised over time. The results suggest that VAT

[17] See the discussion in Havemann and Hollander (2021) on the current time inconsistency of fiscal policy.

or a combination of VAT and PIT produce by far the most favourable outcomes. CIT funding is therefore excluded from this scenario.[18]

- Scenario 3 introduces a government investment stimulus alongside a tax-funding combination of VAT and CIT. Here, VAT follows its optimised path to limit economic and fiscal losses and CIT adjusts along a path determined by its historical reactions to output and debt. Allowance is made for CIT to adjust to the extent that the government investment stimulus promotes crowding-in of private sector investment, which would lead to improved CIT revenue collect as the economy grows.

Although a first-best ('optimal') fiscal strategy can be inferred from the results of the scenarios considered in this paper, no explicit evaluation of which of these scenarios is optimal in terms of household welfare is performed. An extension of this work to assess the impacts of alternative strategies on household welfare, and the optimal policy for fiscal sustainability and social relief would be valuable. In the results section, the focus is on the discussion on the most favourable outcomes for fiscal sustainability and growth.[19]

Finally, an important aspect of the modelling exercise is whether the economic stimulus from higher transfers are attenuated by higher taxes, crowding-out effects, interest rates, and debt servicing costs. A sustainable expansion of fiscal transfers depends most notably on: (1) how binding the fiscal constraint is; (2) whether the consumption multiplier of grant recipients is higher than tax multipliers for taxpayers facing a higher tax burden, which affects the degree of crowding-out of private expenditure and public non-transfer expenditure; (3) what the net impact on labour supply will be from redistribution between groups in the economy; (4) the scope of the BIG (its level but also whether it is universal or targeted); and (5) the financing approach (funded through tax revenue, expenditure re-prioritisation, debt accumulation, or economic growth). These aspects are explored in the results.

[18] Section 4.2 does, however, evaluate the efficacy of all tax funding options possible in the model. A summary of the results for any alternative scenarios can be reproduced upon request.

[19] As mentioned in the previous section, the framework requires estimating or calibrating the share of each type of household in the model, which may not be a sufficient statistic for welfare analysis on the full income distribution. For example, since 'poor' households make up a small share of total consumption, the likely outcome of a welfare analysis of fiscal transfers would, on net, minimise crowding-out of 'rich' households' lifetime consumption. A more comprehensive study of the welfare effects of fiscal transfers requires a more detailed and focused analysis, which is a natural extension of the investigative policy research conducted here.

Table 6: Scenarios considered in this paper (sizes are per annum)

	Size of intervention	VAT	PIT	CIT	Debt
Scenario 1					
Expand social transfers *with baseline values*	R44 bn to R332 bn (SRD to Universal)	✓	✓	✓	✓
Scenario 2					
Expand social transfers *with tax financing*	~ R74 bn (FPL)	✓	✓	✗	✗
Scenario 3					
Expand social transfers *with tax & iG*	~ R74 bn + R60 bn	✓	✗	✓	✗
with tax, iG & efficiency gains	~ R74 bn + R15 bn	✓	✗	✓	✗
Alternatives not considered					
Employment tax incentive	✗				
Work-linked intervention	✗				

Notes: *baseline* = estimated model where all fiscal instruments adjust based on historical sample at different levels of income support. *tax financing* = tax instrument optimised to stabilise the trade-off between debt and output. *iG* = public investment stimulus. *iG & efficiency gains* = public investment stimulus with efficiency gains for private investment. SRD = social relief of distress. FPL = food poverty line. Tables 1, 8, 9, A.1, and 6 provide more details on each scenario and their outcomes.

Source: National Treasury (2020), authors' calculations.

3.2 An overview of the NT-DSGE model

This section presents an overview of the framework adopted to quantify alternative fiscal policy interventions and their associated trade-offs between social relief, economic growth, and the sustainability of public expenditure and taxes. As such, the framework explicitly captures predominant macro-fiscal interactions in the economy. This means that, as an internally consistent system, our model incorporates several channels and feedback effects for fiscal policy to influence aggregate demand and economic growth (through, for example, its impact on interest rates and incentives for firms and individuals to consume, invest, and supply labour). Furthermore, it takes into account expected behavioural responses of households and firms to changes in economic conditions (for example, income, interest rates, or effective tax rates). These features make the model particularly well-suited to analyse counterfactual policy scenarios, and it therefore complements alternative BIG projections to date that are based on static, deterministic, and/or time inconsistent estimates.[20]

A medium-scale DSGE model is estimated on historical South African macroeconomic and fiscal data, and make quarterly projections based on alternative fiscal policy scenarios. This

[20] See Havemann and Hollander (2022) for a discussion of time inconsistency in South African fiscal policy.

model is being developed for the National Treasury ('NT-DSGE' hereafter) for fiscal policy analysis (see Kemp and Hollander 2020; Hollander 2021; Havemann and Hollander 2022). The NT-DSGE model incorporates several distinguishing features in the context of assessing the impact of a BIG:

1. The model is dynamic (multi-period), stochastic (i.e. includes uncertainty), and general equilibrium (captures the interaction of supply and demand in key markets)
2. The model distinguishes between two types of households (poor and rich) allowing for an analysis of both macroeconomic and redistributive policies and net consumption and labour supply effects
3. Firm and household behaviour is guided by forward-looking expectations
4. The model identifies the relative impacts of different tax policy mixes (VAT, PIT, and CIT) and adjustments to the composition of public expenditure (consumption, investment, and transfers)
5. The simultaneous reactions of fiscal and monetary policy to economic outcomes
6. The model includes channels through which the domestic economy is affected by foreign trade and capital markets.

Two features of the model structure are important for the analysis. The first feature (#2 above) is the distinction between rich and poor households, so-called 'Ricardian' and 'non-Ricardian' (or 'hand-to-mouth') consumers, which creates the ability to assess the impact of redistributive policies.[21] Specifically, the model structure implies that consumption is more volatile for poorer households because they have limited access to finance to smooth consumption over time. As a result, poor households are assumed to consume all of their income from wages and government transfers. The key adjustment to the model for this paper is to allow for 'targeted transfers'. Section 4.1 leverages this feature of the model to show

[21] The term 'Ricardian' reflects the fact that these households have access to financial instruments that allow for smoothing consumption over time – i.e., they are forward-looking and therefore anticipate the effects of policy in their consumption decisions. At the extreme, 'Ricardian equivalence' is a proposition (under the assumption of full information, complete markets, and rational expectations) that government spending financed with taxes or debt (future taxes) will have equivalent effects on the overall economy. In other words, the presence of Ricardian households attenuates the impact of policy. In contrast, 'non-Ricardian' households do not optimise over time and therefore consume all income, including transfers, each period. The combination of these two types of households together with weakly exogenous processes for fiscal instruments allows for non-zero budget balances. A structural budget deficit/surplus is not explicitly modelled.

that a universal BIG produces less favourable macro-fiscal outcomes than a commensurate targeted BIG.[22]

The second feature (#4 above) is that fiscal policy actions are identified within the whole scope of the economic system. In the short- to medium-run, the different tax revenues and expenditures can fluctuate independently of each other, which means that the government can run a balanced budget, a surplus, or a deficit. In the long-run (that is, as any number of observed shocks to the economy dissipate), the government adjusts expenditure, tax rates, and transfer payments to stabilise the ratio of debt to gross domestic product and therefore maintain long-run fiscal sustainability. Specifically, 'automatic stabilisers' to output and debt allow for spending and tax receipts to adjust to the business cycle and government debt. Automatic stabilisers are modelled through changes in all six fiscal instruments to the deviations of output and debt from their respective steady-state trends. Using historical data, estimates of the coefficients that determine the degree of influence of automatic output and debt stabilisers for each fiscal instrument, as well as identifying the size of independent policy innovations to these instruments, are produced. Section 4.2 focuses on this aspect of the results in more detail. Appendix A.3 provides more technical details about the fiscal block and the six fiscal instruments. Lastly, the framework assumes that monetary policy and fiscal policy respond contemporaneously to achieve their policy objectives (e.g., debt sustainability and stable inflation). The implications of this feature of the model is that policy authorities will respond to counteract macroeconomic destabilisation associated with unsustainable trajectories. That said, no time horizon is specified over which policy objectives must be achieved.

It is worth noting several limitations of the approach in this paper. Modelling the macroeconomic effects of social policies and their fiscal ramifications is inherently complex, particularly for dramatic policy changes that have not been implemented previously. A lack of empirical evidence on these dynamics in South Africa means that the estimated effects and the adjustment of the economy back to its steady state is illustrative. Unprecedented policy changes (particularly if they create a non-linear debt profile) and unprecedented economic circumstances (particularly in the context of political and social instability) are very difficult to model accurately. That said, by presenting results from a general equilibrium model es-

[22] In Kemp and Hollander (2020), the fiscal authority distributes transfers between both types of households in the model. This specification serves as the 'universal' grant scenario in the main text. The model suggests that approximately 74% of transfers are directed to hand-to-mouth households where their share of aggregate consumption amounts to around 10%. In contrast, for the targeted transfer scenarios (the baseline assumed in the paper), the focus of the paper is on direct transfers to poor (hand-to-mouth) households to better capture the behaviour of the targeted recipients. The transfer redistribution share parameter is therefore fixed to 1 and the share of poor household consumption to total consumption is estimated to be approximately 5%. A more-detailed discussion on this feature of the model is available in Appendix A.3.

timated with a wide-range of macroeconomic data, this paper is unique in the literature on the impacts of different fiscal strategies to accommodate a BIG.[23]

3.3 Applying the model: calibration and estimation

In order to assess the counterfactual social relief options estimated in this study, it is important to know the historical context and understand how the data drive the estimated effects in the model, as summarised in the preceding stylised facts. The key structural parameters in the model for the South African economy are estimated as in Kemp and Hollander (2020). Since the model is slightly different and it is estimated with a different set of data, the results for the estimated parameters are available in Appendix A.4. The model is re-calibrated based on the up-to-date fiscal and macroeconomic data to simulate fiscal projections beyond 2022Q1.

The model is estimated using Bayesian methods with 20 observable variables and 21 shocks.[24] The domestic variables are output, private consumption, private investment, employment, consumer inflation, real wages, short-term interest rate, import inflation, export inflation, government debt-to-GDP, and the inflation target. The foreign variables, where the paper uses the U.S. as proxy, are output, inflation, and the short-term interest rate.[25] The six fiscal policy variables are estimated by six fiscal reaction functions that respond to output and debt.

The sample period to estimate the structural parameters of the model is 1994Q1−2019Q4. The model is re-run up to the end of 2021 and run counterfactual projections to compare

[23] Future extensions of this work will consider explicitly incorporating a channel capturing the potential positive effects that expanding transfers could have on social stability, and therefore fiscal costs (through a risk premium reduction on debt) and macroeconomic costs (through a reduction in protests, strikes and riots, which typically have a direct impact on production and employment).

[24] Bayesian analysis allows the researcher to attach some prior belief over the distributions of structural parameter values. These prior distributions are updated sequentially to maximize the models ability to explain the information fed into it (i.e., the full data set used to estimate the model produces posterior distributions of the estimated parameters). A comparison of these prior and posterior distributions are available in the technical appendix. A similar prior and posterior distribution either implies the prior belief of the research is accurate or the data does not provide sufficient information. Another reason is related to the model structure itself — here, identification tests indicate that all parameters are identified. Robustness checks are also conducted on different samples and different assumptions regarding the model.

