SA-TIED

Southern Africa – Towards Inclusive Economic Development

WORKING PAPER 224

Exploring options to deepen and broaden the personal income tax base in South Africa

Gemma Wright,[1] Katrin Gasior,[1] Joonas Ollonqvist,[2] Wynnona Steyn,[3] Winile Ngobeni,[3] Helen Barnes,[1] Michael Noble,[1] David McLennan,[1] Jukka Pirttilä,[4] and Ada Jansen[5]

December 2023

UNU WIDER

national treasury
Department:
National Treasury
REPUBLIC OF SOUTH AFRICA

SARS

British High Commission Pretoria

About the project

Southern Africa – Towards Inclusive Economic Development (SA-TIED)

SA-TIED is a unique collaboration between local and international research institutes and the government of South Africa. Its primary goal is to improve the interface between research and policy by producing cutting-edge research for inclusive growth and economic transformation in the southern African region. It is hoped that the SA-TIED programme will lead to greater institutional and individual capacities, improve database management and data analysis, and provide research outputs that assist in the formulation of evidence-based economic policy.

The collaboration is between the United Nations University World Institute for Development Economics Research (UNU-WIDER), the National Treasury of South Africa, the South African Revenue Services, and other universities and institutes. It is funded by the National Treasury of South Africa and UNU-WIDER through the Institute's contributions from Finland, Sweden, and the United Kingdom to its research programme.

[1] Southern African Social Policy Research Insights, Hove, United Kingdom; [2] Finnish Institute for Health and Welfare, Helsinki, Finland;
[3] South African Revenue Service, National Treasury, Government of South Africa, Pretoria, South Africa; [4] University of Helsinki, Helsinki, Finland;
[5] Stellenbosch University, Stellenbosch, South Africa; * corresponding author: G. Wright, gemma.wright@saspri.org

WIDER Working Paper 2023/147

Exploring options to deepen and broaden the personal income tax base in South Africa

Gemma Wright,[1,*] Katrin Gasior,[1] Joonas Ollonqvist,[2] Wynnona Steyn,[3] Winile Ngobeni,[3] Helen Barnes,[1] Michael Noble,[1] David McLennan,[1] Jukka Pirttilä,[4] and Ada Jansen[5]

December 2023

United Nations University World Institute for Development Economics Research

wider.unu.edu

Abstract: In this paper we explore options for augmenting South Africa's personal income tax revenue using two microsimulation models: PITMOD simulates the personal income tax system and is underpinned by a dataset comprising a full extract of anonymized individual-level administrative tax data; and SAMOD simulates personal income tax and social benefits using a nationally representative survey. We explore policy reforms at both the upper and lower ends of the income distribution of tax-registered individuals and assess the impacts on revenue and measures of progressivity. The PITMOD simulations are enhanced by introducing a behavioural element to the model and are complemented by using SAMOD to estimate the impacts of the reforms on the whole population including those who are not tax-registered.

Key words: microsimulation, personal income tax, income distribution, South Africa

JEL classification: C63, C81, D31, H24

Acknowledgements: This paper was written as part of Phase II of the Southern Africa—Towards Inclusive Economic Development (SA-TIED) programme for Work Stream 2 (public revenue mobilization). We thank United Nations University World Institute for Development Economics Research for supporting the construction of PITMOD as part of the SA-TIED programme. The results presented here are based on PITMOD version 3.1 and the EUROMOD software version 3.5.8. Originally maintained, developed, and managed by the Institute for Social and Economic Research, since 2021 EUROMOD is maintained, developed, and managed by the Joint Research Centre of the European Commission, in collaboration with Eurostat and national teams from countries of the European Union. Results presented here are also based on SAMOD version 7.5 which is maintained, developed, and managed by Southern African Social Policy Research Insights. We are indebted to the many people who have contributed to the development of PITMOD, SAMOD, and the EUROMOD software. The results and their interpretation are the authors' responsibility.

[1] Southern African Social Policy Research Insights, Hove, United Kingdom; [2] Finnish Institute for Health and Welfare, Helsinki, Finland; [3] South African Revenue Service, National Treasury, Government of South Africa, Pretoria, South Africa; [4] University of Helsinki, Helsinki, Finland; [5] Stellenbosch University, Stellenbosch, South Africa; * corresponding author: G. Wright, gemma.wright@saspri.org

This study has been prepared within the UNU-WIDER project Southern Africa—Towards Inclusive Economic Development (SA-TIED).

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9267-455-7

https://doi.org/10.35188/UNU-WIDER/2023/455-7

Typescript prepared by Ayesha Chari.

United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland and Sweden, as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

Personal income tax (PIT) in South Africa constitutes the largest source of tax revenue for the government, comprising 35.4 per cent of all tax revenue in 2021/22 or 8.8 per cent of gross domestic product (GDP) (National Treasury and SARS 2023). Any reforms to this tax require careful exploration, scrutiny, and consultation before implementation in order to avoid jeopardizing this important income stream. Opinions differ as to whether PIT could be adjusted to further increase revenue: some argue that taxpayers are already under too much pressure (e.g., Cohen 2021), while others argue that the PIT rules could and should be adjusted to augment the revenue (e.g., Goldman and Woolard 2022; Jordaan and Schoeman 2018; Steyn et al. 2022).

In this paper, we use two complementary microsimulation models to interrogate these issues empirically. We profile the current tax base and explore options for reforms that would *deepen* the tax base by bringing additional taxpayers into the top tax band and by increasing the tax rates of four of the higher tax bands (but not the maximum tax rate), and *broaden* the tax base by lowering the minimum tax threshold. Additionally, a behavioural element is incorporated, to estimate how taxpayers may respond to these reforms. The focus is on the extent to which these reforms achieve improvements in revenue mobilization as well as redistributive goals.

Section 2 reviews how the PIT system has developed since 1994 and sets out the key features of the tax schedule in 2020 (i.e. the 2019/20 tax year) which is the timepoint for the analysis. The methodological approach is described in Section 3, including details about the two microsimulation models that were used, how the reforms were implemented in the models, how the behavioural element was incorporated, and the main outcome variables that were used to assess the 2020 baseline and reforms. In Section 4, a profile of the baseline group of tax-registered individuals is presented, including a focus on the two groups at the extremes of the taxable income distribution. The results of the reforms are presented in Section 5. Section 6 contains a discussion of the findings.

2 A changing tax scene

Taxes are financial charges on individuals, companies, or other entities levied by the state to fund public expenditure. The South African tax system is governed by (i) the country's constitution (RSA 1996), (ii) legislation in terms of imposed tax laws (including Income Tax Act 58 of 1962 and Tax Administration Act 28 of 2011), (iii) the courts in terms of providing clarity on tax regulations, (iv) regulations and notices issued by the South African Revenue Service (SARS) for discretionary and delegated regulation, and (v) interpretation notices that provide guidance on SARS practices.

In 1994, the new democratic government was faced with, among other things, the challenge of restructuring the tax system to meet the objectives of the 1994 Reconstruction and Development Programme. The Katz Commission (officially known as the Commission of Enquiry into Certain Aspects of the Tax Structure of South Africa) was established in June 1994 (Manuel 2002) and sat for four years.[1] The Commission's findings resulted in far-reaching reforms comprising changes

[1] The Katz Commission reinforced many of the recommendations for tax reforms that had been made by the 1986 Margo Commission of Inquiry into the Tax Structure of the Republic of South Africa, including the taxation of

at both the institutional and policy levels. This included broadening the tax base, lowering marginal tax rates (MTRs), and restructuring the then Inland Revenue and Customs and Excise Directorates in the Department of Finance (renamed the National Treasury) into SARS, which was established as an autonomous revenue collection agency in 1995 (SARS Act 34 of 1997).

Despite the many recommendations that were implemented, and the removal of all formal discrimination that had existed in the previous system (except for the age-related rebates in the PIT system), there were still challenges around equity. For example, Smith (2000) highlighted the diminishing proportion of direct taxation paid by companies compared with individuals. Others highlighted its complexity and the risk of exploitation, with Steenekamp (2012: 51) describing PIT as follows:

> The income tax system in South Africa conforms to a semi-comprehensive income tax system [CPIT]. The semi-CPIT system is prone to tax arbitrage as individuals restructure their tax affairs to exploit exemptions, allowances and (savings and investment) after-tax rate differentials.

Although concerns existed about PIT, there was also strong resistance in some quarters to tampering further with the PIT system, including a reluctance to increase the PIT rates, as summarized again by Steenekamp (2012: 53):

> The PIT rate in South Africa is at the same level as the average OECD rates. The scope for higher personal income tax rates seems to be constrained by already-high marginal tax rates, a small tax base and a CIT [corporate income tax] rate that is lower than the top marginal PIT rate.

Subsequently, the Davis Tax Committee (DTC) was established in 2013 and tasked with the responsibility of reviewing the country's 'tax policy framework and its role in supporting the objectives of inclusive growth, employment, development and fiscal sustainability' (Ministry of Finance 2013: 1). The DTC highlighted the importance when designing tax policy of efficiency, equity, simplicity, transparency and certainty, and buoyancy (see DTC 2014: 13). They observed that PIT 'imparts a strong element of progressivity in the system' (DTC 2014: 93) but reminded the reader of the narrow target group: 'despite the highly progressive nature of the PIT system, it barely makes a difference to the yawning gap between the rich and the poor, which is driven by other non-tax factors, such as labour market inequalities' (DTC 2014: 26).

Regarding the question of raising taxes, the DTC cautioned that 'higher direct taxes are likely to reduce growth which will, in turn, reduce tax revenue and limit the ability of the fiscal system to redistribute in the future' (DTC 2014: 95) and that 'increases in PIT [. . .] could enhance progressivity but may encourage tax avoidance behaviours, reduce labour supply, prompt the flight of those who are skilled and undermine incentives for entrepreneurship' (DTC 2014: 95).

Despite these concerns, tax thresholds were not fully inflation-adjusted, there was an increase in MTRs in 2015/16, and a new PIT tax band was introduced to the tax schedule in 2017/18, with incomes over R1.5 million being taxed at 45 per cent (Donaldson 2023). Fears about the flight of skilled workers have been described as overstated: SARS reported that only around 6,000 taxpayers

---

individuals separately (irrespective of gender or marital status), and for there to be fewer personal income tax bands (Smith 2000: 5).

moved from South Africa in the last year, of whom only a small portion were high-income earners (Businesstech 2023).

2.1 Options for deepening and broadening the tax base

Before discussing options by which the tax base could be deepened and broadened, we summarize here the key features of South Africa's PIT system.

The main mechanism to achieve progressivity of PIT is the use of income tax bands at which tax is paid on taxable income at increasing MTRs. PIT is applied at the level of the individual, and there are seven income tax bands (see Table 1).

Table 1: Tax bands and rates (2020)

Taxable income (ZAR)	Rate of tax (ZAR)
0–195,850	18% of taxable income
195,851–305,850	35,253 + 26% of taxable income above 195,850
305,851–423,300	63,853 + 31% of taxable income above 305,850
423,301–555,600	100,263 + 36% of taxable income above 423,300
555,601–708,310	147,891 + 39% of taxable income above 555,600
708,311–1,500,000	207,448 + 41% of taxable income above 708,310
1,500,001 and above	532,041 + 45% of taxable income above 1,500,000

Note: ZAR, South African Rand.

Source: reproduced from SARS (2019: 1) with permission by SARS Media.

The PIT system also contains primary, secondary, and tertiary tax rebates,[2] which are related to the tax thresholds and determine the levels at which individuals aged below 65 years, 65–74 years, and 75 years and over are exempted from tax (DTC 2014: 74). The rebates are deducted from tax payable and in effect modify the threshold in the lowest tax band at which tax becomes payable, as shown in Table 2.

Table 2: Tax rebates and thresholds by age (2020)

	Rebate amount (ZAR)
Rebates	
Primary	14,220
Secondary (persons 65 years and older)	7,794
Tertiary (persons 75 years and older)	2,601
Age (years)	Threshold at which tax becomes payable (ZAR)
Below 65	79,000
65 to below 75	122,300
75 and older	136,750

Note: ZAR, South African Rand.

Source: reproduced from SARS (2019: 1) with permission by SARS Media.

The PIT system also allows for tax expenditures. There are two medical tax credits: a medical scheme fees tax credit (SARS 2023a) and an additional medical expenses tax credit (SARS 2023b).

[2] The OECD (2021) defines a tax rebate as an 'allowance of deduction from or a direct offset against the amount of tax due as opposed to an offset against income'. The terms 'rebate' and 'credit' can be used interchangeably as they both refer to an amount that is removed from the final amount of tax payable. They are distinguishable from tax allowances or tax deductions that indirectly reduce tax liability by reducing the amount of taxable income.

Both serve to reduce a taxpayer's liability (the amount of income tax due) by subtracting the amount of the credit from the total tax liability. The medical tax credits are not refundable (i.e. the tax liability is reduced to zero only).

Decisions regarding adjustments to the tax base and the rate schedule involve a delicate balancing act between competing priorities that include promoting efficiency and progressivity, while not discouraging economic activity (Abdel-Kader and de Mooij 2020; Jordaan and Schoeman 2018; Tanzi and Zee 2001). Such decisions bring with them political sensitivities: in the Mirrlees review of taxation that considers in detail the design features of tax systems, the authors make the following observation:

> The shape of the rate schedule is the most political part of the tax system—the forum in which different views about the trade-off between achieving higher average living standards and achieving a more equal distribution of living standards plays out. Indeed, we see direct taxes and benefits as the key part of the system for achieving the redistribution society desires. (Mirrlees et al. 2011: 120)

There are numerous options for deepening the tax base by increasing the MTRs. A recent analysis of the 2011–2020 period in South Africa has highlighted that although PIT has increased, market incomes in the top decile, in particular, have grown at a greater rate, suggesting that 'as long as this trend in rising market inequality continues, South Africa is correct to continue to increase the progressivity of income tax', notwithstanding a complementary imperative of introducing more effective ways to reduce inequality (Goldman and Woolard 2022: 8).

Regarding income tax rates for top earners, the Mirrlees review observes that estimates suggest that taxing the top band at 50 per cent might maximize receipts (Mirrlees et al. 2011). The IMF (2013) estimated that the revenue-maximizing rate is slightly higher—between 50 and 60 per cent. But in the light of the recent introduction of Band 7 at which incomes are taxed at 45 per cent—and the fact that this is already high compared with the average of 31 per cent for sub-Saharan African countries (McNabb 2022) as well as globally (Abdel-Kader and de Mooij 2020)—raising the tax rate of this tax band further is not pursued here. This decision also considers the study by Kemp (2019) who estimated the 'actual effective' MTRs for the top two income tax bands for South Africa to be 47.9 per cent and 49.7 per cent for the statutory rates of 39 per cent and 41 per cent, respectively (at the time of his study), which exceeds the current top statutory rate of 45 per cent.

Instead, and as will be elaborated later in this paper, we explore options for bringing in additional people to the highest tax band (Band 7) by lowering its threshold. Currently, the threshold for the highest tax band starts at 17 times the GDP per capita amount, which is much higher than the African median of just over 5 times of GDP per capita (McNabb and Granger 2022). Additionally, we increase the tax rates slightly for the top bands apart from the very highest band.

One self-evident way in which the PIT tax base could be broadened in South Africa is to reduce the minimum threshold at which tax becomes payable. The minimum tax threshold is determined by the interaction of the primary rebate and the tax rate of the first income tax band, with these two factors interlinked as follows: the first R79,000 of income (the minimum tax threshold), when taxed at 18 per cent (the tax rate for Band 1), amounts to R14,220 (the amount of the primary rebate). In practice, this means that people with a taxable income below R79,000 do not pay PIT. This interlinkage is important when considering how to bring more people into the tax net in Band 1: the bottom threshold of Band 1 cannot be lowered further as it is already set to zero, and so instead the primary rebate (and consequently also the minimum tax threshold) would need to be lowered.