[25] In Kemp and Hollander (2020); Hollander (2021); Havemann and Hollander (2022) the foreign block is based on the weighted-average series from South Africa's main trading partners (which includes China post-2000). Using the U.S. data only increases the importance of the foreign block, and it improves the identification of the domestic and foreign shocks. Aggregating trade-weighted data was found to obscure the impact of the foreign block and did not map well into the set of equilibrium equations governing foreign output, inflation, and the interest rate. If one wants to incorporate trade-weighted effects, the model should treat each of the foreign series as exogenous processes or build a multi-country model. The former reduces spillover effects between variables, whereas the latter adds additional layers of complexity to an already large model.

alternative fiscal scenarios – i.e., forecasts conditional on a set growth path for government transfers. The baseline projection is a permanent once-off increase in the growth rate of transfers. It is permanent in the sense that, after the once-off growth rate shock, households and firms anticipate the path of the fiscal intervention and respond according to their estimated behavioural responses. Notably, this projection is maintained for five years, after which the economy is allowed to stabilise at a new steady state level.[26]

4 Results

4.1 The dynamics of fiscal transfers: universal vs. targeted

Figures 18 to 22 summarise the model-implied macroeconomic dynamics associated with different fiscal transfer scenarios over the estimated and projected sample periods (1994Q1–2021Q4 and 2022Q1–2032Q1, respectively). The projections are conditional on the fiscal expansion associated with increased transfers being a once-off increase lasting for 5 years, after which the policy ends and the economy stabilises around its new steady-state. Plotting the projections alongside the historical series provides a useful context to compare the magnitude of the projections against.[27] In this section, the focus is on the general macro-fiscal dynamics in response to a BIG, before investigating alternative funding scenarios. As such, government tax and expenditure instruments respond according to their historical estimated values.[28]

The first set of results consider the outcomes of a universal BIG in relation to a targeted grant of commensurate value (Scenario 1 in Table 6). Tables A.1 and A.3 show that a universal grant R460 per person per month (pppm), with an eligible population of 60.1 million, amounts to approximately 100% per annum (pa) increase in transfers. A commensurate BIG targeted to the poor could cover a range of alternative combinations of eligible population and grant sizes per person. For example, a targeted BIG to all adults between 19 and 59 (an eligible population of 33 million) at R840 pppm amounts to approximately 100% pa increase in transfers (R333 bn pa). For comparability with the SRD eligible population of 10.5 million, it is rather assumed that the targeted scenario amounts to R2500 pppm – R 315 bn pa.[29] This

[26] Strictly speaking, a growth rate shock is modelled that persists for 250 years (10 000 quarters). This is very near a unit root process (i.e., a 0.999 coefficient on the first-order auto-regressive process for fiscal transfers).

[27] The 5-year horizon is arbitrary and can be extended indefinitely. Allowance is made for the policy to end to better understand the macro-fiscal dynamics in response to such a large shock. For example, if the BIG is expected to be unsustainable (i.e., temporary), the results show that a significant contraction in both public and private sector activity would occur to restore stability. These results are available upon request.

[28] See Appendices A.3 and A.4 for more details on the fiscal reaction functions and their estimated values.

[29] As pointed out in Section 3, since the model only distinguishes between two types of households, fixing

set of figures are included in the projected path of the macroeconomic and fiscal variables for the FPL, which, at an eligible population of 10.5 million amounts to approximately 25% pa increase in transfers.

The results clearly show that a grant targeted to poor – hereafter 'hand-to-mouth' (H2M) households – produces more favourable debt and growth outcomes whilst substantially increasing redistribution (see Figures 18 and 19). Debt-to-GDP for a targeted BIG would rise to around 111% of GDP after 5 years (a 41 percentage point increase) – which is 5 percentage points below that of a universal BIG of commensurate value (left panel in Figure 18). The key reason for this outcome is that Ricardian households anticipate that the portion of transfers that is debt-financed will lead to higher future taxes which partly leaves expected lifetime income unchanged. In contrast, H2M households cannot smooth their consumption over time and all transfers will be allocated towards offsetting income loses and raising consumption. In other words, the decrease in disposable income of H2M households (as a result of the decrease in labour income, owing to weaker economic growth and higher taxes) dampens the overall impact of the expanded grant system less than the offsetting factors affecting forward-looking (Ricardian) households. As a result, the consumption of the poor is potentially four times larger for a targeted grant compared to a commensurate universal BIG at a lower macroeconomic and fiscal cost (right panel in Figure 18). In fact, a targeted grant at the food poverty line (red line in the figures) produces a better welfare outcome than a universal grant (measured in terms of H2M consumption) at considerably lower macroeconomic and fiscal costs. Figure 19 highlights these unsustainable costs in terms of large and persistent output losses below trend (left panel) and the required primary balance to stabilise debt in a given period – the 'sustainability gap' derived in Havemann and Hollander (2022) (right panel).

To generate positive output multipliers in response to government spending shocks, private consumption must typically respond positively (i.e., it must generate crowding-in effects).[30] However, South African evidence does not provide unambiguous support for the contention that higher government spending raises private consumption. Kemp and Hollander (2020), for example, show that tax multipliers are very negative for private consumption and investment, while government spending and investment multipliers are positive but less than one. Likewise, Kemp (2020a) estimates tax multipliers to be large and negative and govern-

the share of H2M households requires that the eligible targeted population be consistent across assumed scenarios.

[30]The quantitative effects of fiscal policy shocks can be summarised using present-value fiscal multipliers. Present value multipliers are calculated as the ratio of the discounted output (or consumption or investment) response to the discounted government spending response, scaled by the sample mean ratio of government spending to output (or consumption or investment). Similarly, tax multipliers measure the response to discounted unanticipated effective tax revenue changes, scaled by the respective sample mean ratios.

ment spending multipliers to be generally smaller than 1. Fiscal spending multipliers have been shown to be larger than one, but only typically in certain states of the world. For example, Makrelov et al. (2018) estimate multipliers from 2 to 3 immediately following the global financial crisis, such that the conditions for fiscal support are amplified by a recession (a negative output gap) with an accommodative monetary policy stance, a low government debt burden, foreign capital inflows, and positive domestic financial accelerator effects owing to a stable financial system. Over recent years, however, van Rensburg et al. (2021) show that spending multipliers have declined to zero as a consequence of higher debt and risk premia.

The inclusion of H2M households in the model can produce sizeable positive fiscal multipliers in structural models. Because H2M consumers have a higher marginal propensity to consume than wealthier households, consumption multipliers increase with an increasing share of H2M households. The marginal propensity to consume (MPC) measures the amount of consumption in rand terms for each additional rand of income. Hand-to-mouth households, by construction, have an MPC close to 1. For example, Figures 24 and 25 show that a BIG at the FPL baseline raise both transfers and H2M consumption approximately 5 percentage points of GDP after 5 years. Table A.4, reproduced from Kemp and Hollander (2020), shows present-value output and consumption multipliers for increasing shares of H2M households following a positive government consumption spending shock. The paper finds that multipliers indeed increase with the share of H2M households, but the output multipliers remain well below one and consumption multipliers remain negative. These values imply that every one-rand spent by government for consumption purposes leads to a less than one-rand increase in GDP and crowding-out of private sector consumption, even if H2M households comprise 90% of the consumption share of aggregate private consumption. Since the share of H2M households is estimated to be well-below 0.25 in this updated estimation of the NT-DSGE model, this paper similarly does not find positive aggregate consumption multipliers. Kemp and Hollander (2020) further point out that this finding is consistent with evidence for open economies, and that the introduction of labour and consumption taxes which respond to both output *and* debt further dampen the effect of government spending increases.

Given the dramatic contractionary effects associated with a BIG, whether universal or targeted, unprecedented increases in effective tax rates and reductions in government non-transfer expenditure would be required (Figures 20 and 21). Historically, the adjustment burden of higher fiscally expenditure in South Africa fell on personal income taxes and government investment expenditure.[31] Thus, implementing a BIG without a sustainable fund-

[31] The results in Section 4.2 confirm that the effective corporate income tax rate is a less reliable instrument

ing source would exacerbate an unsustainable fiscal path (i.e., a substantial worsening of government investment and over-burdening of the individual tax base).[32] Extending the grant at the food poverty line produces less dramatic tax effects and would require a less aggressive fiscal consolidation to prevent a debt spiral. That said, our analysis does not consider tax base effects (i.e., the possibility that South Africa goes beyond the peak of the 'Laffer curve'), which would imply that tax revenues might rise by less than expected from the tax increases required to fund further social grant expansion (for a detailed analysis and discussion on tax elasticities in South Africa, see Kemp 2019, 2020b).

The key transmission mechanisms driving the contractionary effect of a BIG operate through (1) higher debt, which leads to relatively higher borrowing costs and lower long-term economic growth, (2) direct crowding-out of government expenditure in an attempt to maintain fiscal sustainability, and (3) crowding-out of private sector expenditure through higher taxes. These effects dominate any expansionary effects from higher transfers. Simply put, a large fiscal transfer that has limited direct impact on aggregate demand will result in a large contraction akin to a negative demand shock. As a result, monetary policy is required to ease short-term interest rates in response to disinflationary pressures (Figure 22). The fact that the zero lower bound on nominal interest rates is breached and rates effectively become negative, suggests that monetary policy would not be able to offset the contractionary effects, further worsening the outcomes discussed above. The results for the FPL baseline provide a more realistic scenario, but still requires monetary accommodation to counteract disinflation and a fall in output.[33]

It is important to note that the baseline projections presented here are conditional on one shock hitting the economy: a transfer shock. It is extremely difficult to model the potential non-linear reactions of economic variables to unprecedented economic shocks. Such shocks would also likely lead to unstable economic equilibria (such as a currency crisis or

for automatic stabilisation.

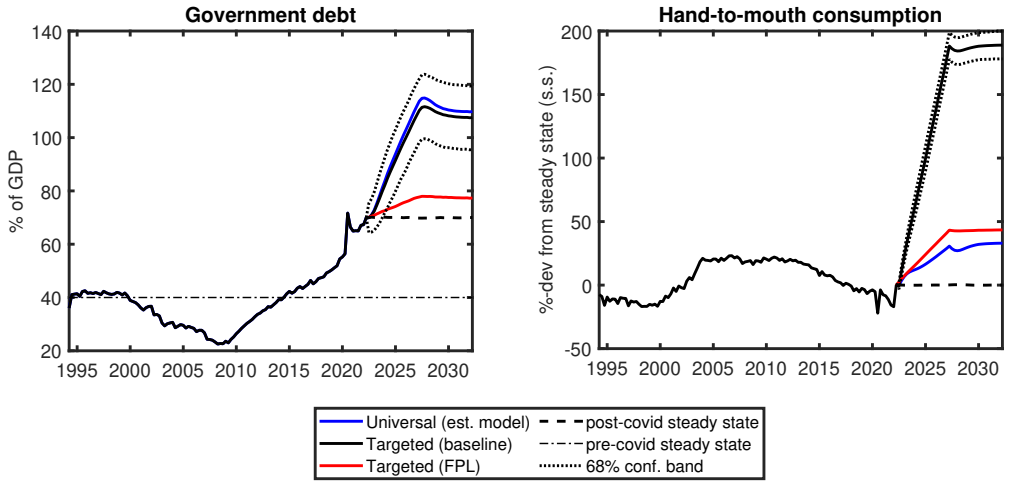
[32] For an analysis of South Africa's unsustainable fiscal path over the long term, outside the context of a BIG, see Havemann and Hollander (2022).

[33] An alternative interpretation is that unprecedented unconventional monetary policy measures (such as quantitative easing) would be needed to prevent macroeconomic destabilisation from an unsustainable fiscal path. As such, the negative short term rate would be a so-called 'shadow rate' – a proxy for unconventional monetary policies (see, e.g., Wu and Xia, 2016). Figures 28 to 32 in the Appendix demonstrate the impact of instead assuming that the zero lower bound (ZLB) for interest rates bind under a universal BIG scenario. If monetary policy could not react sufficiently to stabilise the deflationary impact from the economic decline brought about by aggressive fiscal consolidation and higher taxes, debt and interest rates would rise to unprecedented and unsustainable levels, precipitating a catastrophic decline in output. This would very quickly outweigh any consumption benefits to grant recipients as the economy sheds jobs and shrinks dramatically. Note that these scenarios are illustrative of the unsustainable nature of such scenarios but are likely to be inaccurate projections for the reasons discussed in the main text. That said, the model does not describe several channels through which downside risks to these scenarios might affect the economy - such as the risk of a currency crisis.

an explosive debt position). For example, without the expected domestic macroeconomic, monetary, and fiscal adjustments modelled, the fiscal arithmetic around a BIG policy in South Africa would be worse still. A dramatically higher likelihood of a sovereign crisis would lead to a currency crisis (a shock from large scale foreign capital outflows), which would likely be associated with much higher inflation (to the extent that the sovereign crisis leads to anticipated money-financed fiscal deficits – a realised monetary shock), and therefore much higher interest rates than presented in these scenarios. Indeed, the approach applied in this paper (or any quantitative analysis) cannot capture all of the impacts of unprecedented economic shocks that would likely affect economic relationships and shift underlying trends in the economy. Nonetheless, the model suggests that the policy proposals advanced in the public discussion around a universal BIG in South Africa are so expensive that they would most likely threaten fiscal sustainability and destabilise the macroeconomy.[34]

The section that follows provides an analysis based on optimised tax-funding options. As a result, the analysis can eliminate ineffective tax-financing combinations and focus on 'best-case' tax-financing scenarios.

Figure 18: Government debt and redistribution



[34] An important potential covariate shock to consider in future extensions would be the non-linear relationship between risk premia and debt, which would likely worsen exchange rate and inflation outcomes should fiscal policy not consolidate sufficiently to ensure fiscal sustainability.

Figure 19: Growth and Fiscal sustainability

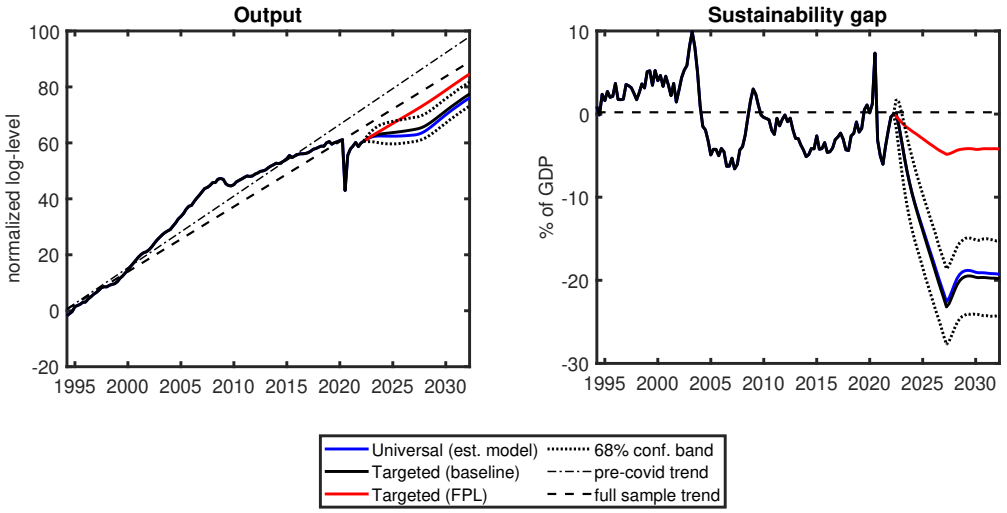


Figure 20: Government revenue

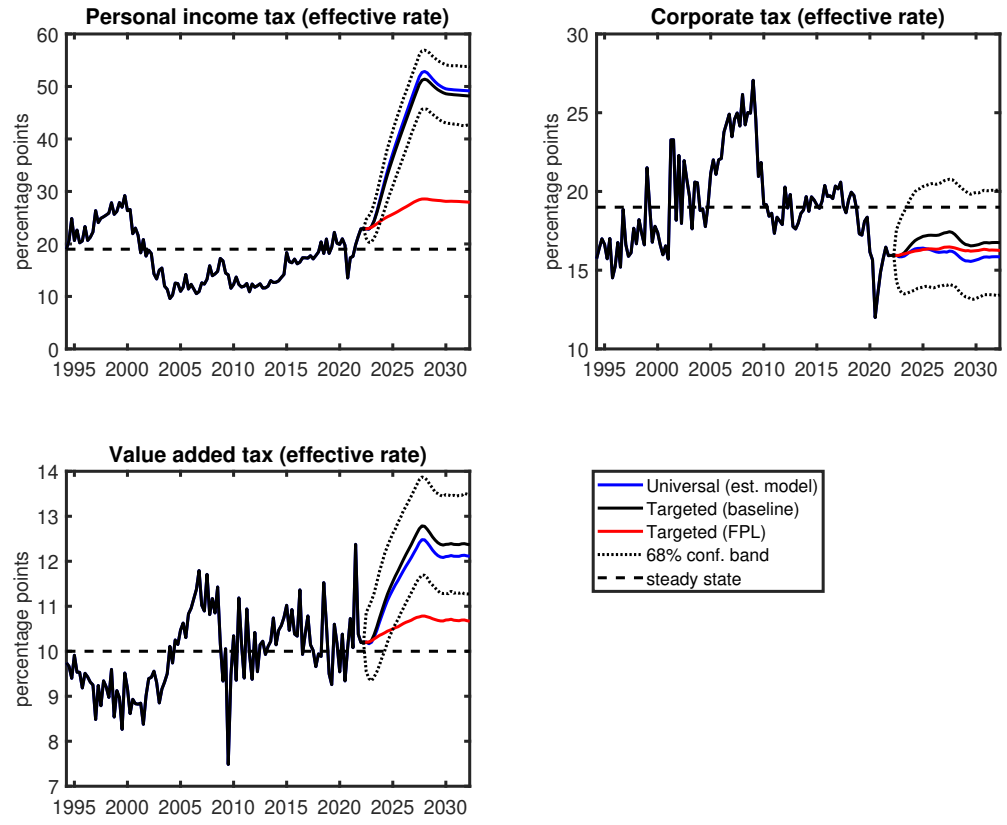


Figure 21: Government expenditure

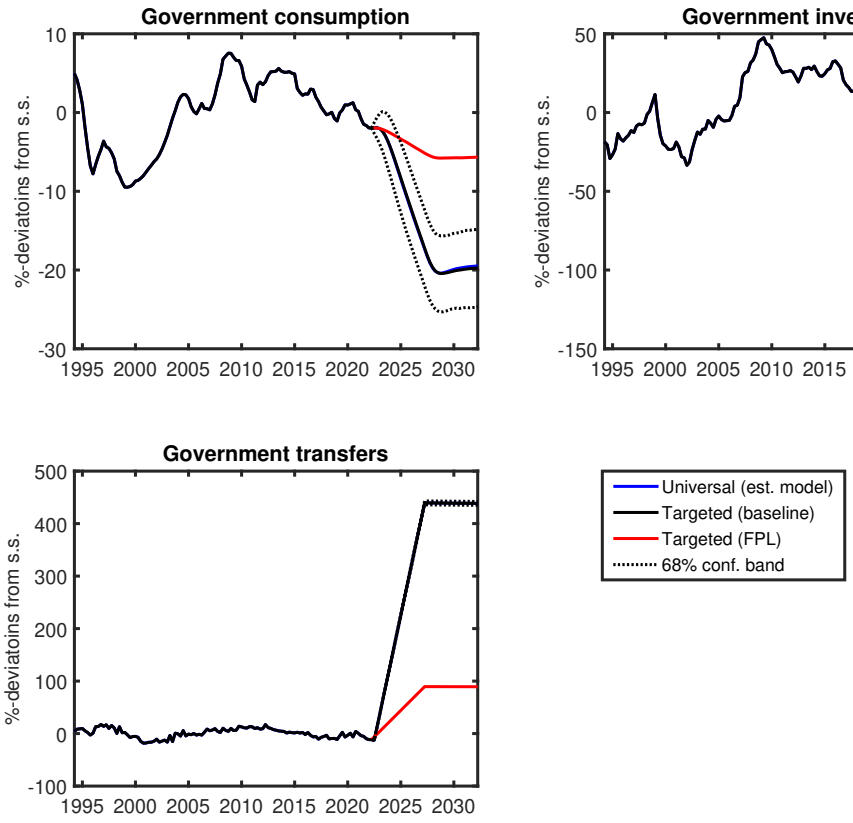
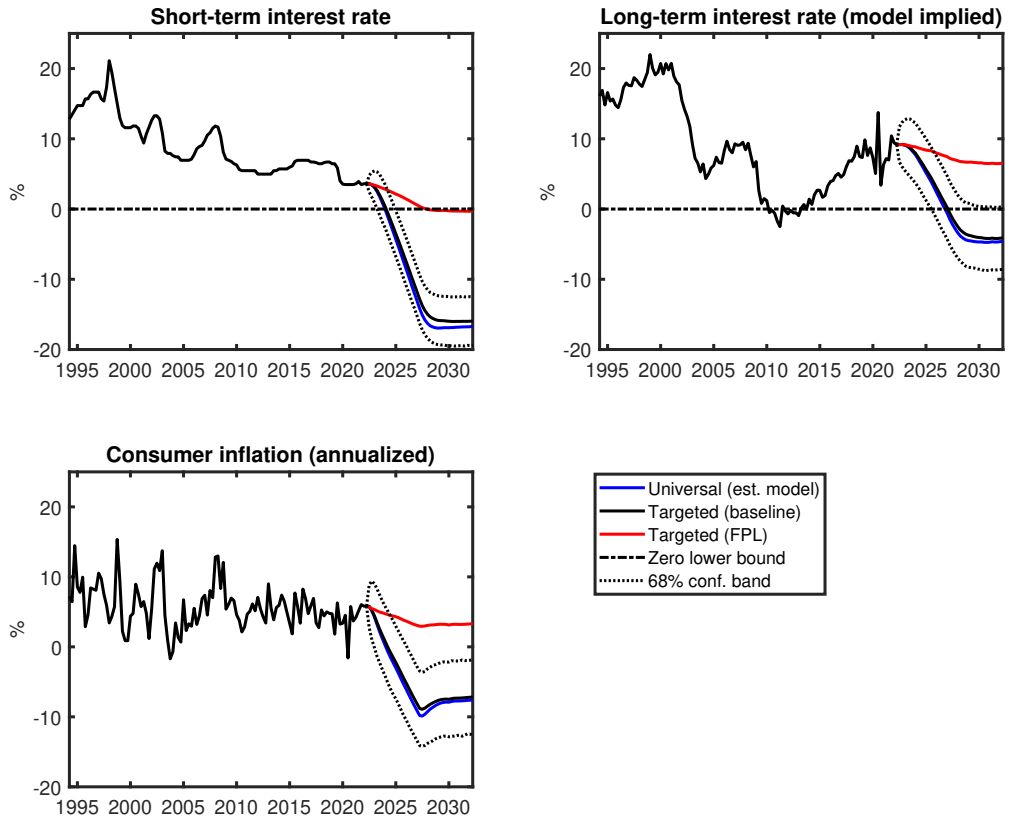


Figure 22: Inflation, monetary policy, and long term interest rates



4.2 Tax funding options for social transfers

This section follows the analysis in Havemann and Hollander (2022) for obtaining 'optimal simple rules' for fiscal policy. Here, the estimated model is used for simulations of alternative funding options for social transfers. To make the analysis concise, it is first established which tax instruments provide the best debt-output trade-off against macroeconomic shocks. That is, the success of policy is assessed by its ability to minimise instability in the target variables, debt and output. Minimising these 'welfare losses' (in real terms) is achieved by adjusting fiscal reaction functions (see Appendix A.3 for more details). Table 7 presents the results for a set of optimised tax-funding parameters, given different weights on debt and output implications of different policy response combinations. The optimised tax instrument parameters for both a 'transfer shock only' scenario and a scenario combining the set of all estimated shocks in the model are compared.