Arguments in support of lowering the minimum tax threshold are that it would raise additional revenue for government, and promote tax citizenship by incorporating additional employees as taxpayers, as currently around half of all employees fall below the threshold (Jordaan and Schoeman 2018; Steyn et al. 2022). Additionally, Abdel-Kader and de Mooij (2020) point out that in the OECD, the median minimum tax threshold is approximately a quarter of the average wage, whereas in South Africa the minimum tax threshold in 2020 was 31 per cent of the average wage.[3] McNabb and Granger (2022) further show that South Africa's minimum tax threshold is low compared with other African countries. While incomes at US$5,000 PPP have an average effective tax rate in Africa of 5 per cent, the effective tax rate is zero in South Africa. In South Africa, only incomes above US$12,000 PPP are taxed at which point the effective tax rate is just 1.1 per cent.

Arguments against such a reform include concerns that recent changes to income tax rules have involved *increasing* the amount that an individual can earn before being required to pay tax, to provide relief from the effect of inflation for lower income individuals. Lowering the minimum tax threshold would defeat the purpose of these changes. This is a particularly pertinent concern in South Africa where there is no arrangement for refundable tax credits for low-income workers. The case can also be made that the relatively narrow PIT base is simply a function of the very unequal distribution of income in South Africa, and that to broaden the tax base would be a misdirected effort compared with addressing structural challenges such as low wages and the very high levels of unemployment. Furthermore, the minimum tax threshold in South Africa in 2019 was around 83 per cent of the GDP per capita value,[4] which is already in-line with the median for low-income and developing countries, and emerging markets (Abdel-Kader and de Mooij 2020).

Other ways to increase the tax base include promoting tax compliance, increasing the efficiency of tax administration, reducing the size of deductions, and changing the definition of taxable income, though these are not discussed further here.

3 Methodology

3.1 Microsimulation models SAMOD and PITMOD

The analysis in this paper uses two microsimulation models called SAMOD version 7.5 and PITMOD version 3.1 that are described in this section.

SAMOD is a tax–benefit microsimulation model for South Africa (Wright and Mpike 2021). It uses the EUROMOD microsimulation software (Sutherland 2001; Sutherland and Figari 2013; *Institute for Social and Economic Research, University of Essex and Joint Research Centre, European Commission 2022*), and was the first model to do so in a developing country context (Wilkinson 2009). SAMOD simulates all the main taxes and benefits that apply to households, although because of data constraints, it is only able to partially simulate PIT. Two nationally representative datasets underpin SAMOD: one constructed from the 2014/15 Living Conditions Survey (Stats SA 2017) and another constructed from Wave 5 (2017) of the National Income Dynamics Study (NIDS)

[3] Based on the average monthly earnings (including bonuses and overtime payments) in May 2020 of employees in the formal non-agricultural sector, which according to the Quarterly Employment Statistics Survey was R21,455 (Stats SA 2020: 9).

[4] In 2019 the nominal GDP was R5,625.20 billion and the population was 58.78 million.

(SALDRU 2018). The dataset that was derived from NIDS is used for the SAMOD analysis presented in this paper.

PITMOD emerged from and complements SAMOD. Also based on the EUROMOD platform, it was built with the narrower purpose of simulating PIT for South Africa. It was the first developing country model to use the EUROMOD software with administrative data (Steyn et al. 2021). As it is underpinned by anonymized individual-level administrative records from SARS, it is possible to simulate the PIT rules in much finer detail than in SAMOD (Barnes et al. 2023; Steyn et al. 2021). The focus of PITMOD is on all tax-registered individuals, which is a narrower focus than SAMOD where results are provided for the entire income distribution.

To build the PITMOD input datasets, SARS combined data from two separate data systems—the employee tax certificate (IRP5/IT3a)[5] and the PIT return (ITR12)[6]—supplemented with third-party information on medical insurance scheme contributions. Separate datasets were constructed for each of the tax years from 2018 to 2020. Each dataset was built through an iterative process involving the drawing of small, anonymized samples that were explored in detail, and then findings were fed back into the specification of the data file to ensure it contained all the necessary variables for the accurate calculation of PIT for that tax year. These raw datasets, each comprising over 1,400 variables, were then transformed into underpinning datasets for PITMOD, following EUROMOD modelling conventions, for example, rules around variable naming and the inclusion of compulsory variables. The data for each tax year comprises approximately 15 million records and there is only one record per individual.[7]

PITMOD contains only the policy rules that relate to PIT,[8] alongside more general rules relating to the framework of the model and the output from the model. For example, there is a policy for income from interest, another for the retirement contributions deduction, and another for the calculation of tax liability. Appendix Table A1 shows the different policies included in PITMOD, in the order in which they appear in the model, with an explanation of the element of PIT modelled by each, or in other words, the scope of the policy. The calculation of final tax liability in PITMOD can be summarized as follows:

> Tax liability = ((tax payable on taxable income) − (tax rebates and medical tax credits))[9] + tax payable on lump sums

---

[5] IRP5/IT3a is the employee tax certificate submitted by the employer on behalf of the employee. The IT3a element relates to people with a wage/salary but where no tax is deductible.

[6] ITR12 is the personal income tax return for individuals with employee income over the specified threshold (R500,000 for the 2019 tax year), or individuals who work for more than one employer during a given tax year, or individuals with additional non-employment income, allowances, or tax-related deductions and rebates not taken into account in the IRP5/IT3a employer return, or not otherwise exempt, or taxpayers who are not employees and are not part of the pay-as-you-earn system. For more information on who is required to submit an income tax return, see SARS (2015) and Barnes et al. (2023: Annex 3).

[7] Although an individual can feature in both the IRP5/IT3a and ITR12 systems, and there can be more than one record per taxpayer (e.g., if an individual moves from one job to another during the tax year, or has several concurrent jobs), this was dealt with in the construction of the datasets (see Barnes et al. 2023: Annex 3).

[8] The PIT rules were incorporated into PITMOD using the following sources of information: ITR12 form, various source code metadata documents supplied by SARS, SARS (2023c), SARS (2023d), and additional SARS guides available online at www.sars.gov.za and listed in Barnes et al. (2023).

[9] With a lower limit of zero.

For both models, a tax policy time point of 2020 is used (i.e. tax year 2019/20). This policy time point was selected as, at the time of writing, it is the most recent tax year for which there is PITMOD data, and it pre-dates the COVID-19 pandemic and associated disruption with lockdowns enforced from 27 March 2020.

SAMOD and PITMOD have complementary strengths: SAMOD enables the impact of the tax and benefit policies to be estimated across the whole population of South Africa and provides an overview of the effect of a policy reform on households in terms of their poverty situation. In contrast, PITMOD focuses only on those individuals who are registered with SARS for PIT and does not provide a full picture of the distributional impact of a policy reform on all households; instead, its main strength is that the PIT policy is coded in great detail, which is then applied to fine-grained administrative data on their income sources, which enables the impact of the policy reforms on their final incomes to be estimated very precisely. The differences between SAMOD and PITMOD are elaborated in more detail in Steyn et al. (2021).[10]

3.2 Baseline and reform scenarios

In Section 4 we first present a baseline profile of tax-registered individuals in 2020. Then comparisons of the 2020 baseline timepoint are made between PITMOD (for simulations involving tax-registered individuals) and SAMOD (for simulations involving the whole population). Informed by the findings of Steyn et al. (2021), which compared PITMOD and SAMOD's simulations of PIT using data for 2018, key points are identified for the 2020 timepoint that should be kept in mind when comparing outcomes of the modelled reform scenarios across the two models.

The results from the modelled reforms are presented in Section 5. For reasons that will be set out in Section 4, the modelled reforms focus on adjustments to the upper and lower ends of the income distribution of registered taxpayers. Building on the reforms tested in Steyn et al. (2022), results are shown for reforms to the top tax band (our Reform 1) and bottom tax band (our Reform 2) separately and in combination (our Reform 3). The results are further provided in three different ways: (i) using PITMOD with no behavioural responses, (ii) using PITMOD with a behavioural response, and (iii) using SAMOD for the total population (see Table 3).

Table 3: Summary of modelled reforms in terms of models used and behavioural adjustments

	PITMOD		SAMOD
	No behavioural response	Behavioural response	No behavioural response
Baseline	—	—	—
Reform 1 (top tax bands)	☑	☑	☑
Reform 2 (bottom tax bands)	☑	☑	☑
Reform 3 (top and bottom tax bands)	☑	☑	☑

Source: authors' compilation based on study data and design.

Reform 1 involves lowering the maximum income threshold of the top tax band. In 2020 this threshold was R1.5 million, and in Reform 1 it is lowered to R1 million. Additionally, four of the tax band rates are increased by 1 percentage point, as shown in Table 4.

[10] For further details on the data preparation steps and the components of PITMOD v3.1, see Barnes et al. (2023).

Reform 2 involves reducing the primary rebate. Although PIT rules apply to all applicable incomes above zero, in practice the primary rebate in 2020 means that the first R79,000 per year is not taxed. By lowering the value of the primary rebate this means that tax becomes payable at lower values of taxable income. The impact of lowering the primary rebate is to increase the number of individuals with a positive tax liability and to increase revenue. Additionally, and in order to soften the transition into tax liability, an extra tax band is added at just 5 per cent for the new entrants. The combined impact of the lowered rebate amount and the new tax band at just 5 per cent is very small for those taxpayers who already have tax liabilities (a net income loss of R1,200 per year), and the minimum tax threshold drops from R79,000 to R55,000.[11]

Table 4: Summary of simulated tax reforms in PITMOD and SAMOD

	Baseline	Reform 1	Reform 2	Reform 3
Primary tax rebate	R14,220	R14,220	R2,750	R2,750
New (bottom) band in Reforms 2 and 3	N/A	N/A	0	0
New (bottom) tax rate in Reforms 2 and 3	N/A	N/A	5%	5%
Band 1	0	0	79,001	79,001
1st tax rate	18%	18%	18%	18%
Band 2	195,851	195,851	195,851	195,851
2nd tax rate	26%	26%	26%	26%
Band 3	305,851	305,851	305,851	305,851
3rd tax rate	31%	32%	31%	32%
Band 4	4233,01	4233,01	4233,01	4233,01
4th tax rate	36%	37%	36%	37%
Band 5	555,601	555,601	555,601	555,601
5th tax rate	39%	40%	39%	40%
Band 6	708,311	708,311	708,311	708,311
6th tax rate	41%	42%	41%	42%
Band 7	1,500,001	1,000,001	1,500,001	1,000,001
7th tax rate	45%	45%	45%	45%

Source: authors' compilation based on study data and design.

3.3 Accounting for the intensive margin responses

It is well known that the changes in tax–benefit schemes may induce behavioural changes, for example in labour supply. Labour supply decisions refer to the choices individuals make about their participation in the labour market (extensive margin) and the amount of time they allocate to work (intensive margin). In this study, we focus solely on the intensive margin responses, as the unemployment rate in South Africa is one of the highest in the world at around 33 per cent (Stats SA 2023). The very high unemployment rate suggests that there are other severe problems in the

[11] For those with a PIT liability in 2020 (i.e. taxable income above R79,000 per year), Reform 2 continues to tax incomes above R79,000 in the same way as the baseline. Reform 2 entails (i) taxing the first R79,000 at 5 per cent (rather than at 18 per cent), and (ii) reducing the primary rebate to R2,750 (rather than to R14,220). The combined effect of these two changes results in their tax liability on the first R79,000 being R1,200 per year (rather than zero in the baseline) (i.e. $(79{,}000 \times 0.05) - 2{,}750 = 1{,}200$). Therefore, the maximum amount that new entrants (registered taxpayers with no tax liability in the baseline) will pay in tax is also R1,200 per year, as by definition their taxable incomes are less than R79,000. Those with incomes less than R55,000 per year will not be liable for tax (i.e. $(55{,}000 \times 0.05) - 2{,}750 = 0$).

South African labour market than just the financial incentives at the extensive margin. In this section we briefly describe how the behavioural assessment is conducted.

In the calculations of behavioural responses, we follow the example of Immervoll et al. (2007) and Ollonqvist et al. (2021) and use the static microsimulation model PITMOD alongside exogenously given elasticity estimates. More precisely, we utilize the concept of elasticity of taxable income (ETI) in our behavioural calculations (see reviews of the ETI literature in Saez et al. (2012) and Neisser (2021)). ETI measures the responsiveness of taxable income to changes in net-of-tax rates. Rather than concentrating on the impact on working hours, ETI assesses the behavioural effects concerning taxable income.

Hence, it has been suggested that ETI estimates capture all the policy-relevant behavioural responses resulting from a tax change at the intensive margin. It quantifies the percentage change in taxable income resulting from a 1 per cent change in the net-of-tax rate. It is expected that ETI would be positive, indicating that taxable income increases as tax rates decrease (i.e. net-of-tax rate increase), suggesting that individuals or households increase their income-earning behaviour (or reduce tax avoidance) in response to tax cuts and reduce income in response to tax increases. On the other hand, a negative ETI implies that taxable income decreases as tax rates decrease.

In principle, the selected estimates of ETI can originate from any study, regardless of the empirical approach. However, the choice of response estimates is naturally influenced by evaluating the context from which they are derived. Specifically, it considers how applicable the findings of a study are to other settings, including the setting of the current study. In practical terms, this implies that the chosen estimates need to be assessed based on their position in existing literature and their relationship to consensus estimates.

In a recent meta-analysis conducted by Neisser (2021), the majority of estimates for the ETI range from 0 to 1, with a significant concentration around 0.3. Similarly, Saez et al. (2012) come to the conclusion that the most reliable estimates for the long-run elasticity fall within the range of 0.12 to 0.4 and are likely to be even smaller in the short term. Based on South African data, Kemp (2019) obtains an elasticity of 0.3, Kemp (2020) estimates an elasticity of 0.4, and Bell (2020) derives an elasticity of 0.08.[12] Kemp (2019, 2020) exploits the 'bracket creep' of taxation to estimate the ETI whereas Bell (2020) uses a bunching method to estimate ETI. Despite the difference in the aggregate elasticities, all three South African studies find larger values of ETI for the high-income individuals.

Based on the results outlined, our choice for ETI is 0.05 for the bottom 90 per cent of the income earners and 0.5 for the top 10 per cent. In further work, one could also consider a scenario with a more smoothly increasing elasticity. These values are slightly higher than the estimates obtained by Kemp (2020), since due to the lack of publicity surrounding 'bracket creep', taxpayers may have limited awareness of the increases in marginal taxes and, as a result, may not adequately respond to the change. In addition, the international evidence about ETI supports our choice. A sensitivity analysis in Appendix 3 furthermore shows that most results are not sensitive to the selection of ETI.

[12] See also Rasmussen (2017: Chapter 5.1) for a discussion of the elasticity of taxable income in the South African context.

We measure financial incentives to earn more at the intensive margin with MTRs. It measures the percentage of the increase in earnings that is taxed away, formally:

$$MTR = \frac{T_1 - T_0}{E_1 - E_0}$$

where the difference between the taxes (and the social insurance contributions) paid by the individual with increased earnings (T_1) and non-increased earnings (T_0) is divided by the difference in increased gross earnings (E_1) and non-increased gross earnings (E_0). A value of 0 means that the individual keeps the full increase in earnings, while a value of 1 means that the entire increase is taxed away.

We calculate the MTRs for individuals aged between 18 and 64 years, who have a positive amount of taxable income. MTRs are computed following a methodology developed for European tax–benefit microsimulation models using EUROMOD (Jara and Tumino 2013; Jara et al. 2020). Earnings are increased by 3 per cent, allowing one to estimate the incentive to earn more. The administrative data underpinning PITMOD does not provide information on working hours which is why increases in working hours cannot be tested. However, at least in the European context, an increase in earnings of 3 per cent roughly corresponds to an extra hour of work for an employee working 40 hours per week (Jara and Tumino 2013). The reason why we use MTRs instead of marginal *effective* tax rates is that PITMOD focuses on the role of income tax only and thus, we cannot take into consideration how the increase in earnings affects the benefits received.