The parameters under the fiscal authority's 'control' are the responses of fiscal instruments to debt: $\theta_{*,b}$, where $* = \{c, w, k\}$ indexes the responses of VAT, PIT, and CIT to debt (b). Allowing feedback effects through output deviations maintains tax buoyancy effects, which enables the fiscal authority in the model to control for expected economic conditions. This approach is also important so that the fiscal policy response is known and anticipated by the agents in the model (i.e., that policy is 'endogenous').[35]

The paper focuses on the set of results that apply to 'all estimated shocks' (top panel in Table 7) and equal weights on debt and output (second column under *optimised values to minimise losses*), which used as the 'optimised' values in the counterfactual scenarios in Section 4.3.

The '***Relative Loss***' statistic in Table 7 determines which individual or combination of the tax funding instruments best stabilise macroeconomic fluctuations. A value less than one implies that instability in the target variables are lower than the benchmark of allowing all instruments potential to the fiscal authority to adjust ($\theta_{*,c}$, $\theta_{w,b}$, and $\theta_{k,b}$ in the top row). Firstly, we note that allowing all instruments to be at the disposal of the fiscal authority provides substantial gains to output and debt stability (compared to if parameters are at their estimated 'actual' values). The optimised parameter values are also fairly robust to alternative weights on the target variables. That said, it is interesting to note that the greater the

[35] If the tax funding instruments are modelled as 'exogenous' (i.e., unexpected) increases in effective tax rates, the agents in the model would interpret their fluctuations as positive tax revenue windfalls, which would be highly unrealistic. In other words, fiscal instrument shocks will be, by definition, unanticipated in a period-by-period sense and agents are assumed to never 'learn' about the fiscal policy trajectory. Accounting for time-consistent policy is a major advantage of using the NT-DSGE model in this context.

weight on output stabilisation, the more effective VAT becomes as a automatic stabiliser.[36] Furthermore, CIT is not estimated to provide a very useful instrument to stabilise debt and output fluctuations. For the individual tax funding options considered, the model suggests that only VAT performs better than an optimal combination of policy instrument adjustments.

The value of the parameters also give an indication of the relative size of the required response of the effective tax rate to ensure fiscal sustainability if the level of debt relative to GDP rises persistently. While VAT may provide the 'best' tax funding instrument in the model, it still requires very large effective tax rate responses to higher debt if there are no macroeconomic adjustments to higher debt levels. As the section that follows shows, the estimated tax response required to changes in debt is much lower in our scenarios because of the endogenous response of macroeconomic variables. But higher debt-to-GDP levels still need to be matched by higher levels of tax-to-GDP to prevent an unsustainable fiscal stance. Based on these estimates, the next section compares VAT-financed outcomes to those of an optimised combination of VAT and PIT.

4.3 Fiscal and economic implications of expansion of social transfers

This section summarises the estimated implications of the three scenarios considered in Table 6. The paper focuses on the subset of 'best' policy options: (1) optimised VAT financing, (2) optimised tax combination (VAT and PIT) financing, (3) optimised VAT financing including government investment stimulus (with and without total investment efficiency gains). Figures 23, 24, and 25 compare the projections of the alternative fiscal scenarios for debt, private expenditures, and public revenues and expenditures, respectively, with the baseline projection based on expanding the income support program at the FPL (shown in Section 4.1). Tables 8 and 9 provide, for each alternative fiscal scenario, point estimates of the impacts of income support on key fiscal and macroeconomic variables after 5 years.

Overall, the results suggest that, given South Africa's small tax base, extensive unemployment, and constrained fiscal position, the fiscal space to expand social transfers is very limited. Paying for expanded transfers through increased borrowing would raise borrowing costs, reducing economic growth. These negative effects would only be marginally counterbalanced by higher H2M consumption spending owing to direct transfers. As a result, the policy strategy that best balances social relief and fiscal sustainability is one that focuses on employment creation and infrastructure development through the private sector.

[36] Such a result highlights the potential role for automatic stabilisers in macroeconomics stabilisation as in McKay and Reis (2016) and McKay and Reis (2021).

Table 7: Robustness and efficacy of alternative tax financing

All estimated shocks

	Weights on policy targets: debt (b) , output (y)			
	$b=0, y=1$	$b=1, y=1^{\dagger}$	$b=1, y=0$	$b=1, y=0$
Policy parameter(s)	*optimised values to minimise losses*			*Actual**
VAT response to debt $\theta_{c,b}$	5.27	3.70	3.67	0.10
PIT response to debt $\theta_{w,b}$	2.22	3.10	3.09	0.65
CIT response to debt $\theta_{k,b}$	0.70	0.85	0.85	0.18
Relative Loss	***1.00***	***1.00***	***1.00***	***51.50***
VAT response to debt $\theta_{c,b}$	5.95	7.07	7.07	-
Relative Loss	***0.86***	***0.77***	***0.87***	**-**
PIT response to debt $\theta_{w,b}$	7.36	6.94	6.87	-
Relative Loss	***3.3***	***2.00***	***1.20***	**-**
CIT response to debt $\theta_{k,b}$	29.91	27.08	26.78	-
Relative Loss	***2.73***	***1.70***	***1.07***	**-**

Transfer shock only

	Weights on policy targets: debt (b) , output (y)			
	$b=0, y=1$	$b=1, y=1^{\dagger}$	$b=1, y=0$	$b=1, y=0$
Policy parameter(s)	*optimised values to minimise losses*			*Actual**
VAT response to debt $\theta_{c,b}$	4.51	4.08	4.05	0.10
PIT response to debt $\theta_{w,b}$	3.05	3.38	3.41	0.65
CIT response to debt $\theta_{k,b}$	0.86	0.93	0.94	0.18
Relative Loss	***1.00***	***1.00***	***1.00***	***77.70***
VAT response to debt $\theta_{c,b}$	3.38	7.86	7.86	-
Relative Loss	***0.00***	***0.60***	***0.83***	**-**
PIT response to debt $\theta_{w,b}$	7.57	7.52	7.52	-
Relative Loss	***10.75***	***3.30***	***1.23***	**-**
CIT response to debt $\theta_{k,b}$	30.04	29.66	29.61	-
Relative Loss	***8.96***	***2.77***	***1.08***	**-**

Notes: † the results for the equal weights on debt and output define the 'optimised' values used in the counterfactual scenarios. $*$ represents the actual values for the fiscal reaction functions estimated for the sample period. The ***Relative Loss*** measure is compared to the scenario in which all tax instruments are optimised. A ***Relative Loss*** > 1 (< 1) means that losses are greater (less) than the benchmark. For all scenarios, VAT dominates.

Source: authors' calculations.

Table 8 outlines the fiscal impacts of each scenario and Table 9 summarises the associated macroeconomic outcomes. As noted in the discussion on the model dynamics, if transfers are not funded through higher tax receipts, higher levels of debt, all else equal, would lead to higher interest rates. If funded through taxation, increased taxes would reduce consumption. The model has dynamic feedback effects, which means that ongoing reductions in consumption (for example) would constrain growth, which in turn would reduce employment, reducing employment-based tax receipts, reducing revenue and consequently increasing debt levels, which in turn would put upward pressure on interest rates. This complex interplay of dynamic effects highlights the usefulness of a large-scale macroeconomic model rather than a static model as has been used in other studies.

Recall that Scenario 1 works on the assumption that National Treasury adopts a similar funding strategy as it has in the past. Thus, any expansion of spending would be partly funded through a combination of an increase in debt, the effective rate of indirect taxes (mainly VAT), and the effective rate of PIT and CIT. Under **Scenario 1**, the model estimates that the extension of the SRD grant would lead to an increase in debt of approximately 2.4 percentage points, or 2.9% of GDP, an increase in the average indirect tax rate of 0.2 percentage points, an increase in the personal income tax rate of approximately 2 percentage points and a marginal increase in the CIT.

Larger fiscal effects would be observed for different transfer expansion programmes, including extensions to the food poverty line (FPL), upper-bound poverty line and a near universal grant, targeted at the poor. The FPL impact is estimated to be an increase debt by 6.4%, VAT/indirect taxes by 0.6 percentage points, PIT by 5.3 percentage points, and CIT by approximately 0.5 percentage points.

A targeted expansion of social transfers to include the poor (that is a grant of R840 for 33 million people at a cost of R333 billion) would have significant impacts on the fiscal position. The model estimates that this would lead to an increase in debt of approximately 42 percentage points of GDP, an increase in the effective VAT rate of approximately 2.6 percentage points, an increase in PIT of approximately 28.5 percentage points and an increase in the corporate income tax rate of approximately 1.5 percentage points.

Under Scenario 1, the extension of the SRD would lead to relatively mild (although still notable) employment losses of approximately 69,000 jobs which arise from the negative economic growth impacts shown in Figure 25. Similarly, private consumption would contract by 0.6% and private investment by 1.9%. Notably, the consumption of H2M households would rise by 16.4% — these are the non-Ricardian households who the model assumes cannot smooth consumption through other means.

Similarly negative macroeconomic results are estimated across different approaches to the financing of social transfers. A grant introduced at the FPL would be associated with job losses of 198,000, a contraction of private consumption of around 1.5%, and of private investment of 4.9%. The impact on poor household consumption would be expected to be significantly positive, with household income increasing by 43%. A grant at the upper-bound poverty line would have even larger negative effects on the economy, which arise from a larger impact on debt, interest rates and personal income taxes.

Given the significant impact on the fiscal position and the consequent contraction in the economy, it is estimated that a near-universal BIG would lead to job losses of approximately 914,000. Private consumption would contract by 5.7% and private investment by 24%. At the same time, the impact on consumption of the targeted households would be very significant — estimated to see H2M households consumption increase by almost 200%.

Scenario 2 assumes that a BIG is set at the food poverty line but financed through tax increases only. As highlighted in the scenarios section, two separate options are considered. In the one, VAT is increased and in the second, both VAT and PIT levels are raised. The model projections show that the VAT revenue collection required to stabilise debt comes to 4.6% of GDP after fives years – equivalent to a 7.2 percentage point increase in the effective rate (Table 8, scenario 2, row 1). Although this VAT funding approach produces the 'best' macro-fiscal outcomes from the set of funding approaches considered, the required increase in the VAT rate would be substantial (Figure 25). Therefore, the VAT-financed outcome is compared to an optimised combination of VAT and PIT (scenario 2, row 2). Under such a funding approach, VAT revenue as a share of GDP would need to rise by 2.6% (equivalent to a 4.1 percentage point increase) with a rise in PIT of 2.3% (equivalent to a 3.4 percentage point increase) after five years of implementing the income support programme.