Once we have acquired the MTRs based on both the initial and reform legislation, we can proceed to calculate the impact on taxable income, ΔTI, at the individual level. Following Saez et al. (2012), we estimate the change in taxable income as:

$$\Delta TI_i = \varepsilon \frac{\Delta(1 - MTR_i)}{(1 - MTR_{0i})} TI_i$$

where ε is the elasticity of taxable income, TI_i is the taxable income of individual i, MTR_0 is the marginal tax rate with the baseline legislation, and $\Delta(1-MTR_i)$ is the change in net-of-tax rate for individual i. We use the same definition for taxable income as Kemp (2019).

Lastly, we add the computed change in taxable income to the individual's initial taxable income and simulate the incomes once again to obtain the overall effect on the individual's disposable income. This total effect encompasses both the direct (mechanical) impact and the effect arising from the behavioural response to the tax–benefit changes.

3.4 Redistributive effects and progressivity of the tax system

Redistributive effects of taxes are assessed by comparing changes in inequality when moving from pre- to post-tax income distribution. The redistributive effect depends on the degree of progressivity (i.e. the extent to which the tax liability increases proportionally for higher incomes) as well as the level of the tax (i.e. the average tax rate) (Figari and Verbist 2014).

The most used measures belong to the Lorenz curve framework, following Musgrave and Thin (1948) and Kakwani (1977a, 1977b). The Reynolds–Smolensky (1977) index of redistributive effect (RS) measures the difference between the Gini based on pre-tax income $G(X)$ and the Gini based on post-tax income $G(Y)$.

$$RS = G(X) - G(Y)$$

It is furthermore a function of vertical equity (*VE*)—showing the redistributive effect of the tax system if re-ranking effects of taxes are disregarded—plus the loss of the redistributive effect due to the re-ranking caused by taxes (*RR*), also referred to as horizontal inequity.

$$RS = G(X) - G(Y) = VE - RR$$

Vertical equity is the combined effect of the progressivity of the tax system and the average tax rate (*g*). Progressivity of the tax system is measured using the Kakwani index (1977a), which is based on the concentration (*C*) of taxes (*T*) and the pre-tax Gini.

$$RS = \left(\frac{g}{(1-g)} * K\right) - RR = \left(\frac{g}{(1-g)} * (C(T) - G(X))\right) - RR$$

The re-ranking effect of taxes is a function of the post-tax Gini and the concentration of post-tax incomes.

$$RS = \left(\frac{g}{(1-g)} * K\right) - RR = \left(\frac{g}{(1-g)} * \big(C(T) - G(X)\big)\right) - G(Y) - C(Y)$$

The Kakwani index is sensitive to the pre-tax income distribution as it appears less progressive if the pre-tax distribution is relatively equal. The progressive capacity index provides an alternative Kakwani measure that is calculated on hypothetical data with a fixed range of incomes (Gerber et al. 2018). As such, it abstracts from the real income distribution and is a measure of the redistributive potential of the tax system. Following Gerber et al. (2018), we calculate the measure with varying incomes (more specifically salaries) from 0 to 500 per cent of per capita GDP in South Africa.[13]

All indicators are calculated using the progress programme in STATA (Peichl and Van Kerm 2007) and are derived from (generalized) Gini coefficients of inequality and (generalized) concentration coefficients.

The composite indicators are supplemented with sections on average tax rates and relative net income changes for different income percentiles, which allows for a more in-depth assessment of the progressivity of the PIT system and the effects of the reforms. Average tax rates are defined as tax liability as a share of original income.[14]

4 The South African PIT system—profile of the baseline

4.1 Baseline profile: PITMOD (all ages)

An overview of the 2020 tax year PIT system is based on the information submitted by employers in terms of the annual IRP5 and IT3(a) certificates issued, the tax returns submitted by individuals, and third-party information submitted, such as IT3(b) certificates and retirement and medical aid contributions. The total register of individuals is summarized in terms of sources of income,

[13] Per capita GDP for South Africa in 2020 was R94,502.3 (see World Bank 2023).

[14] Sometimes referred to as 'effective tax rate'.

deductions, taxable income, and tax credits as produced by the PITMOD summary statistics tool, using the 10 per cent sample (Barnes et al. 2023).[15]

Appendix Tables A2.1 and A2.2 provide breakdowns of incomes and tax-registered individuals respectively for the 2020 tax year. In total, there were 14,729,000 registered individuals who received an income of R3,092 billion. Of these, 12,796,000 individuals received salaries and wages income of R1,991.1 billion, 173,000 individuals received business income of R47.8 billion, and 15,000 individuals received farming income of R4.2 billion. Interest income was received by 514,000 individuals (R46.0 billion), rental income was received by 154,000 individuals (R11.9 billion), 382,000 individuals declared dividend income (R5.8 billion), and 73,000 individuals declared capital gains (R63.6 billion).

Employee income contributed 94 per cent of total original income, of which salary and wages at 69 per cent were the highest employee income component, followed by fringe benefits at 9 per cent and bonuses at 7 per cent. Exempt income and losses totalled R62.3 billion, granted to 617,000 individuals. Retirement contributions of R274.8 billion were deducted by 7,013,000 individuals, and the tax rebates amounted to R152.2 billion. Medical tax credits of R23.8 billion were granted to 2,824,000 individuals. A total of 7,051,000 individuals had a final tax liability of R516.6 billion.

The analysis in this working paper focuses on the age group 18–64 years inclusive. This is 90 per cent of all registered individuals in 2020. Individuals aged between 18 and 64 received 92 per cent of total taxable income and their tax liability share was 93 per cent. A breakdown by gender shows that 46 per cent of individuals were women, with a 40 per cent share in taxable income and a 36 per cent tax liability share.

4.2 Baseline profile: PITMOD (aged 18–64 years inclusive)

This subsection assesses the income distribution of tax-registered individuals of working age in South Africa and explains where along the distribution the 2020 PIT rules affect individuals, and at which points the three reform systems have an impact. The income distribution is presented as income percentiles by ordering individuals based on their original income and dividing them into 100 equally sized groups. The results present averages within each income percentile.[16]

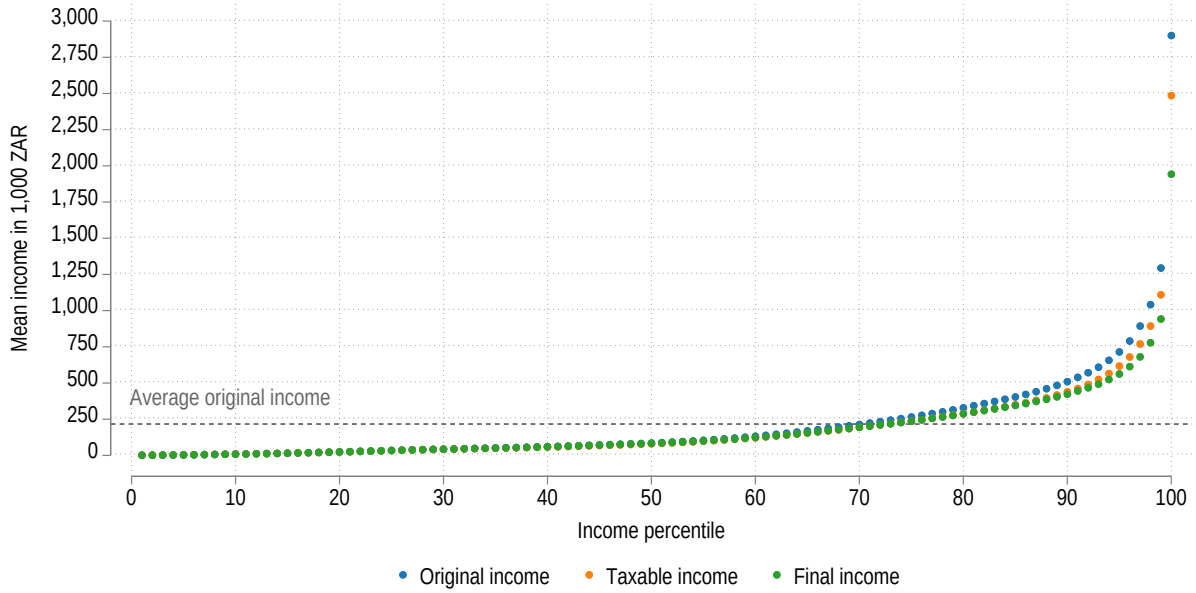
Figure 1 shows average income levels by income percentile. It highlights the unequal distribution of original incomes in South Africa. The top 1 per cent has average incomes that are 34 times higher than the median percentile. The 90th percentile has average incomes that are still six times higher than the median percentile. This very skewed distribution towards top incomes leads to a very large share of individuals (70 per cent) with below average original incomes.

[15] Numbers of individuals are rounded to the nearest thousand, and amounts are rounded to the nearest R100,000. Results are reported for individuals with a positive original income only. Simulated tax liabilities exclude tax on lump sums.

[16] The results in this section apply to all tax-registered individuals aged 18–64 years inclusive, with original income excluding capital gains following the definition of Kemp (2019). Percentiles are calculated based on original income including capital gains in the baseline.

Greater equality is achieved when moving to final income levels due to the higher tax burden for higher income groups.[17] The gap between original income levels and final income levels (blue versus green dots) is larger the higher the level of original income. Still, the top 1 per cent has final incomes that are on average 23 times higher than the median percentile and comparatively little has changed for the 90th percentile with five times higher incomes on average.

Figure 1: Income by income definition and income group, adults aged 18–64 years inclusive



Note: income percentiles are based on original income.

Source: authors' calculations using PITMOD v3.1.

The orange dots show the level of taxable income (i.e. the original income after taking into account deductions). It is the income definition that is used as the tax base for the PIT schedule. Thus, the average level of taxable income in each income percentile highlights where the different elements of the tax schedule kick in.

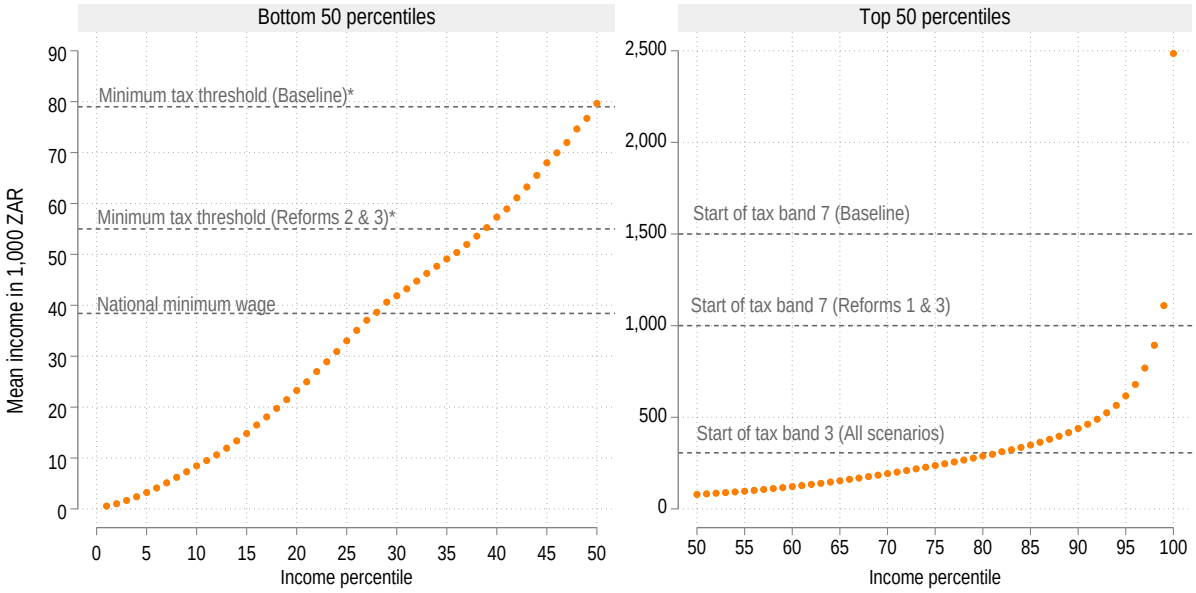
The same distribution of taxable income is plotted in Figure 2. To improve readability, the figure shows the bottom 50 percentiles and the top 50 percentiles in two separate graphs with different scales. Markers with different thresholds and characteristics of the simulated reforms help to understand which income percentiles are on average going to be affected by the different scenarios.

For the baseline, the bottom 50 percentiles do not pay income tax in the current system because their taxable income is below the minimum tax threshold.

Reform 1 only affects income groups with taxable incomes above R305,851 as tax rates below the third income band remain unchanged. On average, these are the top 20 per cent of the income distribution. The additional decrease of the highest income threshold is expected to have a comparably small effect as only the top two percentiles have incomes above the threshold and the richest percentile is already paying the highest tax rate in the current system.

[17] See also Appendix Figure A2.1 for a graph showing taxable and final income as a share of original income by income percentile for the baseline.

Figure 2: Taxable income by income percentile—bottom versus top 50 per cent, adults aged 18–64 years inclusive



Note: *effective tax threshold after taking into account the primary tax rebate. Income percentiles are based on original income. The national minimum wage threshold is based on PEJD Group (2020). Different scales have been used for each graph.

Source: authors' calculations using PITMOD v3.1.

Reform 2 aims at bringing in new taxpayers at the lower end of the distribution. On average, it affects the 39th percentile up to the 49th percentile (i.e. incomes between R55,000 and R79,000). The graph also shows that Reforms 2 and 3 do not affect individuals earning the national minimum wage (NMW), nor those in the percentiles with slightly higher incomes (28th to 38th percentile). This is important as the NMW in 2020 was very low and increases in minimum wage labour incomes should not be disincentivized by the tax reform.

People of working age with taxable incomes below the minimum tax threshold of R79,000

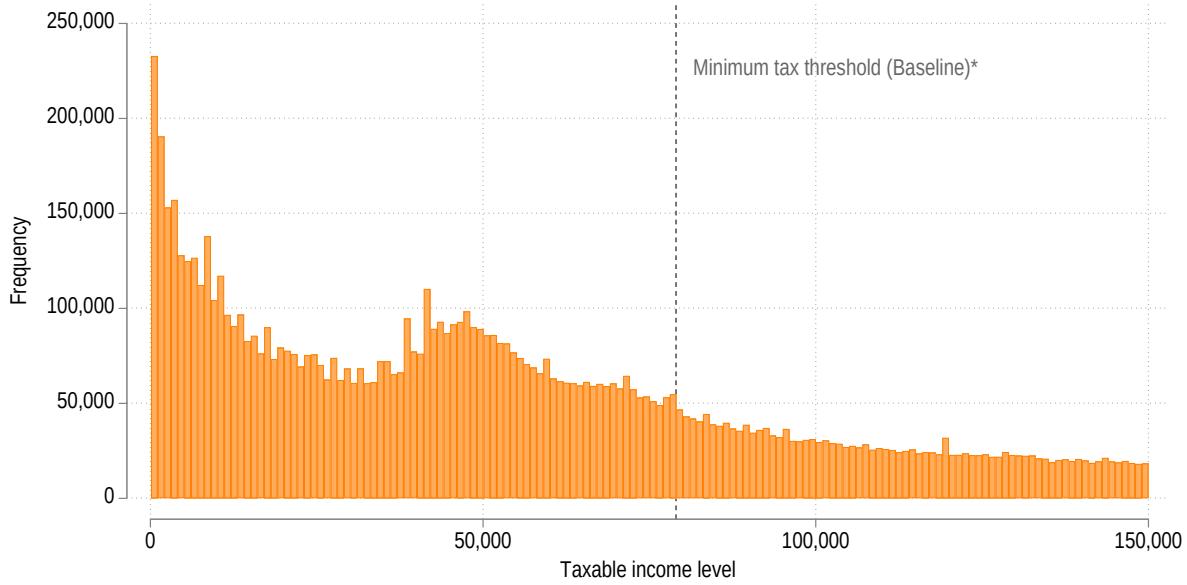
Appendix Tables A2.1 and A2.2 (Columns 3) show that in 2020 there were 6.5 million people of working age with taxable incomes that fell below the minimum tax threshold of R79,000 per year. Of these individuals, 99 per cent had employment income (R229.3 billion) and less than 1 per cent reported income from each of the other reported sources—the next largest in value being income from interest (R1.8 billion) and business income (R1.3 billion). These 6.5 million individuals comprise almost half (49.5 per cent) of all tax-registered individuals of working age. Their taxable income amounts to 9 per cent of the taxable income of all registered 18–64 year olds, and their tax liability is 0 per cent of the tax liability for this age group.