Under Scenario 2, the employment impacts would be substantially dampened. This highlights that VAT and indirect taxes are less distortionary to economic activity. It should be noted that the model suggest a very substantial rise in VAT would be required under this scenario. To achieve the required effective rate rise of 7 percentage points, the statutory VAT rate would have to rise from 15% to 22%. This increase would negatively impact wealthier VAT-paying household consumption so markedly that overall consumption would decline. Private sector consumption would be estimated to contract by 1.5%, while private sector investment would fall by 1.8%.

Similar results arise if the tax financing takes place across not only VAT, but also PIT and CIT. In this case, employment losses would be small (9,000 jobs lost), but again private consumption and private investment would contract, while consumption of H2M households would

expand significantly.

Under **Scenario 3**, a grant at the food poverty line is introduced and financed by an increase in VAT. The scenario simulates that the impact on the economy is counteracted by an expansion in investment and successful policy reform programme that permanently enhances the economy's output potential and efficiency (such as sustainably expanding electricity capacity) – which necessitates a doubling of private sector investment (See final two columns in Table 9). In other words, the model shows that public investment, on its own, cannot create the necessary growth to bring about sustainable macro-fiscal outcomes (see Figures 23 – 25).

The impact on the economy of a successful structural reform programme (requiring public investment, for example), along with efficiency gains for private sector (i.e., conditions conducive to crowd-in private investment) and financing through a broad-based tax (VAT) would have the most favourable macroeconomic outcomes of the scenarios considered. The model suggests that up to 1 million additional jobs would be added to the economy after 5 years, a 6 pp reduction in government debt-to-GDP, and even an improvement in H2M consumption – although this outcome hinges entirely on the assumption that such reforms permanently improve the economy's productive capacity. Of course, with such a significant improvement in total employment, an expanded grant system would be less of a pressing policy need as is the case currently given South Africa's unemployment rate at historical highs. Given South Africa's lack of fiscal space and low growth trajectory, the model suggests that a BIG is only feasible if economic growth rises sustainably. Scenario 3 simulates that this could be achieved through increased government infrastructure investment or growth-enhancing economic reforms.[37] It is important to note that this scenario assumes optimistic growth-enhancing effects of government investment. It is likely that the returns to public investment in South Africa have fallen dramatically over recent years and this would need to be reversed for Scenario 3 to play out as modelled.

[37] We assume that the government investment responds endogenously to the transfer shock (specifically $\theta_{iG,y}$ rises in response to debt accumulation), and that investment efficiency gains ($\epsilon_t^{i,\text{gains}}$) follow from the investment efficiency process estimated in the model with historical data: $i^{\text{gains}} = 0.6943\hat{i}_{G,t}$.

Figure 23: Government debt-to-GDP

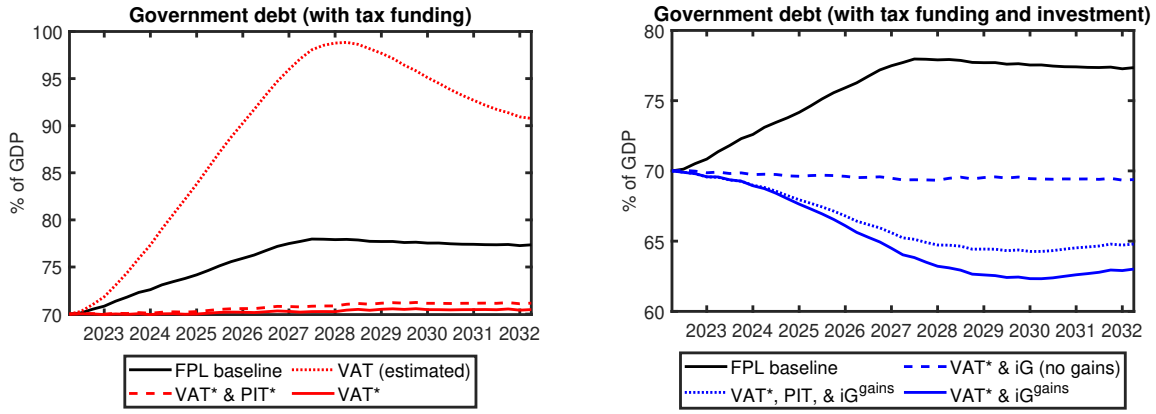


Figure 24: Output and private expenditures

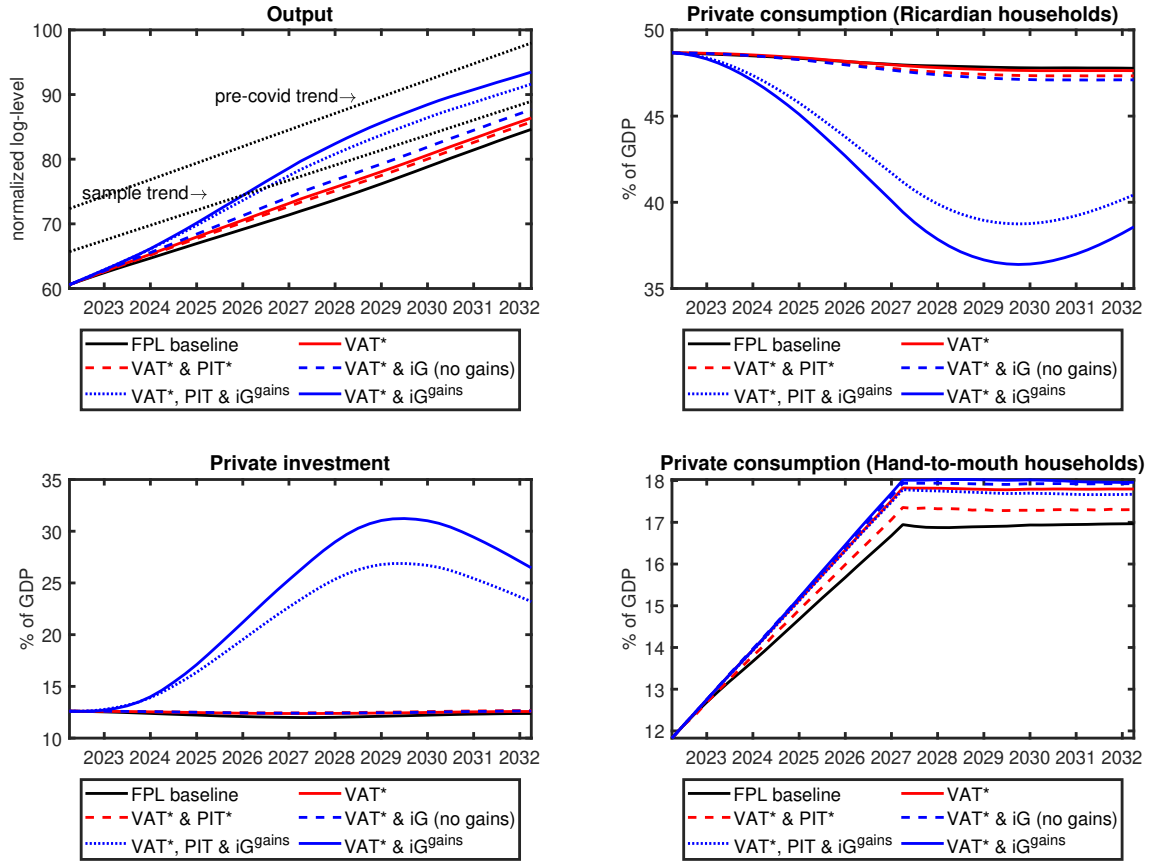


Figure 25: Government revenue and expenditure

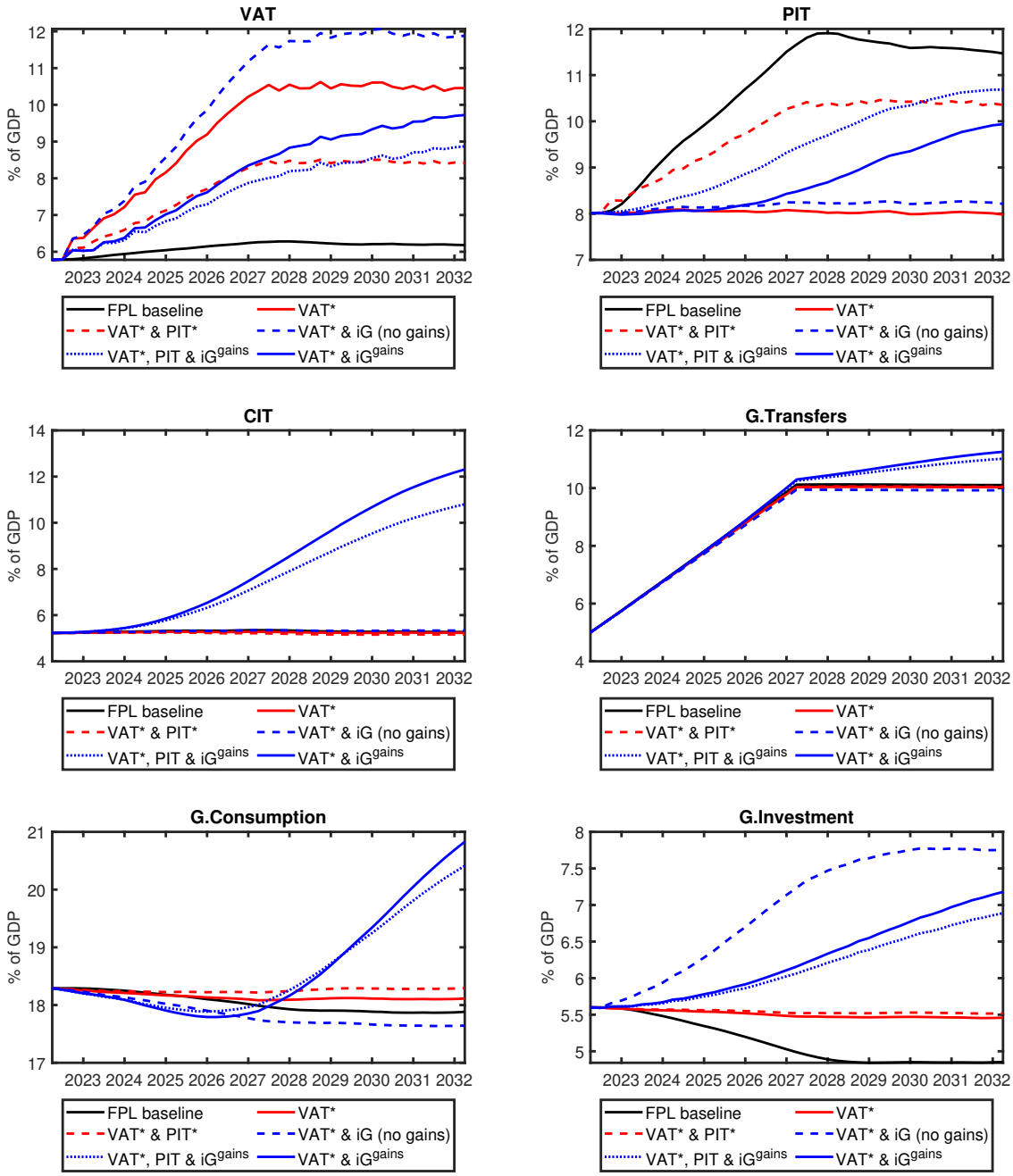


Table 8: Impact of income support after 5 years for alternative scenarios: fiscal variable