Figure 3 shows a histogram of taxable income around the minimum tax threshold. The distribution is smooth apart from a notable bunching around the R50,000 mark which cannot be immediately explained. The maximum NMW for that tax year was R20 per hour, which for an 8-hour day and 20-day month amounted to R3,200 per month or R38,400 per year (PEJD Group 2020), and so the bunching occurs above the NMW level.

For individuals aged 18–64 years below the minimum tax threshold, 2.7 per cent of their combined original income derives from non-employment sources, which is lower than the average for all registered individuals in this age group (4.5 per cent).

An analysis of the sources of income and deductions for individuals of working age below the R79,000 minimum tax threshold showed that the average employee income is, as expected, much less (R35,310) than the average employee income of all taxpayers of working age (R208,071).

Figure 3: Histogram of taxable income around the minimum tax threshold, adults aged 18–64 years inclusive, 2020



Note: *effective tax threshold after taking into account the primary tax rebate. The figure shows individuals with annual taxable incomes greater than R100 and less than R150,000.

Source: authors' calculations using PITMOD v3.1.

People of working age with taxable incomes greater than R1 million

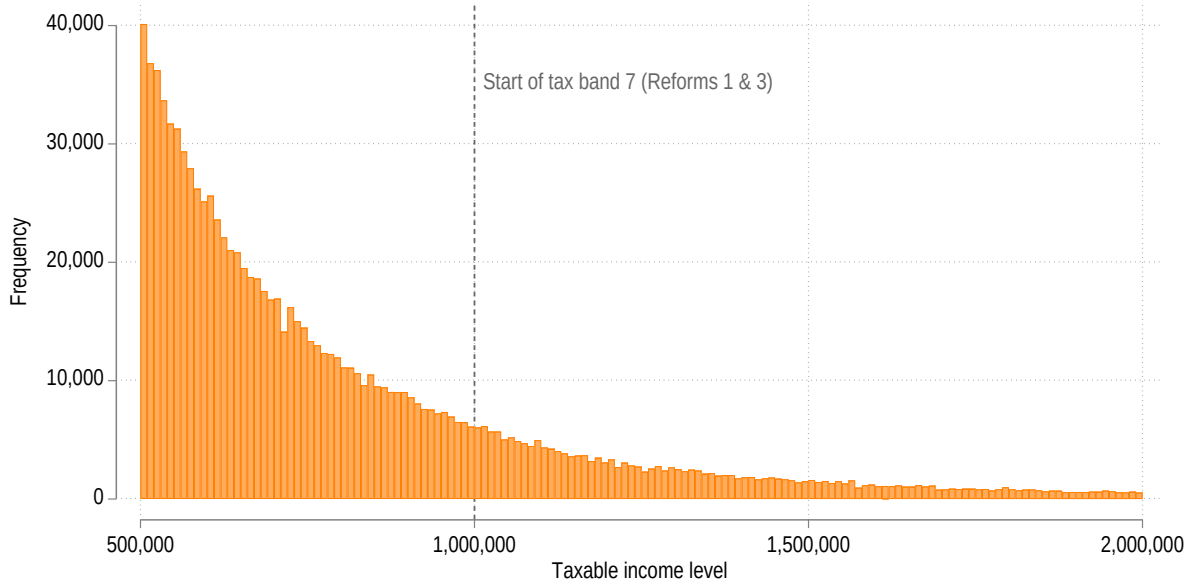
Appendix Tables A2.1 and A2.2 show that in 2020 there were 253,350 people of working age with taxable incomes of R1 million or more (Column 5), of whom 155,650 (Column 6) had taxable incomes of R1.5 million or more (61 per cent of the group with incomes above R1 million). The individuals with incomes above R1 million had a combined employee income of R468.7 billion, capital gains of R31.8 billion, and business income of R19.7 billion. The final tax liability for this group was R171.5 billion.

Fewer than 156,000 individuals aged 18–64 years inclusive (Appendix Table A2.2, Column 6) had a taxable income between R1 million and R1.5 million, comprising just 1 per cent of tax-registered individuals aged 18–64 years inclusive, though as seen in Appendix Table A2.1 they contributed 12 per cent of the final tax liability.

Figure 4 shows a histogram of taxable income around the R1 million level, showing a smooth and declining distribution of taxable income with no sign of bunching around the R1 million (within Band 6) or R1.5 million (lower limit of Band 7) thresholds.

The average annual income from employment of people of working age with taxable incomes greater than R1 million was R1.9 million (nine times higher than the average for all registered individuals in this age group). Along similar lines, their average income from business was six times higher than the average for all registered individuals in this age group, followed by farming (3.7 times higher).

Figure 4: Histogram of taxable income around the R1 million level, adults aged 18–64 years inclusive, 2020



Note: the figure shows individuals with annual taxable incomes greater than R500,000 and less than R2 million.

Source: authors' calculations using PITMOD v3.1.

4.3 Baseline profile: comparing PITMOD and SAMOD (all ages)

In this section, the baseline profile is compared across the two microsimulation models, PITMOD and SAMOD. Table 5 shows that SAMOD simulates 77–78 per cent of the published figures for reported revenue from PIT in the 2020 tax year, whereas PITMOD simulates just over 100 per cent of reported revenue. This is very similar to the results for the 2018 tax year when detailed comparisons of PIT simulations were made across the two models (Steyn et al. 2021). Steyn et al. (2021) observed that although similar total numbers of PIT payers and total taxable incomes were simulated by both PITMOD and SAMOD (when using NIDS as SAMOD's underpinning dataset), SAMOD under-simulated total PIT revenue because the NIDS sample is under-representative of high-income individuals whereas such cases are better captured by administrative data (Shine et al. 2019).

Table 5: Reported and simulated revenue from personal income tax in 2019/20

	Reported (ZAR million)	SAMOD		PITMOD	
		SAMOD simulated (ZAR million)	% captured (simulated/reported)	PITMOD simulated (ZAR million)	% captured (simulated/reported)
SARS	532,387	411,065	77.2	542,885	102.0
National Treasury	527,633	411,065	77.9	542,885	102.9

Note: SARS reported figures are derived from National Treasury and SARS (2023: 24, Table A1.4.2); National Treasury reported figures are from National Treasury (2021: 41). Simulated tax in SAMOD and PITMOD includes tax on lump sums, in this table.

Source: authors' calculations using SAMOD v7.5 and PITMOD v3.1 using 10 per cent dataset.

Table 6 updates and reinforces the observations by Steyn et al. (2021). For the 2020 tax year, SAMOD simulates 100 per cent of PITMOD's taxpayers and taxable income, but only 80 per cent of PITMOD's simulated income tax revenue. Furthermore, SAMOD performs least well for the top tax band of incomes in excess of R1.5 million: SAMOD simulates only 50 per cent of the PIT revenue from this tax band compared with PITMOD.

This means that when examining the impact of the modelled reforms in Section 5.2 using SAMOD, it should be expected that the overall revenue impact will be under-estimated for reforms that involve the upper end of the income distribution.

Table 6: Simulations of taxpayers and taxable income using SAMOD and PITMOD by taxable income band, 2020

Taxable income band	SAMOD			PITMOD			Ratio (SAMOD/PITMOD)		
(ZAR thousand)	Taxpayers (*n*)	Taxable income (ZAR million)	Income tax (ZAR million)	Taxpayers (*n*)	Taxable income (ZAR million)	Income tax (ZAR million)	Taxpayers	Taxable income	Income tax
0–195,850	3,539,966	902,101	26,353	2,959,200	632,001	31,633	1.2	1.4	0.8
195,851–305,850	1,558,242	376,638	45,222	1,606,870	397,562	51,956	1.0	0.9	0.9
305,851–423,300	869,593	311,636	53,091	1,083,440	388,527	68,480	0.8	0.8	0.8
423,301–555,600	458,037	222,558	47,315	627,560	302,037	65,261	0.7	0.7	0.7
555,601–708,310	299,217	191,819	48,401	361,790	225,712	57,416	0.8	0.8	0.8
708,311–1,500,000	456,320	429,304	128,784	482,130	460,938	142,638	0.9	0.9	0.9
1,500,001+	43,503	153,439	61,899	107,050	313,181	125,501	0.4	0.5	0.5
Total	7,224,878	2,587,495	411,065	7,228,040	2,719,958	542,885	1.0	1.0	0.8

Note: amounts shown are annual figures; minor discrepancies in totals are due to rounding. 'Taxpayers' refers to those with a positive tax liability (rather than registered individuals). 'Taxable income' is the sum of all taxable income (rather than the sum of taxable income for those with a final positive tax liability). 'Income tax' includes tax on lump sums, in this table.

Source: authors' calculations using SAMOD v7.5 and PITMOD v3.1 using 10 per cent dataset.

5 Results of the modelled reform scenarios

5.1 Results using PITMOD (working age population)

Changes in final income

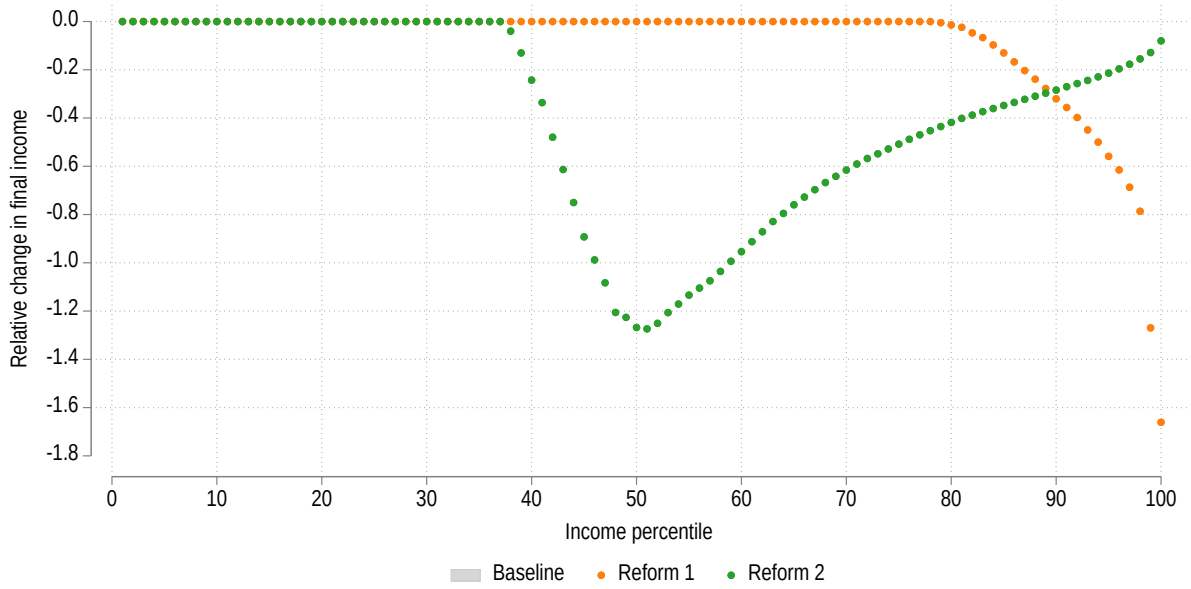
Figure 5 shows how net final income levels change after introducing Reforms 1 and 2 separately. Results are shown in relative terms as percentage change of the baseline final income levels.

Reform 1 is clearly a progressive tax reform with higher relative losses for individuals with higher incomes, ranging between 0.01 per cent for the 80th percentile and 1.7 per cent for the richest 1 per cent. Thus, changes are generally quite modest and only affect the top 20 per cent of the distribution.

The design of Reform 2 is, by definition, not progressive as it aims at bringing in new taxpayers from the lower end of the income distribution. The reform not only affects a larger share of individuals (60 per cent) but also affects the middle of the distribution more than the top, when expressed as a percentage change of final income. In particular, individuals with taxable incomes around the baseline minimum tax threshold are more affected than other income groups as a larger share of income is now taxed due to the tax reform. Individuals in the 46th up to the 60th percentile have the highest relative losses of around 1 per cent. The U-shape of net income losses

is driven by the relative lower relevance of the primary tax rebate at the top of the income distribution.[18]

Figure 5: Relative change in final income (percentage of baseline)—Reform 1 and 2



Note: income percentiles are based on original income.

Source: authors' calculations using PITMOD v3.1.

Figure 6 shows the same results but separately for each reform, now also showing the combined effect of Reforms 1 and 2 in Reform 3, as well as how results change after considering behavioural responses.[19]

The static effects of Reform 3 (i.e. income changes without behavioural responses) show the combined effect of final income reductions of Reforms 1 and 2. While effects are very similar to those of Reform 2 for the bottom 80 per cent, income losses for the top 20 per cent are more pronounced in Reform 3 than in Reform 1. This is due to the top part of the distribution being affected by both reforms, even if effects of Reform 2 are comparably small.

Across reforms, effects are more pronounced after taking into account behavioural responses. All three reforms weaken the incentive to work leading to more pronounced income reductions after taking into account behavioural responses. Based on the estimations by Kemp (2020), such responses are much more pronounced in higher income groups and, thus, affect income changes at the top income percentiles in Reforms 1 and 3 more than lower income groups in Reforms 2 and 3. After considering behavioural responses, the 99th percentile has the highest decrease in final income with close to 3.5 per cent due to their incomes being affected by the lowering of the top income threshold.

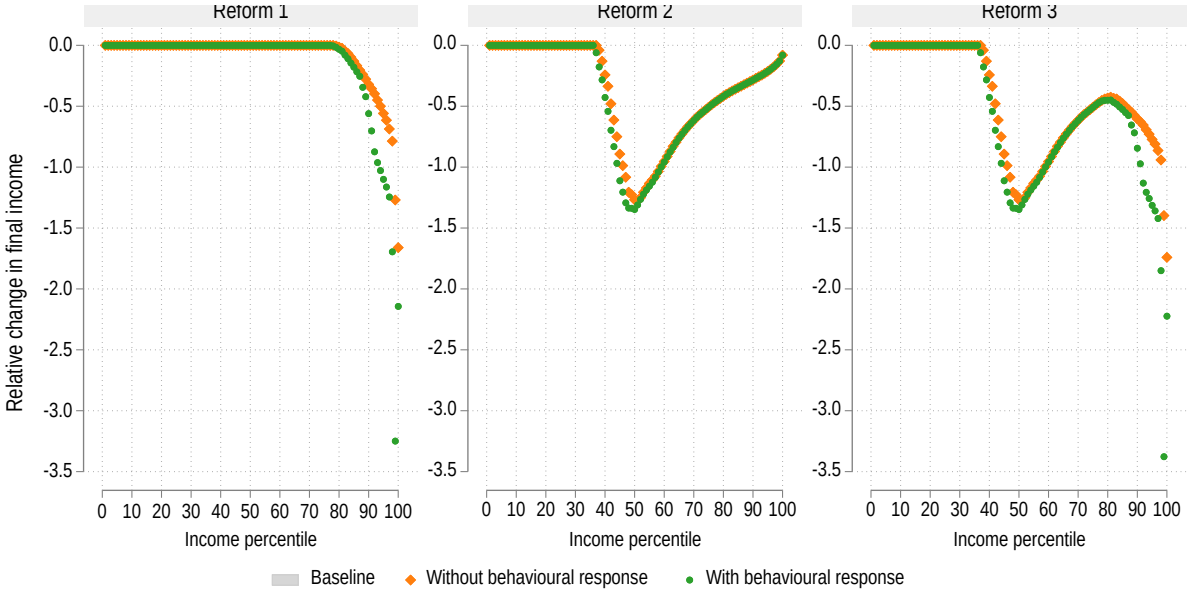
Tax payers below the current minimum tax threshold are low wage earners and, therefore, their ability to restructure their income for tax purposes is negligible. In contrast, high-income earners

[18] See also Appendix Figure A2.2 showing the change in MTR by percentile of original income for Reforms 1 and 2.