	Debt change		**VAT change**		**PIT change**		**CIT change**	
	%	% of GDP	pp*	% GDP	pp*	% of GDP	pp*	% GDP
Scenario 1:								
Expand social transfers with mix of financing (benchmark)								
SRD extended	2.44	2.87	0.23	0.19	2.07	1.42	0.25	0.05
FPL	6.35	7.72	0.56	0.48	5.33	3.65	0.53	0.12
UBPL	14.17	17.37	1.21	1.05	11.84	8.12	1.09	0.25
Targeted at poor	32.50	41.60	2.59	2.20	28.51	17.67	1.50	0.51
Scenario 2:								
FPL with optimised tax financing								
VAT	0.72	0.21	7.17	4.60	0.09	0.06	0.38	0.05
VAT & PIT	0.77	0.76	4.05	2.60	3.40	2.32	-0.04	-0.02
Scenario 3:								
FPL with optimised tax financing and investment stimulus								
VAT & iG	0.88	-0.64	9.01	5.63	0.39	0.23	1.25	0.12
VAT, iG, & gains	*0.36*	*-5.97*	*5.17*	*2.68*	*-0.05*	*0.47*	*5.32*	*2.51*

Notes: Scenario 1 (baseline) = estimated model based on historical sample where all fiscal instruments adjust to their 'actual' values, at different levels of income support (see table A.1). FPL = food poverty line. UBPL = upper-bound poverty line. VAT/PIT financed = tax instrument optimised to stabilise the trade-off between debt and output. iG = Public Investment stimulus. iG & gains = Public Investment stimulus with efficiency gains for private investment. pp* = effective rates.

Source: authors' calculations

Table 9: Impact of income support after 5 years for alternative scenarios: macro variables

	Employment*		**Pvt. cons.†**		**H2M cons.**		**Pvt. invest.**	
	%	'000s	%	% GDP	%	% of GDP	%	% GDP
Scenario 1:								
Expand social transfers with mix of financing (baseline)								
SRD extended	-0.46	-69	-0.56	-0.27	16.43	1.94	-1.91	-0.24
FPL	-1.32	-198	-1.45	-0.71	43.26	5.12	-4.85	-0.61
UBPL	-3.03	-455	-3.23	-1.57	96.92	11.46	-10.75	-1.35
Targeted at poor	-6.09	-914	-5.70	-2.77	188.18	22.28	-23.95	-3.02
Scenario 2:								
FPL with optimised tax financing								
VAT	0.56	84	-1.53	-0.74	50.70	6.00	-1.77	-0.22
VAT & PIT	-0.06	-9	-1.98	-0.97	46.74	5.53	-1.30	-0.16
Scenario 3								
FPL with optimised tax financing and investment stimulus								
VAT & iG	1.21	182	-2.22	-1.08	51.64	6.11	-1.51	-0.19
VAT, iG, & gains	*6.73*	*1010*	*-18.98*	*-9.24*	*52.28*	*6.18*	*108.34*	*13.65*

Notes: Scenario 1 (baseline) = estimated model based on historical sample where all fiscal instruments adjust to their 'actual' values, at different levels of income support. FPL = food poverty line. UBPL = upper-bound poverty line. VAT/PIT financed = tax instrument optimised to stabilise the trade-off between debt and output. iG = Public Investment stimulus. iG & gains = Public Investment stimulus with efficiency gains for private investment. ∗Employment based on current total employment of approximately 15 million people. †Private consumption excludes poor (labelled 'hand to mouth', H2M) households in this table.

Source: authors' calculations

5 Conclusion

Poverty, inequality, and unemployment are three interdependent socio-economic challenges policymakers seek to address. Addressing this 'triple challenge' in South Africa is important, but the approach adopted could lead to even worse economic outcomes – the medicine should not be worse than the disease. To date, there has been relatively little rigorous macroeconomic work done on alternative social relief options. This paper addresses this gap in the literature by identifying the various macroeconomic trade-offs that arise from a substantial options and thus provide useful input into an ongoing policy debate. Specifically, an assessment is provided of whether a BIG can be financed sustainably and what the macroeconomic implications of financing it in different ways would be.

To formally assess the macroeconomic implications of expanded social transfers, a model is presented that allows the trade-offs between social relief, economic growth, and fiscal sustainability to be quantified. The model incorporates channels for fiscal policy to influence aggregate demand and economic growth through its impact on interest rates and incentives for firms and individuals to consume, invest, and supply labour. There are several important distinguishing features of the analysis in the context of assessment of the impacts of a BIG. These include that firm and household behaviour is governed by forward-looking expectations; that the expected reactions of fiscal and monetary policy to the scenarios considered are explicitly modelled; and that the model includes channels through which the domestic economy is affected by global trade and capital markets.

The paper considers three scenarios benchmarked to current public proposals, along with different funding options (i.e. tax financing, debt financing and expenditure reduction). The modelling results show that extending the social relief of distress grant to a level means tested at the food poverty line could be fiscally feasible provided taxes rise to fund such a programme. This would have a contractionary impact on the economy. However, a BIG at the level of the food poverty line could threaten fiscal sustainability as it would require much large tax increases that would crowd-out consumption and investment.

The model shows that South Africa's debt position plays has a crucial role in this assessment: without fiscal space for expansionary policies and with a small tax base, any stimulus is impotent. If the BIG is predominantly debt-financed, the deteriorating fiscal position causes the risk premium on sovereign debt to rise and weigh on investment and growth. If the BIG is predominantly tax financed, significant crowding-out of private expenditure occurs. If the BIG is predominantly financed through government expenditure re-prioritisation, the provision of other important public services will be meaningfully hampered.

It is important to note that the framework applied assumes that monetary policy and fiscal policy respond contemporaneously to prevent a macroeconomic destabilisation associated with an unsustainable fiscal position under the BIG scenarios considered. In response to such a large fiscal expansion, the only way to prevent the economy from becoming destabilised in the model is for the Treasury to raise taxes so dramatically that the size of the economy shrinks. Given the negative implications for economic growth and a constrained fiscal position, the model suggests that a BIG is only feasible if economic growth rises sustainably — this necessitates, for example, increased government infrastructure investment, expansion of employment programmes and, critically, growth-enhancing economic reforms that leverage the private sector.

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A Appendix

A.1 Alternative combinations of income support measures

Table A.1: Modelled income support measures per annum

Base = 2019Q4	**Population** millions	**Total transfers** R bn	% of GDP	**Additional cost** R bn	% GDP	**Increase** % pa
SRD	10.5	360	6.3	44	0.8	14
FPL	8.3	374	6.5	58	1.0	18
FPL*	10.5	390	6.8	74	1.3	**23**
LBPL	13.2	449	7.9	133	2.3	42
UBPL*	10.5	476	8.3	160	2.8	**51**
UBPL	18.3	594	10.4	278	4.9	88
Universal	60.1	648	11.3	332	5.8	**105**
Targeted	10.5 - 33	631	11.0	315	5.5	**100**

Note: See also Table A.2 and Table A.3 for results using base=2021Q4 and an expanded range of income support measures. SRD = social relief of distress. FPL = food poverty line. LBPL = lower bound poverty line. UBPL = upper bound poverty line. Asterisked values (∗) in the table represent the baseline cases: for targeted transfers, the outcomes are benchmarked against an eligible population of 10.5 million. Alternative measures for given total costs therefore fall between a universal grant (R 332 billion per annum) and a targeted SRD grant (R 44 billion per annum).

Source: SARB statistics, Intellidex (2022), authors' calculations

Table A.2: Modelled income support measures per annum (base = 2021Q4)

Base = 2021Q4	**Population** millions	**Total transfers** R bn	% of GDP	**Additional cost** R bn	% GDP	**Increase** % pa
SRD	10.5	384	6.0	44	0.7	13
FPL	8.3	398	6.3	58	0.9	17
FPL*	10.5	413	6.5	74	1.2	**22**
LBPL	13.2	473	7.4	133	2.1	39
UBPL*	10.5	499	7.9	160	2.5	**47**
UBPL	18.3	618	9.7	278	4.4	82
Universal	60.1	672	10.6	332	5.2	**98**
Targeted	10.5 - 33	655	10.3	315	5.0	**93**

Note: The transfer increase per annum is derived by dividing the additional cost of the income support by the pre-support total (i.e., total transfers less additional cost from columns 3 and 5, respectively.)
$*$ is set the baseline population size to 10.5 million for the extension of income support at the food poverty line (R585 per person per month) and the upper bound poverty line (R1268 per person). It is important to note, however, that the modeling approach is top-down in that the total costs are estimated and modeled. While it is not possible to distinguish between a universal and a targeted grant, intensive margin adjustments for a given total cost and targeted population (such as the eligible poor and the cost per person) can only be inferred ex post. See the full table of alternative combinations in Table A.3.

Source: SARB statistics, Intellidex (2022), authors' calculations

Table A.3: Alternative combinations of income support measures (bn per annum)

	Eligible		***SRD***	***Uni.***	***FPL***	***LBPL***	***UBPL***		***Targ.***	
Universal	***60.1****	188	252	***332****	422	606	914	1 428	1 803	2 524
Universal (adults only)	38.4	120	161	212	270	387	584	912	1 152	1 613
Adults under upper-bound povery line	18.3	57	77	101	128	184	278	435	549	769
All adults between 19 and 59	33	103	139	182	232	333	502	784	990	1 386
Adults without employment	22.3	70	94	123	157	225	339	530	669	937
Adults under lower-bound poverty line	13.2	41	55	73	93	133	201	314	396	554
Adults without any employment	17.3	54	73	95	121	174	263	411	519	727
Adults under food poverty line	8.3	26	35	46	58	84	126	197	249	349
CSG beneficiaries	13.8	43	58	76	97	139	210	328	414	580
Caregivers	7.2	22	30	40	51	73	110	171	216	302
SRD recipients (Intellidex)	6.5	20	27	36	46	66	99	154	195	273
SRD recipients (actual)	***10.5****	33	***44****	58	***74****	106	***160****	249	**315***	441
Additional cost above SRD	10.5	(11)	-	14	30	62	116	205	271	397
Cost (rands pppm)		260	350	460	585	840	1268	1980	2500	3500

Notes: pppm = per person per month. SRD = social relief of distress. FPL = food poverty line. LBPL = lower bound poverty line. UBPL = upper bound poverty line. Uni.= Universal. Targ.=Targeted. Asterisked values (∗) in the table represent the baseline cases: for targeted transfers with outcomes benchmarked against an eligible population of 10.5 million. Alternative measures for given total costs therefore fall between a universal grant (R332 billion per annum) and a targeted SRD grant (R44 billion per annum).

A.2 Additional charts

Figure 26: Debt projections over time

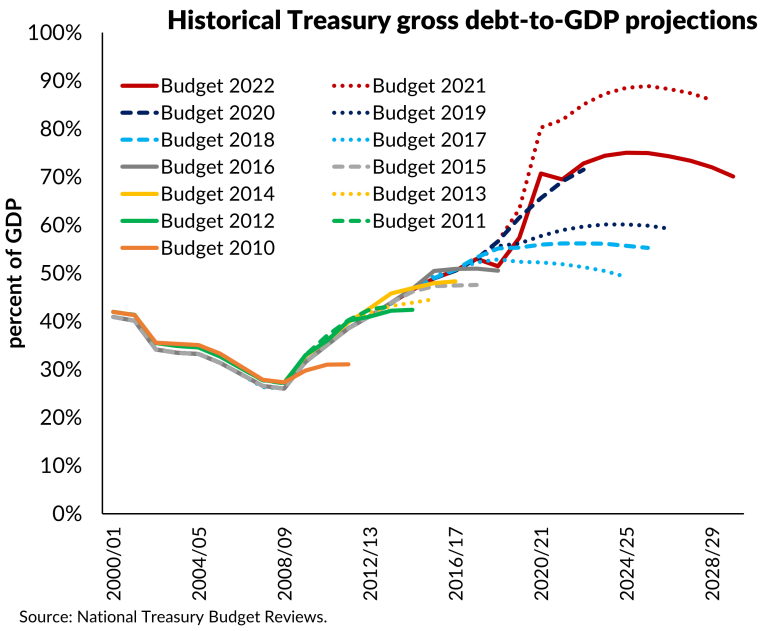


Figure 27: Sovereign risk measures for South Africa

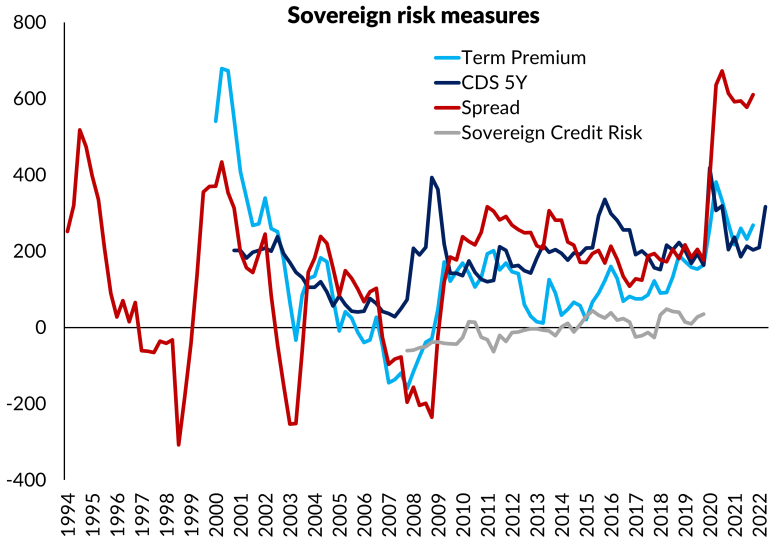


Figure 28: Government debt under a binding zero lower bound scenario

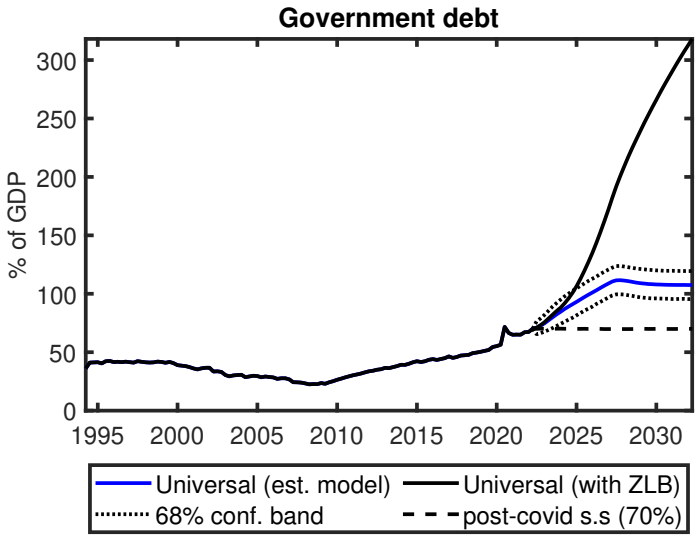


Figure 29: GDP trajectory under a binding zero lower bound scenario

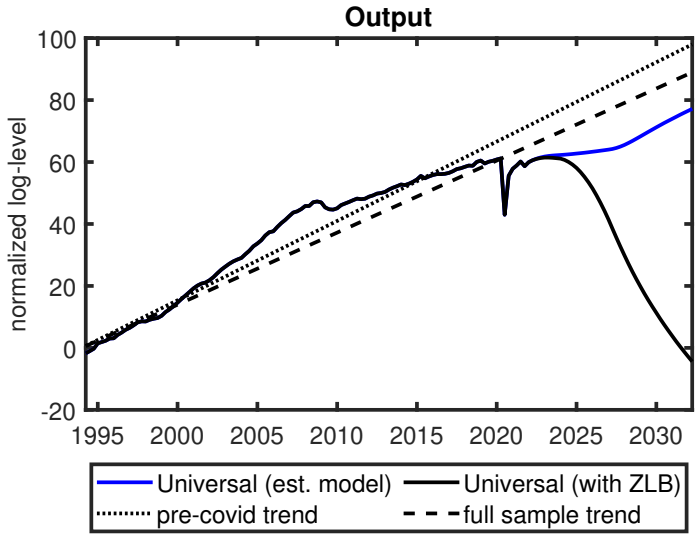


Figure 30: Short term interest rates under a binding zero lower bound scenario

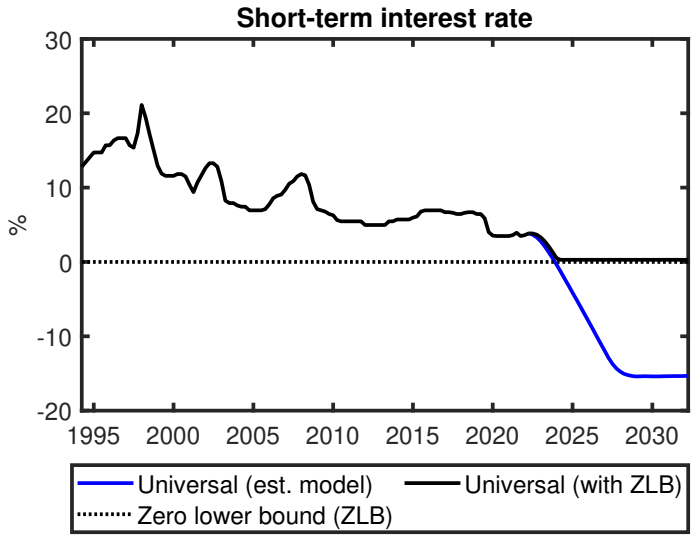


Figure 31: Long term interest rates under a binding zero lower bound scenario

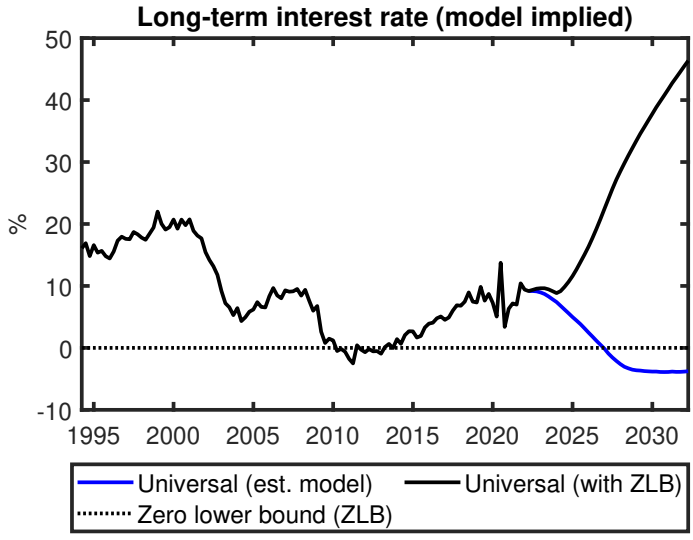
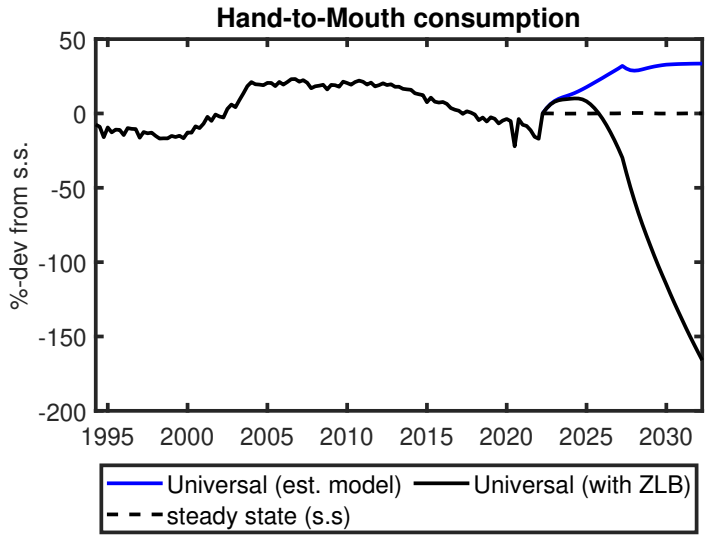


Figure 32: Consumption under a binding zero lower bound scenario



A.3 Additional information on the model economy

The specification of the fiscal sector balances the need for a high degree of detail, which is essential for analysing the quantitative effects of fiscal policy innovations, and tractability, which allows for the identification of the relevant transmission mechanisms. the model includes (1) non-Ricardian (or 'hand-to-mouth') consumers to facilitate a direct transmission mechanism for government transfers; (2) government consumption in the aggregate consumption basket of households, thereby supplying direct utility; (3) public capital which can either be a complement or a substitute for private capital; (4) time-varying distortionary taxes; and (5) a set of fiscal reaction functions (so-called feedback 'rules') governing the discretionary and automatic responses of fiscal variables.

Hand-to-mouth households

Non-Ricardian ('hand-to-mouth') households maximise the same utility function (an increasing function in consumption and leisure) as Ricardian households. Hand-to-mouth households do not display the standard optimising behaviour, however. They cannot invest in physical capital, and they do not have access to financial markets. As a result, each hand-to-mouth household $j \in [0, \omega]$ consumes its entire disposable income in each period. The period-by-period budget constraint is:

$$\left(1+\tau_t^c\right) P_{C,t} C_{j,t} = \left(1-\tau_t^w\right) W_{j,t} N_{j,t} + TR_{j,t}\,, \tag{A.1}$$

where the left-hand-side of (A.1) represents total consumption expenditure (inclusive of VAT) and the right-hand-side represents after-tax disposable wage income and government transfers.

With respect to aggregate wage dynamics, the model makes a simplifying assumption that the hand-to-mouth household wage rate equals the average of the Ricardians' wage rate. The assumption that hand-to-mouth households in the model cannot borrow and save to smooth their consumption over time, however, implies that these individuals are low-income (i.e., 'poor') workers with no collateral. As such, their wage rates might be different, and indeed lower, than the wage rates of Ricardians. Forni et al. (2009) extend this specification to allow for hand-to-mouth household preferences in labour choices and find no substantial difference between their results. In fact, they find that the model dynamics depend most importantly on the calibrated share of hand-to-mouth households – which we turn to next.