[19] See Appendix Figure A3.1 for results on relative change in final income after considering behavioural response by reform and sensitivity scenario.

may restructure their income, for example, by opting to receive dividends instead of salary income if they earn business income.

Figure 6: Relative change in final income (percentage of baseline) by reform scenarios (with and without behavioural response)



Note: income percentiles are based on original income.

Source: authors' calculations using PITMOD v3.1.

Changes in average tax rates

This section depicts similar results but from the perspective of average tax rates. Average tax rates are expressed as the share of original incomes that is taxed away.

Figure 7 compares the average tax rates of Reforms 1 and 2 (orange and green dots) to the average tax rates in the baseline (grey bars).[20] The baseline results highlight the progressivity of the current PIT system in South Africa. Average tax rates steadily increase with increasing incomes up to a level of 32 per cent for the top income percentile. While tax rates are very low (zero or close to zero) for the bottom 50 per cent, they increase to 5 per cent around the 59th percentile, 10 per cent at the 73rd percentile, 15 per cent at the 86th percentile, and 20 per cent at the 94th percentile. Overall, average tax rates are still relatively moderate for higher income groups.

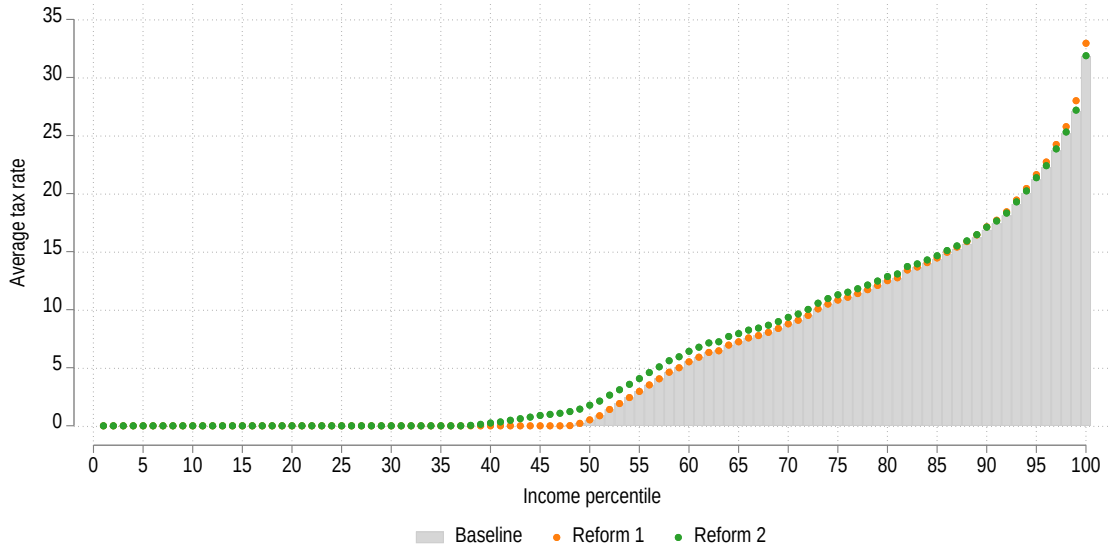
Increases in tax rates in Bands 4–6 in Reform 1 lead to small increases in average tax rates. However, these increases are below 1 per cent for the 83rd to the 98th percentile and around 1 per cent for the two highest income percentiles. The lowering of the threshold of the top income band to R1 million plays a relatively small role in these results as most taxable incomes are below the new threshold.

Increases due to Reform 2 are equally small but affect individuals further down the income distribution. The new taxpayers who are brought in by lowering the minimum tax threshold to R55,000 only pay a very small level of average tax as they are only being taxed at a marginal rate of 5 per cent on income above R55,000. The average tax rate increases by around 1 per cent for

[20] See also Appendix Figure A3.2 for results on average tax rates after behavioural response by income percentile and sensitivity scenario.

the 46th up to the 60th percentile. Increases for the top 40 per cent are smaller and especially small for the top 5 per cent with less than 0.20 per cent.

Figure 7: Average tax rates by income group—baseline versus Reforms 1 and 2



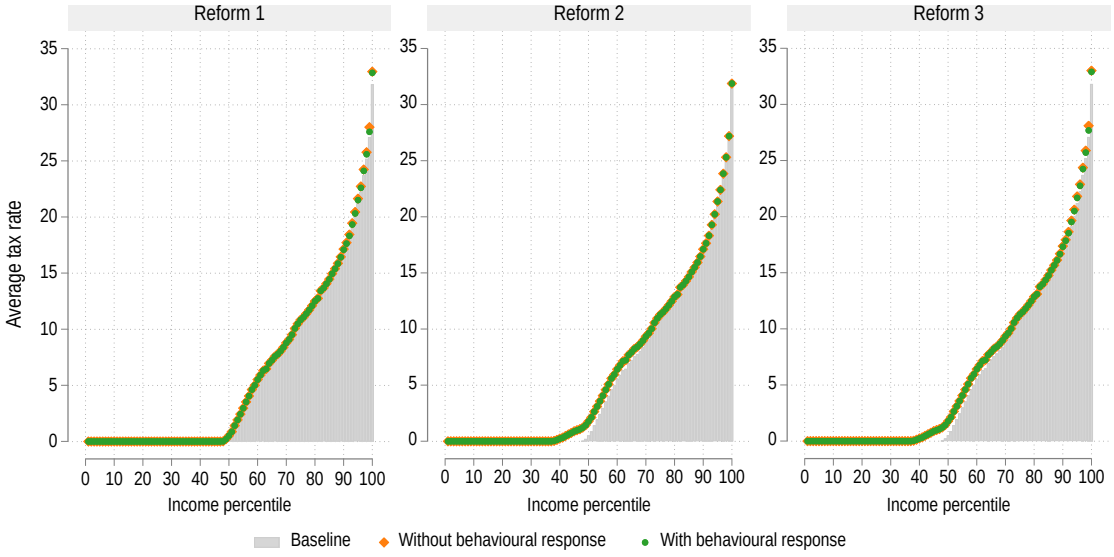
Note: income percentiles are based on original income.

Source: authors' calculations using PITMOD v3.1.

Figure 8 shows the same results but now separately for each reform scenario and including behavioural effects. The static increases of average tax rates in Reform 3 are the cumulative effect of Reforms 1 and 2 due to their additive design.

Behavioural responses result in smaller increases in average tax rates for the top 20 per cent in Reform 1 whereas they have very little impact on average tax rates in Reform 2. The same is true for the combined effect in Reform 3 where only higher income groups show behavioural responses.

Figure 8: Average tax rates by income percentile—baseline versus reform scenarios (with and without behavioural response)



Note: income percentiles are based on original income.

Source: authors' calculations using PITMOD v3.1.

Changes in the redistributive effects and progressivity of the tax system

While average tax rates provide an overview of the tax burden along the income distribution, this section complements the analysis by assessing the redistributive effects and progressivity of the tax system using aggregated indicators (see Table 7).[21]

The first set compares the Gini based on original incomes with the Gini based on final incomes. It highlights again the high inequality in original incomes and shows the comparably low impact of the tax system in the baseline. This situation is not changed by the tested reform scenarios, independent of static or behavioural results. The high inequality of market incomes makes it very difficult to improve the Gini solely through tax reforms as this would require a significant increase in average tax rates for the top 20 percentiles.

This is also reflected in the Reynolds–Smolensky index, which is the difference between the two Ginis but can also be decomposed into vertical equity and re-ranking effect. The PIT system in South Africa leads to very small or no re-ranking effects and this is still the case in the reform scenarios. Instead, inequality is driven by the lack of income vertical equity. This is measured as a combination of the Kakwani index—a measure of progressivity—and the average tax rate. Both are not significantly affected by the reforms.

The progressivity capacity index (i.e. the Kakwani index calculated on hypothetical data) is lower than the Kakwani index calculated on actual micro data and suggests an even lower level of progressivity of the South African PIT system. However, this is based on an income range that is much smaller than the real range in South Africa (excluding the top incomes). In any case, reform scenarios have a very small impact on the results.

Table 7: Overview of redistributive and progressivity indicators

		Without behavioural response			With behavioural response		
	Baseline	Reform 1	Reform 2	Reform 3	Reform 1	Reform 2	Reform 3
Gini original incomes	0.640	0.640	0.640	0.640	0.638	0.640	0.638
Gini final incomes	0.600	0.598	0.600	0.599	0.597	0.600	0.598
Vertical equity	0.040	0.042	0.040	0.041	0.041	0.040	0.041
Kakwani index	0.198	0.199	0.191	0.192	0.200	0.191	0.193
Average tax rate*	0.169	0.173	0.172	0.176	0.171	0.172	0.175
Re-ranking	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Reynolds–Smolensky index	0.040	0.041	0.040	0.041	0.041	0.040	0.041
Progressivity capacity	0.112	0.114	0.108	0.110	0.114	0.108	0.110

Note: average tax rate in this table refers to the aggregated tax rate calculated based on the aggregated sum of original and final incomes. Differences between without behavioural response and with behavioural response in Reform 2 are different from zero but very small.

Source: authors' calculations using PITMOD v3.1.

Changes in MTRs

Changes in the tax system may lead to behavioural changes in labour supply. MTRs show to what extent individuals are incentivized to work more or to earn more and, thus, provide information

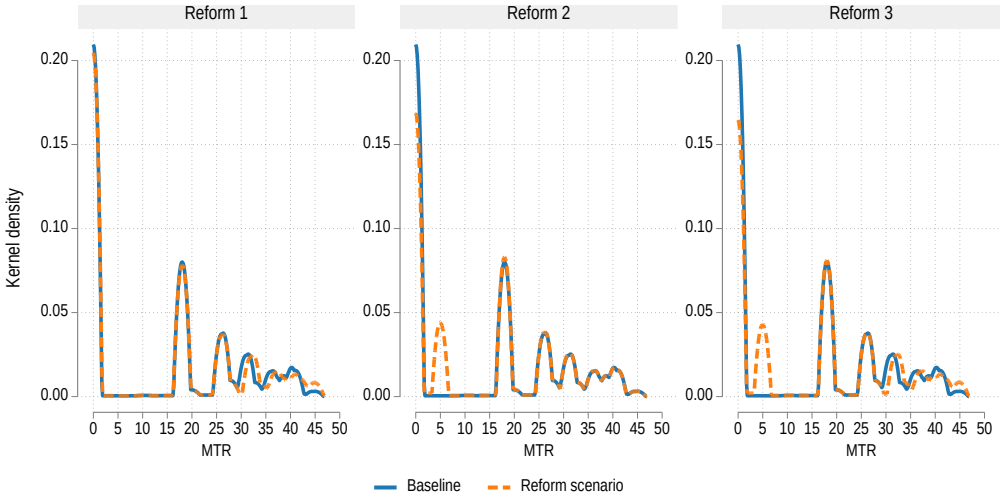
[21] See also Appendix Table A3.1 for an overview of redistributive and progressivity indicators after behavioural response by sensitivity scenario.

about the intensive margin of labour supply. They measure to what extent increases in incomes are taxed away by the PIT system. Ideally, tax reforms should not lead to high increases in MTRs.

Figure 9 shows the distribution of MTRs, comparing the distribution of each reform scenario to the distribution in the baseline. The baseline distribution shows a very high concentration of individuals with zero MTRs. This is still the case in Reform 1 but is reduced in Reforms 2 and 3 with a higher share of individuals moving to MTRs of around 5 per cent. Other changes to the distribution are observed in Reforms 1 and 3, which slightly shift the distribution towards a higher concentration of higher MTRs. Still, overall, changes to MTRs are small across reforms. (See Appendix Table A2.3 for an overview of MTRs for the baseline and Reforms 1–3.)

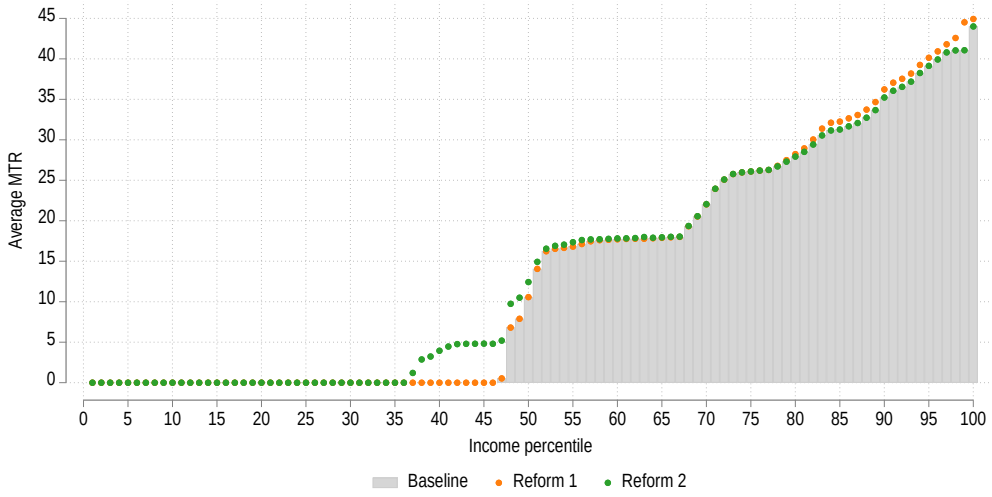
Figure 10 shows how average MTRs change across income percentiles, comparing the baseline with Reforms 1 and 2. It highlights that the shift from 0 to 5 per cent MTRs in Reform 2 is driven by the new taxpayers. Other groups are only affected by very small increases. The shift from relatively high MTRs to even higher MTRs in Reforms 1 and 3 is driven by the top 20 per cent income groups and is especially high for the 99th percentile due to lowering the top tax threshold.

Figure 9: Distribution of marginal tax rates by reform scenarios



Source: authors' calculations using PITMOD v3.1.

Figure 10: Average marginal tax rates by income group—baseline versus Reforms 1 and 2



Note: income percentiles are based on original income.

Source: authors' calculations using PITMOD v3.1.

Changes in revenue

This final section focuses on the estimated revenues that are additionally generated by the reforms. Table 8 shows the overall change in billion South African Rand as well as the relative change in percentage of the baseline revenues.[22]

The total PIT revenues simulated in the baseline are R483 billion in 2020. This is increased by R9.1 billion in Reform 1, R8.8 billion in Reform 2, and R17.9 billion in Reform 3, resulting in increases of 1.9, 1.8, and 3.7 per cent, respectively.

After taking into account behavioural responses, increases are much lower for Reforms 1 and 3, reducing the increases to 0.8 and 2.6 per cent, respectively. Behavioural responses to Reform 2 are generally smaller and less significant in terms of size of revenues due to the lower tax burden of the affected lower income percentiles.

Table 8: Total PIT revenues and changes in revenues from PIT

		Without behavioural response			With behavioural response		
	Baseline	Reform 1	Reform 2	Reform 3	Reform 1	Reform 2	Reform 3
Total in ZAR billion	482.83	491.95	491.61	500.73	486.75	491.59	495.51
Change in ZAR billion		9.12	8.77	17.89	3.92	8.76	12.68
Change in percentage		1.89	1.82	3.71	0.81	1.81	2.63

Source: authors' calculations using PITMOD v3.1.

5.2 Results using SAMOD

Using SAMOD, it is possible to estimate the impact of the modelled reforms on PIT revenue and expenditure on benefits, and on poverty and inequality for the whole population of South Africa. All results presented in this section are based on equivalized household incomes (household per capita incomes) whereas PITMOD results are based on a per-person definition.

Table 9 shows additional PIT revenues of R7 billion for Reform 1, just under R10 billion for Reform 2, and almost R17 billion for Reform 3. For reasons set out in Section 4.3, these estimates are less accurate than those generated using PITMOD presented in Table 8, though they follow the same pattern.

Reform 1 has no impact on benefit receipt apart from a very small increase in expenditure on the disability grant. Reforms 2 and 3 each result in an overall increase in expenditure on benefits of R131 million, due to simulated increases in receipt of the child support grant (R75 million), disability grant (around R9 million), and old age grant (R46.5 million) as a result of the changes made to the PIT schedule.

The reforms have no impact on poverty using the lower bound poverty line, nor on the poverty gap (not shown).

Using the upper bound poverty line, Reform 1 has no impact on poverty, whereas Reforms 2 and 3 increase poverty very slightly, by much less than 1 percentage point. By sub-group (male- and

[22] See also Appendix Table A3.2 for results on total PIT revenues and changes in revenues from PIT after behavioural response by sensitivity scenario.

female-headed households, households containing children, households containing older person(s)—not shown in the table), Reform 1 has no impact on poverty, and Reforms 2 and 3 increase poverty by at most 0.13 percentage points (for households containing older person(s)).

Table 9: Simulated reforms using SAMOD for tax year 2020

	Baseline	Reform 1	Difference (Reform 1−baseline)	Reform 2	Difference (Reform 2−baseline)	Reform 3	Difference (Reform 3−baseline)
Revenue from direct taxes (ZAR billion)	543.58	550.70	7.12	553.44	9.86	560.55	16.97
Expenditure on benefits (ZAR billion)	198.36	198.36	0.00	198.49	0.13	198.49	0.13
Percentage of population below upper bound poverty line	45.05	45.05	0.00	45.14	0.08	45.14	0.08
Percentage of population below lower bound poverty line	30.28	30.28	0	30.28	0	30.28	0
Poverty gap (upper bound poverty line)	21.39	21.39	0.00	21.40	0.01	21.40	0.01
Gini (household income)	0.647	0.646	−0.001	0.647	0.000	0.646	−0.001
P80/P20	7.28	7.28	0.00	7.24	−0.04	7.24	−0.04

Note: lower bound poverty line R9,720 per year. Upper bound poverty line R14,724 per year (Stats SA 2019). The poverty gap (using the upper bound poverty line) measures the extent to which individuals fall below the poverty line as a proportion of the poverty line.

Source: authors' calculations using SAMOD v7.5.

Still using the upper bound poverty line, Reform 1 has no impact on the poverty gap and Reforms 2 and 3 have a negligible impact. Reforms 1–3 have almost no impact on inequality, whether measured using the Gini coefficient or the P80/20 ratio, though Reform 3 has the most impact, reducing the Gini coefficient very slightly from 0.647 to 0.646.

Redistributing the new revenue to the benefit system

Although the reforms have limited impact on inequality, the additional revenue generated could be redistributed to the benefit system. For example, the increase in PIT revenue under Reform 3 (see Table 8) could be used to increase the amount of the child support grant by R70 per month from R430 (October 2019) to R500. Simulations using SAMOD (see Appendix Table A2.4) show that this would result in a decrease in poverty of just over 1 percentage point using the upper bound poverty line (UBPL) and comparing to the baseline. The impact on poverty would be slightly greater when using the lower bound poverty line (LBPL) or food poverty line (FPL) (a decrease of 1.1 and 1.4 percentage points, respectively). This would mean that approximately 588,000 people would be taken out of poverty using the UBPL, or 605,000 people using the LBPL or 787,000 people using the FPL.

For households with children and female-headed households, the decrease would be 1.4 percentage points when using the UBPL and 1.9 percentage points when using the FPL. For households with older persons (aged 60 years or over), the decrease would be just over 0.5 percentage points when using the UBPL and 2.6 percentage points when using the FPL. Inequality measured using the Gini coefficient would decrease from 0.647 to 0.641.

6 Concluding remarks

In this paper we have explored options for deepening and broadening the PIT base. Three hypothetical reforms were applied in the static microsimulation model, PITMOD, for the 2020 tax year.

In Reform 1 the tax base was deepened by expanding the top tax band to include taxable incomes of R1 million or more (rather than R1.5 million or more in the baseline). Additionally, the tax rates of Bands 3, 4, 5, and 6 were each increased by 1 percentage point (see Table 4). The objective of this reform was to augment tax revenue without raising the maximum tax rate in the top band. Reform 1 only affected income groups with taxable incomes above R305,851—the top 20 per cent of the income distribution of tax-registered individuals—as tax rates below the third income tax band remained unchanged.

In Reform 2 the tax base was broadened by incorporating additional tax-registered individuals into the tax net by lowering the minimum tax threshold from R79,000 to R55,000 per year. Additionally, a new tax band was introduced for incomes between R55,001 and R79,000, with a tax rate of 5 per cent, and the primary tax rebate was reduced from R14,220 to R2,750 (see Table 4). The net impact of these changes for the new entrants (individuals with taxable incomes between R55,000 and R79,000—located between the 39th and 49th percentiles of taxable incomes of tax-registered individuals) is that their maximum tax liability was R1,200 per year. Those with incomes below R55,000 per year (spanning the 1st to the 38th percentile of taxable incomes of tax-registered individuals) retained their zero tax liability. In 2020, the maximum salary from the NMW was R38,000 per year, which is around the 27th percentile of taxable incomes of tax-registered individuals and still falls far below the new minimum tax threshold. Individuals who already had a tax liability in the baseline (and so had taxable incomes above R79,000) gained an additional tax liability of R1,200 per year, as the reduced rebate was almost entirely counterbalanced by the first R55,000 of income being taxed at just 5 per cent. The primary objective of this reform was to bring additional taxpayers into the net but without a sudden transition into a tax rate of 18 per cent.

Reform 3 combined Reforms 1 and 2, to measure the combined effect of these changes.

The three reforms had only a small impact on average tax rates across the distribution of taxable incomes of tax-registered individuals (see Figures 7 and 8). Reform 1 led to small increases in average tax rates, of below 1 per cent for the 83rd to the 98th percentile and around 1 per cent for the two highest income percentiles. Reform 2 led to small increases for the 39th to 49th percentiles (which were below the minimum tax threshold in the baseline), and up to the 60th percentile, while increases for the top 40 per cent were smaller and especially small for the top 5 per cent. All three reforms had only a small impact on MTRs, and a negligible impact on eight different measures of progressivity of the tax system.

The three reforms are not prescriptive but do imply that it is possible to adjust the tax schedule to broaden the tax base without prejudicing the progressivity of the system. Reforms 1 and 3 increased the number of individuals aged 18–64 years with a tax liability by 1,436,000 (or 22 per cent). All three reforms deepened the tax base by achieving higher revenues, but again without prejudicing the progressivity of the system. Reforms 1–3 raised additional PIT revenues of R9.1 billion, R8.8 billion, and R17.9 billion, respectively. When adjustments were made for behavioural responses to the reforms, the revenues for Reforms 1 and 3 fell to R3.9 billion and R12.7 billion, respectively, but the revenue from Reform 2 was unaffected.

Using SAMOD, a tax–benefit microsimulation model underpinned by nationally representative data for the population of South Africa, the three reforms were found to have no impact on poverty using the LBPL. Although poverty increased very slightly for Reforms 2 and 3 using the UBPL, the increase was by less than 0.1 percentage point. It was further demonstrated that if the most modest estimate of PIT revenue for Reform 3 (taking into account behavioural responses) was ploughed back into the benefit system by topping up the payment amounts of the monthly child support grant, the poverty rate would fall using either the LBPL or the UBPL.

Importantly, the administration and compliance cost of having more taxpayers should be minimal. This is because SARS's electronic filing system has in recent years been improved to include the assessment of all wage earners, whereas previously individuals with a salary income below R500,000 per annum were not required to submit a tax return.

The timepoint of the study pre-dates the COVID-19 pandemic, and subsequent changes to the labour market and the PIT schedule. It also predates the introduction of the 'social relief of distress' grant for low- or no-income people of working age. When newer datasets for PITMOD come on stream, it is recommended that this analysis is repeated to assess whether these reforms would have a similar impact in 2023. Updates to the SAMOD analysis would ideally use a new nationally representative survey as NIDS Wave 5 is increasingly out-of-date, but it is not known when a new wave will be conducted or the forthcoming 2022/23 Income and Expenditure Survey.

Additionally, this study considered only behavioural responses at the intensive margin. There is scope to explore possible behavioural responses at the extensive margin that might arise from bringing low-income wage earners into the tax base, such as an incentive to move to the shadow economy.

To conclude, and as highlighted at the outset of this paper, any reforms to the PIT schedule are politically sensitive and would require extensive scrutiny and consultation before being implemented. This paper provides examples of potential reforms that would deepen and broaden the tax base without jeopardizing the progressivity of the system. The behavioural adjustments for tax payers' responses to the reforms suggest that they would not have a deleterious effect on the labour market, although the incomes of those at the top of the distribution may decline slightly if their taxes are raised. Furthermore, if the additional PIT revenue was ploughed back into the benefit system it would help to reduce poverty, which is an urgent priority for the country.

References

Abdel-Kader, K., and R.A. de Mooij (2020). 'Tax Policy and Inclusive Growth'. IMF Working Paper WP/20/271. Washington, DC: International Monetary Fund (IMF). Available at https://www.imf.org/en/Publications/WP/Issues/2020/12/04/Tax-Policy-and-Inclusive-Growth-49902 (accessed June 2023).

Barnes, H., D. McLennan, and M. Noble (2023). User Manual—PITMOD—A Microsimulation Model of South Africa's Personal Income Tax Policy, Version 3.1. [For more information about PITMOD, please contact sarsmedia@sars.gov.za.]

Bell, P.B. (2020). 'Taxpayer Responsiveness to Taxation: Evidence from Bunching at Kink Points of the South African Income Tax Schedule'. WIDER Working Paper 2020/68. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/2020/825-2

Businesstech (2023). 'South Africa's Tax Base Isn't Shrinking: SARS'. 24 February 2023. Available at https://businesstech.co.za/news/finance/667817/south-africas-tax-base-isnt-shrinking-sars/ (accessed December 2023).

Cohen, T. (2021). 'Here's Why a Wealth Tax Is a Stunningly Poor Idea for South Africa'. *Daily Maverick*, 24 January 2021. Available at: https://www.dailymaverick.co.za/opinionista/2021-01-24-heres-why-a-wealth-tax-is-a-stunningly-poor-idea-for-south-africa (accessed 14 July 2023).

DTC [Davis Tax Committee] (2014). *The Tax System and Inclusive Growth in South Africa: Towards an Analytical Framework for the Davis Tax Committee.* Discussion Document June 2015. First Interim Report on Macro Analysis for the Minister of Finance. Pretoria: DTC. Available at: https://www.taxcom.org.za/docs/20150605%20DTC%20First%20Macro%20Analysis%20Report%20-%20Full%20Report.pdf (accessed November 2023).

Donaldson, A. (2023). 'The South African Personal Income Tax Base, 2011–2018: Income and Taxable Income, Adjusted for Retirement Fund and Medical Expense Reporting Changes'. WIDER Working Paper 2023/43. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/2023/351-2

Figari, F., and G. Verbist (2014). 'The Redistributive Effect and Progressivity of Taxes Revisited: An International Comparison across the European Union'. *FinanzArchiv*, 70(3): 405–29. https://doi.org/10.1628/001522114X684529

Gerber, C., A. Klemm, L. Liu, and V. Mylonas (2018). 'Personal Income Tax Progressivity: Trends and Implications'. IMF Working Paper 18/246, November 2018. Available at: https://www.imf.org/en/Publications/WP/Issues/2018/11/20/Personal-Income-Tax-Progressivity-Trends-and-Implications-46332 (accessed November 2023).

Goldman, M., and I. Woolard (2022). 'How Effective Is Income Tax in Reducing Inequality in SA?' Econ3x3 paper. Available at: https://www.econ3x3.org/sites/default/files/articles/Goldman%2C%20M%20%26%20Woolard%2C%20I_Income%20Tax%20Inequality_Jun22.pdf (accessed November 2023).

Immervoll, H., H.J. Kleven, C.T. Kreiner, and E. Saez (2007). 'Welfare Reform in European Countries: A Microsimulation Analysis'. *The Economic Journal*, 117(516): 1–44. https://doi.org/10.1111/j.1468-0297.2007.02000.x

Institute for Social and Economic Research, University of Essex and Joint Research Centre, European Commission (2022). EUROMOD: Version 3.5.8 (software).

IMF (2013). *Fiscal Monitor October 2013: Taxing Times.* Washington, DC: International Monetary Fund (IMF).

Jara, H.X., and A. Tumino (2013). 'Tax–Benefit Systems, Income Distribution and Work Incentives in the European Union'. *International Journal of Microsimulation*, 6(1): 27–62. https://doi.org/10.34196/ijm.00076

Jara, H.X., K. Gasior, and M. Makovec (2020). 'Work Incentives at the Extensive and Intensive Margin in Europe: The Role of Taxes, Benefits and Population Characteristics'. *Social Indicators Research*, 152: 705–78. https://doi.org/10.1007/s11205-020-02462-0

Jordaan, Y., and N.J. Schoeman (2018). 'The Benefit of Aligning South Africa's Personal Income Tax Thresholds and Brackets with that of Its Peers Using a Micro-Simulation Tax Model', *South African Journal of Economic and Management Sciences*, 21(1): 1–9. https://doi.org/10.4102/sajems.v21i1.1650

Kakwani, N.C. (1977a). 'Measurement of Tax Progressivity: An International Comparison'. *Economic Journal*, 87: 71–80. https://doi.org/10.2307/2231833

Kakwani, N.C. (1977b). 'Application of Lorenz Curves in Economic Analysis'. *Econometrica*, 45: 719–72. https://doi.org/10.2307/1911684

Kemp, J.H. (2019). 'The Elasticity of Taxable Income: The Case of South Africa'. *South African Journal of Economics*, 87(4): 417–49. https://doi.org/10.1111/saje.12232

Kemp, J.H. (2020). 'The Elasticity of Taxable Income: New Data and Estimates for South Africa'. WIDER Working Paper 2020/29. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/2020/786-6

Manuel, T. (2002). 'The South African Tax Reform Experience Since 1994'. Address by the Honourable Trevor A Manuel, MP, Minister of Finance, South Africa. Annual Conference of the International Bar

Association, Thursday, 24 October 2002. Available at: https://www.treasury.gov.za/comm_media/speeches/2002/2002102501.pdf (accessed November 2023).

McNabb, K. (2022). *The TaxDev Employment Income Taxes Dataset (Africa): Technical Guide v1.0*. London: ODI Available at: https://odi.org/en/publications/the-taxdev-employment-income-taxes-dataset-and-technical-guide (accessed November 2023).

McNabb, K., and H. Granger (2022). 'Employment Income Tax in Africa. Findings from a New Dataset'. ODI Working Paper 619. London: ODI. Available at: https://odi.org/en/publications/employment-income-tax-in-africa-findings-from-a-new-dataset/ (accessed November 2023).

Ministry of Finance (2013). 'Minister Gordhan Announces Further Details of the Tax Review Committee and the Terms of Reference'. Media Statement, 17 July. Pretoria: Ministry of Finance, Republic of South Africa. Available at: http://www.treasury.gov.za/TaxReviewCommittee/ (accessed 27 April 2021).

Mirrlees, J., S. Adam, T. Besley, R. Blundell, S. Bond, R. Chote, M. Gammie, P. Johnson, G. Myles, and J.M. Poterba (2011). *Tax by Design*. Oxford: Oxford University Press. Available at: https://ifs.org.uk/books/tax-design (accessed November 2023).