Following Coenen et al. (2013), the model allows for an uneven distribution of government transfers between the two types households:

$$\bar{\omega}\left(TR_{i,t}/TR_i - 1\right) = (1-\bar{\omega})\left(TR_{j,t}/TR_j - 1\right)$$

$\bar{\omega}$ is estimated to be 0.74 with a 90% confidence band of [0.5850, 0.8925] (i.e., 74% of transfers are directed to hand-to-mouth households where their share of aggregate consumption amounts to approximately 0.096 (9.6%) within a confidence band of [0.0369, 0.1553]. These estimates serve as the parameterisation for the 'universal' grant scenario in the main text. In contrast, for the targeted transfer scenarios (the baseline assumed in the paper), $\bar{\omega}$ is fixed to 1, which means that all transfers are directed to poor households. The corresponding estimated share of H2M households is $\omega = 0.06$ within a confidence band of [0.025, 0.093]. This calibration broadly maps to the the number of grant recipients corresponding to the bottom 5 income deciles of the income distribution.

Consumption multipliers and hand-to-mouth households

Table A.4, reproduced from Kemp and Hollander (2020), shows present-value output and consumption multipliers for increasing shares of hand-to-mouth households following a positive government consumption spending shock.

Table A.4: Present-value multipliers for different values of ω

	Q1	Q4	Q8	Q20	∞
$\omega = 0.233$ (baseline estimate)					
$\frac{\Delta Y}{\Delta G}$	-0.04	0.19	0.21	0.20	0.20
$\frac{\Delta C}{\Delta G}$	-0.82	-0.72	-0.64	-0.55	-0.55
$\omega = 0.50$					
$\frac{\Delta Y}{\Delta G}$	0.07	0.29	0.30	0.27	0.27
$\frac{\Delta C}{\Delta G}$	-0.574	-0.51	-0.49	-0.45	-0.45
$\omega = 0.75$					
$\frac{\Delta Y}{\Delta G}$	0.20	-0.42	0.41	0.35	0.34
$\frac{\Delta C}{\Delta G}$	-0.27	-0.28	-0.30	-0.34	-0.35
$\omega = 0.90$					
$\frac{\Delta Y}{\Delta G}$	0.29	0.51	0.49	0.40	0.38
$\frac{\Delta C}{\Delta G}$	-0.07	-0.11	-0.18	-0.28	-0.30

Note: The table presents results for the baseline model in Kemp and Hollander (2020) where all fiscal instruments respond to stabilise debt. These qualitative results generalize to alternative specifications. ω represents the share of hand-to-mouth households. ΔY and ΔC represent the discounted changes to aggregate output and consumption in response to government consumption spending G, appropriately scaled by respective sample mean ratios.

Source: Table reproduced from Kemp and Hollander (2020).

Fiscal reaction functions

The fiscal feedback rules embed two features. First, they incorporate automatic stabilisers through the inclusion of a contemporaneous response of the relevant fiscal variable to the output gap (defined as deviations of output from a steady-state trend). Second, all fiscal instruments are permitted to respond to deviations of real government debt from its' steady-state level in an effort to stabilise public debt. Both sets of rules are defined in real terms. Tax rules are estimated using effective (observed and realised) tax rates, not marginal tax rates.[38]

Equations A.3 to A.8 show the fiscal reaction functions (so-called 'fiscal rules') for taxes and government expenditure.[39]

Government expenditure rules for consumption, investment, and transfers are given by:

$$\hat{g}_t = \phi_g \hat{g}_{t-1} - \theta_{g,y}\hat{y}_t - \theta_{g,b}\hat{b}_t + \hat{\varepsilon}^g_t \tag{A.2}$$

$$\hat{i}_{G,t} = \phi_{i_G} \hat{i}_{G,t-1} - \theta_{i_G,y}\hat{y}_t - \theta_{i_G,b}\hat{b}_t + \hat{\varepsilon}^{i_G}_t \tag{A.3}$$

$$\hat{tr}_t = \phi_{tr} \hat{tr}_{t-1} - \theta_{tr,y}\hat{y}_t - \theta_{tr,b}\hat{b}_t + \hat{\varepsilon}^{tr}_t \ , \tag{A.4}$$

[38] See Kemp and Hollander (2020); Hollander (2021) for further discussion on the comparability of effective/average and marginal tax rates, as well as the possible distortions that may arise in identification of fiscal policy.

[39] This specification, popularised by Bohn (1998), follows a first order auto-regressive process (see also Bohn 1995, 2007, 2011). There is also a rich history of investigating fiscal reaction functions in South Africa outside the context of DSGE models (see, for example, Burger et al. 2012; Burger and Marinkov 2012; and Burger et al. 2015). Additionally, Ravn et al. (2007) shows that such linear rules can approximate optimal rules.

where the '^' symbol denotes percentage deviations from the steady-state expenditure trends, t represents time, and ε_t^z are exogenous AR(1) processes (where z indexes the set of fiscal instruments $\{g, i_G, tr, w, k, c\}$).

Tax rules for personal income, corporate income, and consumption, are given by:

$$\check{\tau}_t^w = \phi_w \check{\tau}_{t-1}^w + \theta_{w,y}\hat{y}_t + \theta_{w,b}\hat{b}_t + \hat{\varepsilon}_t^{\tau^w} \tag{A.5}$$

$$\check{\tau}_t^k = \phi_k \check{\tau}_{t-1}^k + \theta_{k,y}\hat{y}_t + \theta_{k,b}\hat{b}_t + \hat{\varepsilon}_t^{\tau^k} \tag{A.6}$$

$$\check{\tau}_t^c = \phi_c \check{\tau}_{t-1}^c + \theta_{c,y}\hat{y}_t + \theta_{c,b}\hat{b}_t + \hat{\varepsilon}_t^{\tau^c} \tag{A.7}$$

$$\tag{A.8}$$

where the '˘' symbol denotes percent-point deviations from the steady-state tax rate.

The fiscal rules in equations A.3 to A.8 are consistent with the idea that debt stabilisation is an important consideration in the formulation of fiscal policy. In order to guarantee longer-term debt sustainability, the debt-feedback coefficients ($\theta_{z,b}$) must be non-zero for at least one instrument.

The value of these coefficients are set to their estimated values based on the historical data. For the scenario analysis, this assumption will be relaxed and simulations run using different specifications of the fiscal rules. By adjusting these fiscal feedback rules, both on the revenue and expenditure side, the macroeconomic impact of using different instruments to stabilise debt in the face of a shock can be investigated. Such counterfactual analysis can be done by adjusting the feedback variables in the expenditure and tax equations (A.3 to A.8). For example, by removing these feedback terms from one or more of the equations (setting the coefficients to zero), the instrument that will respond to a shock in order to stabilise debt can be specified.

Effective tax rates

Effective tax rates for labour (personal income tax), capital (corporate income tax), and consumption (value added tax) are calculated as:

$$\text{Labour tax rate: } \tau_t^w = \frac{TP_t}{COMP_t} \tag{A.9}$$

$$\text{Capital tax rate: } \tau_t^k = \frac{TC_t + TPROP_t}{NOS_t} \tag{A.10}$$

$$\text{Consumption tax rate: } \tau_t^c = \frac{TP_t}{COMP_t} \tag{A.11}$$

where TP_t is total personal income taxes and $COMP_t$ is total compensation; TC_t is total corporate taxes, $TPROP_t$ is taxes on property, and NOS_t is net operating surplus; and $TGOOD_t$ is taxes on goods and services and CP_t is (nominal) private consumption spending.

A.4 Additional information on the estimated model results

Prior and posterior distributions

Table A.5: Parameter priors and posterior estimation results

Parameter description	Prior			Posterior	
	Density[a]	Mean	Std. dev	Mean	90% interval
Share of non-Ricardian households					
ω Total share	B	0.25	0.1	0.06	[0.025, 0.093]
$\bar{\omega}$ Transfer share	-	1	-	-	-
Adjustment costs					
γ_I Investment	-	8.0	-	-	-
Preferences					
κ Habit formation	B	0.65	0.1	0.93	[0.892, 0.970]
Elasticity of substitution					
ν_K Capital	-	1.0	-	-	-
ν_G Consumption	-	1.0	-	-	-
Calvo parameters					
θ_H Domestic prices	B	0.8	0.05	0.74	[0.660, 0.825]
θ_X Export prices	B	0.8	0.05	0.75	[0.663, 0.825]
θ^M Import prices	B	0.8	0.05	0.80	[0.740, 0.853]
θ^W Domestic wages	B	0.75	0.1	0.45	[0.277, 0.610]
Indexation					
χ_H Domestic prices	B	0.75	0.1	0.52	[0.337, 0.711]
χ_X Export prices	B	0.75	0.1	0.68	[0.501, 0.873]
χ^* Import prices	B	0.75	0.1	0.69	[0.512, 0.875]
χ^W Domestic wages	B	0.5	0.1	0.53	[0.356, 0.687]
Taylor rule					
ϕ_R Smoothing	B	0.75	0.1	0.85	[0.829. 0.883]
ϕ_π Inflation	N	1.5	0.1	1.49	[1.341, 1.635]
$\phi_{\Delta Y}$ Output growth	N	0.35	0.05	0.39	[0.311, 0.474]
Fiscal policy rules: smoothing coefficients					
ϕ_G Gvt. consumption	B	0.75	0.1	0.830	[0.730, 0.936]
ϕ_{I_G} Gvt. investment	B	0.1	0.15	0.754	[0.556, 0.951]
ϕ_{TR} Transfers	B	0.75	0.1	0.487	[0.260, 0.732]
ϕ_W Labour taxes	B	0.75	0.1	0.806	[0.700, 0.912]
ϕ_K Capital taxes	B	0.75	0.1	0.382	[0.228, 0.530]
ϕ_C Consumption taxes	B	0.75	0.1	0.375	[0.222, 0.528]
Fiscal policy rules: output feedback coefficients					
$\theta_{G,Y}$ Gvt. consumption	G	0.2	0.1	0.11	[0.031, 0.198
$\theta_{I_G,Y}$ Gvt. investment	G	0.2	0.1	0.20	[0.048, 0.338]
$\theta_{TR,Y}$ Transfers	G	0.2	0.1	0.21	[0.047, 0.366]
$\theta_{W,Y}$ Labour taxes	G	0.5	0.3	0.21	[0.032, 0.375]
$\theta_{K,Y}$ Capital taxes	G	0.5	0.3	0.54	[0.325, 0.738]
$\theta_{C,Y}$ Consumption taxes	G	0.5	0.3	0.17	[0.086, 0.254]

[a] *B - Beta, G - Gamma, IG - Inverse gamma N - Normal*

Table A.1 (cont.): Parameter priors and posterior estimation results

Parameter description	Prior			Posterior	
	Density[a]	Mean	Std. dev	Mean	90% interval
Fiscal policy rules: debt feedback coefficients					
$\theta_{G,B}$ Gvt. consumption	*G*	0.4	0.2	0.16	[0.081, 0.245]
$\theta_{I_G,B}$ Gvt. investment	*G*	0.4	0.2	0.60	[0.268, 0.923]
$\theta_{TR,B}$ Transfers	*G*	0.4	0.2	0.39	[0.135, 0.599]
$\theta_{W,B}$ Labour taxes	*G*	0.4	0.2	0.65	[0.433, 0.888]
$\theta_{K,B}$ Capital taxes	*G*	0.4	0.2	0.18	[0.071, 0.287]
$\theta_{C,B}$ Consumption taxes	*G*	0.4	0.2	0.10	[0.048, 0.155]

[a] *B - Beta, G - Gamma, IG - Inverse gamma N - Normal*