Musgrave, R., and T. Thin (1948). 'Income Tax Progression, 1929–48'. *Journal of Political Economy*, 56(6): 498–514. https://doi.org/10.1086/256742

National Treasury (2021). *Budget Review 2021*. Pretoria, Republic of South Africa: National Treasury. Available at: https://www.treasury.gov.za/documents/national%20budget/2021/review/FullBR.pdf (accessed July 2023).

National Treasury and SARS (2023). 'Tax Statistics 2022'. Pretoria, South Africa: National Treasury and South African Revenue Service. Available at: https://www.sars.gov.za/wp-content/uploads/Docs/TaxStats/2022/TStats-2022-a.pdf (accessed July 2023).

Neisser, C. (2021). 'The Elasticity of Taxable Income: A Meta-Regression Analysis'. *The Economic Journal*, 131(640): 3365–91. https://doi.org/10.1093/ej/ueab038

OECD (2021). 'Glossary of Tax Terms'. *OECD Web Archive*. Available at: https://web-archive.oecd.org/2021-02-12/78005-glossaryoftaxterms.htm (accessed November 2023).

Ollonqvist, J., J. Tervola, J. Pirttiä, and T.O. Thoresen (2021). 'The Distributional Effects of Tax–Benefit Policies: A Reduced Form Approach with Application to Finland'. THL discussion Paper 1/2021. Helsinki: Finnish Institute for Health and Welfare. Available at: https://www.julkari.fi/bitstream/handle/10024/140916/URN_ISBN_978-952-343-609-1.pdf (accessed November 2023).

Peichl, A., and P. Van Kerm (2007). 'PROGRES: STATA Module to Measure Distributive Effects of an Income Tax'. Statistical Software Components, S456867. Boston College Department of Economics.

PEJD Group (Pietermaritzburg Economic Justice & Dignity Group) (2020). *Housing Affordability Index: February 2020*. Pietermaritzburg, South Africa: PEJD Group and Heinrich Böll Foundation. Available at https://pmbejd.org.za/wp-content/uploads/2020/02/February-2020-Household-Affordability-Index-PMBEJD.pdf (accessed July 2023).

Rasmussen, E.H. (2017). Increasing Progressivity in South Africa's Personal Income Tax System. Thesis for the degree of Master of Commerce. Cape Town: University of Cape Town. Available at: https://open.uct.ac.za/items/e8f479be-9f55-4281-a097-5fbd53111160 (accessed November 2023).

Reynolds, M., and E. Smolensky (1977). *Public Expenditures, Taxes, and the Distribution of Income: The United States, 1950, 1961, 1970*. New York: Academic Press.

RSA (Republic of South Africa) (1996). Constitution of the Republic of South Africa. Available at: https://www.justice.gov.za/legislation/constitution/SAConstitution-web-eng.pdf (accessed December 2023).

Saez, E., J. Slemrod, and S.H. Giertz (2012). 'The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review'. *Journal of Economic Literature*, 50(1): 3–50. https://doi.org/10.1257/jel.50.1.3

SALDRU (2018). 'National Income Dynamics Study 2017'. Wave 5 [dataset], version 1.0.0. Pretoria: Department of Planning, Monitoring, and Evaluation [funding agency]. Cape Town: Southern Africa Labour and Development Research Unit [implementer]. Cape Town: DataFirst [distributor]. https://doi.org/10.25828/fw3h-v708

SARS (2019). *Budget 2019 Tax Guide*. Pretoria: SARS. Available at: https://www.sars.gov.za/wp-content/uploads/Docs/Budget/2019/Budget-Tax-Guide-2019.pdf (accessed December 2023).

SARS (2023a). 'Medical Credits'. Pretoria: South African Revenue Service. Available at: https://www.sars.gov.za/types-of-tax/personal-income-tax/medical-credits/ (accessed December 2023).

SARS (2023b). 'Additional Medical Expenses Tax Credits'. Pretoria: South African Revenue Service. Available at: https://www.sars.gov.za/types-of-tax/personal-income-tax/additional-medical-expenses-tax-credit/ (accessed December 2023).

SARS (2023c). 'IT-AE-36-G05—Comprehensive Guide to the Income Tax Return for Individuals'. Pretoria: South African Revenue Service. Available at: https://www.sars.gov.za/wp-content/uploads/Ops/Guides/IT-AE-36-G05-Comprehensive-Guide-to-the-ITR12-Income-Tax-Return-for-Individuals-External-Guide.pdf (accessed December 2023).

SARS (2023d). 'PAYE-AE-06-G06—Guide for Codes Applicable to Employees Tax Certificates 2019'. Pretoria: South African Revenue Service. Available at: https://www.sars.gov.za/wp-content/uploads/Ops/Guides/PAYE-AE-06-G06-Guide-for-Codes-Applicable-to-Employees-Tax-Certificates-2024-External-Guide.pdf (accessed December 2023).

Shine, M., C. Clark, R. Tonkin, and D. Webber (2019). *Using Tax Data to Better Capture Top Earners in Household Income Inequality Statistics*. London: Office for National Statistics. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/articles/usingtaxdatatobettercapturetopearnersinhouseholdincomeinequalitystatistics/2019-02-26 (accessed November 2023).

Smith, T. (2000). Women and Tax in South Africa. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.379.6701&rep=rep1&type=pdf (accessed November 2023).

Stats SA (2017). 'Living Conditions of Households in South Africa: An Analysis of Household Expenditure and Income Data Using the LCS 2014/2015'. Statistical Release P0310 (2015). Pretoria: Statistics South Africa. Available at: https://www.statssa.gov.za/publications/P0310/P03102014.pdf (accessed November 2023).

Stats SA (2019). 'National Poverty Lines'. Statistical Release P0310.1. Pretoria: Statistics South Africa. Available at: https://www.statssa.gov.za/publications/P03101/P031012021.pdf (accessed November 2023).

Stats SA (2020). 'Quarterly Employment Statistics (QES)'. Statistical Release P0277 (June 2020). Pretoria: Statistics South Africa. Available at: https://www.statssa.gov.za/publications/P0277/P02772ndQuarter2020.pdf (accessed November 2023).

Stats SA (2023). 'Quarterly Labour Force Survey. Quarter 4: 2022'. Statistical Release P0211 (May 2023). Pretoria: Statistics South Africa. Available at: https://www.statssa.gov.za/publications/P0211/P02114thQuarter2022.pdf (accessed November 2023).

Steenekamp, T.J. (2012). 'The Progressivity of Personal Income Tax in South Africa Since 1994 and Directives for Tax Reform'. *South African Business Review*, 16(1): online. Available at: https://www.ajol.info/index.php/sabr/article/view/85455 (accessed 3 June 2021).

Steyn, W., W. Ngobeni, and A. Jansen (2022). 'Personal Income Tax Reform to Support Inclusive Growth: A Case Study of South Africa'. Paper presented at Global Development Conference: 'Tax Policy for Sustainable Development', Clermont-Ferrand, France, 2–4 November 2022.

Steyn, W., A. Sithole, W. Ngobeni, E. Muwanga-Zake, H. Barnes, M. Noble, D. McLennan, G. Wright, and K. Gasior (2021). 'Simulating Personal Income Tax in South Africa Using Administrative Data and Survey Data: A Comparison of PITMOD and SAMOD for Tax Year 2018'. WIDER Working Paper 2021/120. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/2021/060-3

Sutherland, H. (2001). 'EUROMOD: An Integrated European Benefit–Tax model—Final Report'. EUROMOD Working Paper EM9/01. Colchester, UK: University of Essex.

Sutherland, H., and F. Figari (2013). 'EUROMOD: The European Union Tax–Benefit Microsimulation Model'. *International Journal of Microsimulation*, 6(1): 4–26. https://doi.org/10.34196/ijm.00075

Tanzi, V., and H. Zee. (2001). *Tax Policy for Developing Countries*. Economic Issues Series, 27pp. Washington, DC: International Monetary Fund. https://doi.org/10.5089/9781589060210.051

Wilkinson, K. (2009). 'Adapting EUROMOD for Use in a Developing Country—The Case of South Africa and SAMOD'. EUROMOD Working Paper EM5/09. Colchester, UK: University of Essex. Available at: https://www.econstor.eu/bitstream/10419/64902/1/600747654.pdf (accessed November 2023).

World Bank (2023). 'GDP Per Capita (Current LCU)—South Africa'. *World Development Indicators*. Available at: https://databank.worldbank.org/source/world-development-indicators/Series/NY.GDP.PCAP.KN (accessed December 2023).

Wright, G., and M. Mpike (2021). 'A South African Tax and Benefit Microsimulation Model'. In S. Motala, S. Ngandu, and T. Hart (eds), *Social Security Review 2021: Evolution of Social Security in South Africa—An Agenda for Action* (pp. 92–97). Pretoria: Department of Social Development.

Appendix 1: Components of PITMOD

The different components of the relevant PIT legislation are represented by separate modules or 'policies' (EUROMOD terminology) within the PITMOD model, as summarized in Appendix Table A1.

Table A1: Policies in PITMOD

Policy name	Scope of the policy
Framework	
uprate	Defining uprating factors
tudef	Defining assessment units
Income	
inc_employee	Summing the different elements of employee income (before deductions)
inc_business	Adding together local (profit–loss) and foreign business income
inc_farming	Adding together local and foreign farming income (profit–loss)
inc_interest	Applying income exemption thresholds to income from interest
inc_dividends	Adding local and foreign income from dividends after applying partial exemption to foreign income
inc_capital_gains	Calculating taxable capital gains
inc_rental_income	Calculating local and foreign rental income (profit–loss)
Deductions	
it_retirement_contributions	Calculating the deduction for retirement contributions
it_deductions	Summing the other deductions
Tax liability	
it_main_tax_liability	Calculating gross tax liability
it_tax_rebates	Calculating rebates (primary, secondary and tertiary)
it_medical_tax_credits	Calculating medical tax credits
it_lump_sums	Tax on lump sums*
it_final_tax_liability	Calculating final tax liability
Output	
taxable_inc_category	Defining taxable income categories for the summary statistics tool
output_stats	Defining output for the summary statistics tool
output_std	Defining standard output

Note: *tax on lump sums is not simulated currently in PITMOD; instead, the reported variable from the administrative data relating to tax paid on lump sums is used.

Source: authors' compilation using PITMOD v3.1.

As shown in the table, these policies can be grouped into five categories relating to the model framework, income, deductions, tax liability (amount of PIT payable), and output. Income and deductions are used to calculate final taxable income, which is then used in the calculations of tax credits and tax liability. The output policies produce both the standard output found in any EUROMOD based model and output for the PITMOD summary statistics tool. This tool—used for some of the analysis in this paper—has a user interface built in Python and produces summary statistics using Stata.

Jumping over the framework policies, which are simply required by the EUROMOD software for the model to operate and do not have a great significance in PITMOD, the first group of policies is income. Various sources of income are included in the taxable income concept in PITMOD. These may be used in their 'raw' form or may require an exemption or exclusion to be applied, and, as such, require a separate policy to perform the calculation. Income from lump sums

(retirement, severance, and withdrawal) is taxed separately, though this is not currently simulated in PITMOD and the actual tax paid on lump sums from the administrative data has to be used.

Deductions reduce a taxpayer's taxable income. In PITMOD, the deduction for retirement contributions is in a separate policy as there is a complex set of rules for calculating the amount of the deduction. The other deductions are more straightforward and combined into a single policy.

Taxable income is calculated by summing up the different sources of income (employment income, passive income, taxable capital gains) and subtracting deductions from relevant income sources. A particular type of module or 'function' within PITMOD, called an 'income list', is used to make this calculation. Technically, an income list is the aggregate of several variables, which are added or subtracted to build the aggregate.

A tax schedule, currently comprising seven tax brackets, is then applied to taxable income to give a gross (or main) tax liability.

Tax credits (rebates, medical tax credits, and foreign tax credits) reduce a taxpayer's tax liability. Only the first two types of tax credit are modelled in PITMOD, each in a separate policy. It is intended that the foreign tax credit policy will be modelled in due course.

Appendix 2: Additional tables and graphs

Table A2.1: Overview of aggregate income sources and government revenues in annual million South African Rand (ZAR)

	1	2	3	4	5	6	7	8	Ratio 2/1	Ratio 3/2	Ratio 6/2	Ratio 7/2	Ratio 8/2
	All registered individuals with positive original incomes	Registered individuals aged 18–64 years	Registered individuals aged 18–64 years with taxable income below R79,000	Registered individuals aged 18–64 years with taxable income between R79,000 and R1 million	Registered individuals aged 18–64 years with taxable income above R1 million	registered individuals aged 18–64 years with taxable income between R1 million and R1.5 million	registered women aged 18–64 years	Registered men aged 18–64 years	18–64 year olds divided by all	18–64 year olds below R79,000 divided by all 18–64 year olds	18–64 year olds between R1 million and R1.5 million divided by all 18–64 year olds	Women aged 18–64 years old divided by all 18–64 year olds	Men aged 18–64 years divided by all 18–64 year olds
	ZAR million	ZAR million	ZAR million	ZAR million	ZAR million	ZAR million	ZAR million	ZAR million	%	%	%	%	%
Employee income	2,898,638	2,728,956	229,319	2,030,886	468,751	201,541	1,107,626	1,543,816	94	8	7	41	57
Salaries and wages	1,991,103	1,936,382	193,365	1,453,033	289,984	138,196	803,652	1,081,354	97	10	7	42	56
Annual payment (bonuses)	203,571	197,285	7,840	126,616	62,830	17,453	73,582	118,223	97	4	9	37	60
Director's income	1,199	886	37	536	312	38	218	654	74	4	4	25	74
Commission	60,601	57,058	2,583	35,538	18,937	5,468	19,234	32,163	94	5	10	34	56
Overtime	67,934	67,301	7,821	52,806	6,674	4,614	17,901	47,357	99	12	7	27	70
Pension income	107,464	32,472	5,000	25,628	1,843	724	18,054	13,960	30	15	2	56	43
Annuities	27,591	7,268	1,230	5,262	776	379	2,828	4,406	26	17	5	39	61
Fringe benefits	265,658	261,756	5,983	218,911	36,863	17,537	114,674	141,305	99	2	7	44	54
Allowances	153,722	150,425	4,262	102,786	43,378	14,876	51,510	94,177	98	3	10	34	63
Other employee-related	19,794	18,123	1,199	9,771	7,153	2,256	5,974	10,220	92	7	12	33	56
Business income	47,827	39,847	1,282	18,818	19,747	4,114	13,827	25,678	83	3	10	35	64
Farming income	4,232	2,891	697	1,314	880	180	388	2,503	68	24	6	13	87
Interest	46,024	23,971	1,804	12,630	9,536	2,263	10,129	13,538	52	8	9	42	56
Dividends	5,794	3,196	113	1,055	2,029	275	1,125	1,481	55	4	9	35	46

Capital gains	63,602	40,258	872	7,569	31,817	2,238	10,392	21,784	63	2	6	26	54
Rental income	11,916	7,346	867	4,786	1,693	728	3,467	3,733	62	12	10	47	51
Other income sources	14,039	10,264	835	5,706	3,723	904	3,025	6,839	73	8	9	29	67
(1) Original income	3,092,072	2,856,730	235,788	2,082,765	538,176	212,242	1,149,979	1,619,370	92	8	7	40	57
Retirement contributions	274,813	269,531	8,797	222,174	38,560	20,330	119,801	147,371	98	3	8	44	55
Other deductions	34,977	33,085	1,038	23,928	8,119	3,991	9,417	23,524	95	3	12	28	71
Exemptions and losses	62,321	39,124	4,410	12,287	22,426	2,503	11,290	22,603	63	11	6	29	58
(2) Taxable income	2,719,955	2,514,986	221,542	1,824,374	469,070	185,418	1,009,470	1,425,870	92	9	7	40	57
Gross tax liability	692,623	640,905	39,878	424,243	176,785	63,109	241,963	375,924	93	6	10	38	59
Tax rebates	152,209	135,325	39,878	91,845	3,603	2,213	59,239	71,539	89	29	2	44	53
Medical tax credit	23,804	22,603	0	20,958	1,644	1,003	10,695	11,764	95	0	4	47	52
Final tax liability	516,611	482,977	0	311,439	171,538	59,892	172,028	292,621	93	0	12	36	61
(3) Net income	2,575,461	2,373,752	235,788	1,771,326	366,638	152,350	977,950	1,326,749	92	10	6	41	56

Note: including registered individuals with positive original market incomes only. Column 2 is the baseline for the analysis in this paper which comprises all PIT-registered individuals aged 18–64 years inclusive with positive original incomes.

Source: authors' calculations using PITMOD v3.1.

Table A2.2: Total number of taxpayers, national 2020

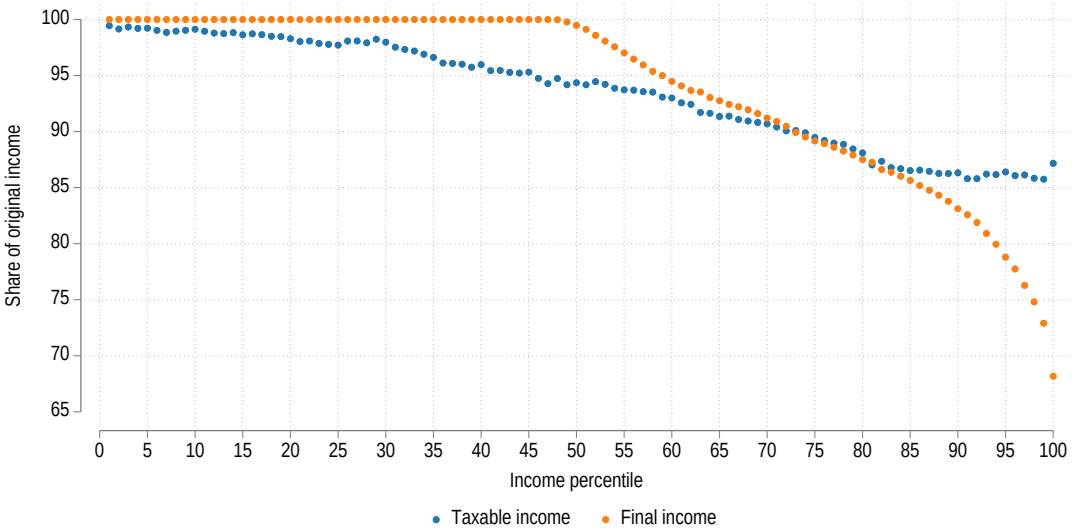
	1	2	3	4	5	6	7	8	Ratio 2/1	Ratio 3/2	Ratio 6/2	Ratio 7/2	Ratio 8/2
	All registered individuals with positive original incomes	Registered individuals aged 18–64 years	Registered individuals aged 18–64 years with taxable income below R79,000	Registered individuals aged 18–64 years with taxable income between R79,000 and R1 million	Registered individuals aged 18–64 years with taxable income above R1 million	Registered individuals aged 18–64 years with taxable income between R1 million and R1.5 million	Registered women aged 18–64 years	Registered men aged 18–64 years	18–64 year olds divided by all	18–64 year olds below R79,000 divided by all 18–64 year olds	18–64 year olds between R1 million and R1.5 million divided by all 18–64 year olds	Women aged 18–64 years old divided by all 18–64 year olds	Men aged 18–64 years old divided by all 18–64 year olds
	N	*N*	*N*	*N*	*N*	*N*	*N*	*N*	%	%	%	%	%
Employee income	14,487,770	13,115,500	6,494,480	6,374,120	246,900	152,790	5,982,110	6,647,170	91	50	1	46	51
Salaries and wages	12,796,430	12,425,870	6,006,240	6,179,290	240,340	149,190	5,563,910	6,392,810	97	48	1	45	51
Annual payment (bonuses)	7,698,940	7,458,580	2,451,360	4,822,570	184,650	114,910	3,328,590	3,929,020	97	33	2	45	53
Director's income	4,880	3,650	520	2,460	670	200	1,130	2,410	75	14	5	31	66
Commission	644,930	622,010	221,900	383,670	16,440	9,960	309,740	292,460	96	36	2	50	47
Overtime	3,849,350	3,795,380	1,737,150	2,031,460	26,770	21,130	1,464,670	2,198,460	99	46	1	39	58
Pension income	1,142,320	366,990	148,740	210,370	7,880	5,260	230,850	133,870	32	41	1	63	36
Annuities	623,580	164,440	69,040	87,070	8,330	4,950	82,820	80,520	26	42	3	50	49
Fringe benefits	6,934,160	6,840,640	1,864,780	4,774,130	201,730	125,640	2,994,660	3,713,190	99	27	2	44	54
Allowances	4,377,490	4,306,150	1,072,590	3,069,890	163,670	100,340	1,879,840	2,349,850	98	25	2	44	55
Other employee-related	269,360	243,940	90,370	142,150	11,420	6,700	104,690	129,950	91	37	3	43	53
Business income	173,090	145,110	24,070	108,870	12,170	5,270	65,280	78,510	84	17	4	45	54
Farming income	14,720	9,170	2,460	5,960	750	360	2,110	7,050	62	27	4	23	77

Interest	513,920	298,620	60,330	186,650	51,640	22,220	150,610	146,380	58	20	7	50	49
Dividends	381,960	228,350	22,140	161,700	44,510	21,070	115,480	112,380	60	10	9	51	49
Capital gains	73,290	37,030	3,710	22,230	11,090	3,670	16,990	19,760	51	10	10	46	53
Rental income	154,200	106,760	16,820	70,380	19,560	10,220	50,490	54,520	69	16	10	47	51
Other income sources	97,500	64,770	12,160	43,820	8,790	3,830	28,530	34,660	66	19	6	44	54
(1) Original income	14,729,220	13,289,490	6,577,300	6,458,840	253,350	155,650	6,066,750	6,732,450	90	49	1	46	51
Retirement contributions	7,013,490	6,913,000	1,757,050	4,937,820	218,130	136,690	3,018,990	3,773,530	99	25	2	44	55
Other deductions	491,570	456,660	7,400	369,120	80,140	46,490	168,470	286,190	93	2	10	37	63
Exemptions and losses	616,540	397,700	73,180	259,600	64,920	29,560	185,870	209,780	65	18	7	47	53
(2) Taxable income	14,685,700	13,258,800	6,546,610	6,458,840	253,350	155,650	6,054,180	6,714,600	90	49	1	46	51
Gross tax liability	14,685,610	13,258,730	6,546,540	6,458,840	253,350	155,650	6,054,160	6,714,550	90	49	1	46	51
Tax rebates	14,685,520	13,258,730	6,546,540	6,458,840	253,350	155,650	6,054,160	6,714,550	90	49	1	46	51
Medical tax credit	2,824,470	2,743,260	0	2,582,730	160,530	98,860	1,313,890	1,398,590	97	0	4	48	51
Final tax liability	7,051,110	6,634,940	0	6,381,590	253,350	155,650	2,832,530	3,620,020	94	0	2	43	55
(3) Net income	14,729,220	13,289,490	6,577,300	6,458,840	253,350	155,650	6,066,750	6,732,450	90	49	1	46	51

Note: including registered individuals with positive original market incomes only.

Source: authors' calculations using PITMOD v3.1.

Figure A2.1: Taxable and final income as a share of original income by income percentile (baseline)



Note: income percentiles are based on original income.

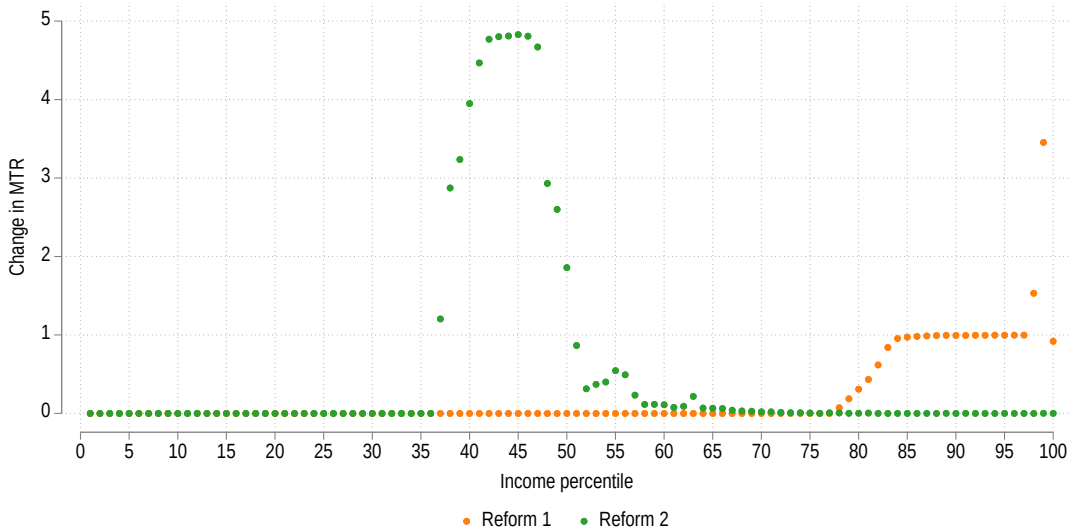
Source: authors' calculations using PITMOD v3.1.

Table A2.3: Overview of marginal tax rates

	Baseline	Without behavioural response			With behavioural response		
		Reform 1	Reform 2	Reform 3	Reform 1	Reform 2	Reform 3
Mean	13.52	13.75	14.09	14.31	13.74	14.08	14.29
Median	18.00	18.00	18.00	18.00	18.00	18.00	18.00
P5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P75	26.00	26.00	26.00	26.00	26.00	26.00	26.00
P95	39.00	40.00	39.00	40.00	40.00	39.00	40.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	46.88	46.88	46.88	46.88	46.88	46.88	46.88

Source: authors' calculations using PITMOD v3.1.

Figure A2.2: Change in marginal tax rate (MTR) by income percentile and reform scenario



Note: income percentiles are based on original income.

Source: authors' calculations using PITMOD v3.1.

Table A2.4: Simulated poverty rates using SAMOD for the baseline, Reform 3, and Reform 3 plus redistribution of additional revenue via the child support grant

	Baseline	Reform 3	Difference to base	Reform 3 plus redistribution via CSG	Difference to base
UBPL: share of poor population (%)					
All	45.05	45.14	0.08	44.02	−1.03
Poor households out of . . .					
. . . male-headed households	32.12	32.15	0.03	31.57	−0.54
. . . female-headed households	54.15	54.26	0.12	52.78	−1.37
. . . households with children	53.26	53.37	0.11	51.86	−1.40
. . . households with older persons	49.16	49.29	0.13	48.61	−0.55
LBPL: share of poor population (%)					
All	30.28	30.28	0.00	29.22	−1.07
Poor households out of . . .					
. . . male-headed households	21.23	21.23	0.00	20.58	−0.65
. . . female-headed households	36.65	36.65	0.00	35.28	−1.36
. . . households with children	35.75	35.75	0.00	34.29	−1.45
. . . households with older persons	29.60	29.60	0.00	26.88	−2.72
FPL: share of poor population (%)					
All	18.71	18.71	0.00	17.33	−1.37
Poor households out of . . .					
. . . male-headed households	13.14	13.14	0.00	12.51	−0.63
. . . female-headed households	22.62	22.62	0.00	20.73	−1.89
. . . households with children	21.15	21.15	0.00	19.28	−1.87
. . . households with older persons	9.65	9.65	0.00	7.04	−2.61

Note: CSG, child support grant; UBPL, upper bound poverty line R14,724 per person per year; LBPL, lower bound poverty line R9,720 per person per year; FPL, food poverty line R6,732 per person per year (Stats SA 2019).

Source: authors' calculations using SAMOD v7.5.

Appendix 3: Sensitivity analysis of behavioural effects

The sensitivity analysis applies three different sets of elasticity of taxable incomes (ETIs) to assess the sensitivity of the behavioural effects to the chosen elasticity:

- 'Kemp 2020': the first scenario uses the ETIs based on Kemp (2020) and amounting to 0.05 for the bottom 90 per cent and 0.5 for the top 10 per cent.
- Uniform: the second scenario applies the elasticity of 0.3 across the taxable income distribution, which is based on Kemp (2019). This is an extreme scenario where all income groups are expected to respond to the same extent.
- Upper bound: the third scenario tests ETIs that are twice as high as the ones presented in Kemp (2020), 0.1 for the bottom 90 per cent and 1 for the top 10 per cent. Doubling the ETIs applied in our analysis provides a better intuition for the upper bound of behavioural responses.

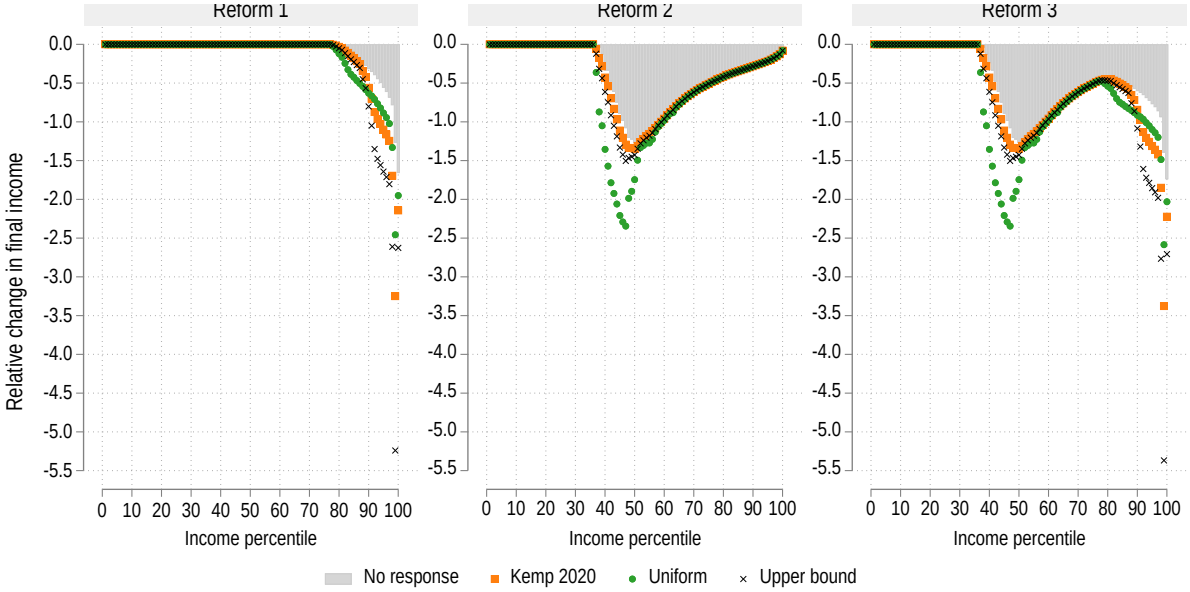
All three behavioural response scenarios are compared with the non-behavioural response scenario.

The following results show that average tax rates and redistributive indicators are not affected by the choice of ETI.

This is mostly also the case for the generated revenues. The additional revenues generated in Reform 2 are similar across sensitivity scenarios and revenues generated in Reform 1 are similar for the 'Kemp 2020' and unitary scenarios. The only exception are results for the upper-bound scenario in Reforms 1 and 3. Revenues are close to revenue-neutral, which highlights that Reform 1 is very likely to generate revenues even if behavioural responses would be more pronounced than assumed in the present paper.

The only result that shows some sensitivity is relative change in final income. Applying a uniform elasticity leads to higher income losses in the middle of the distribution in both Reforms 2 and 3. However, such uniform responses are highly unlikely due to lower income groups being generally more restricted in their behavioural responses than higher income groups. The upper-bound scenarios leads to more pronounced income reductions for the 99th percentile following behavioural responses to the tax reform.

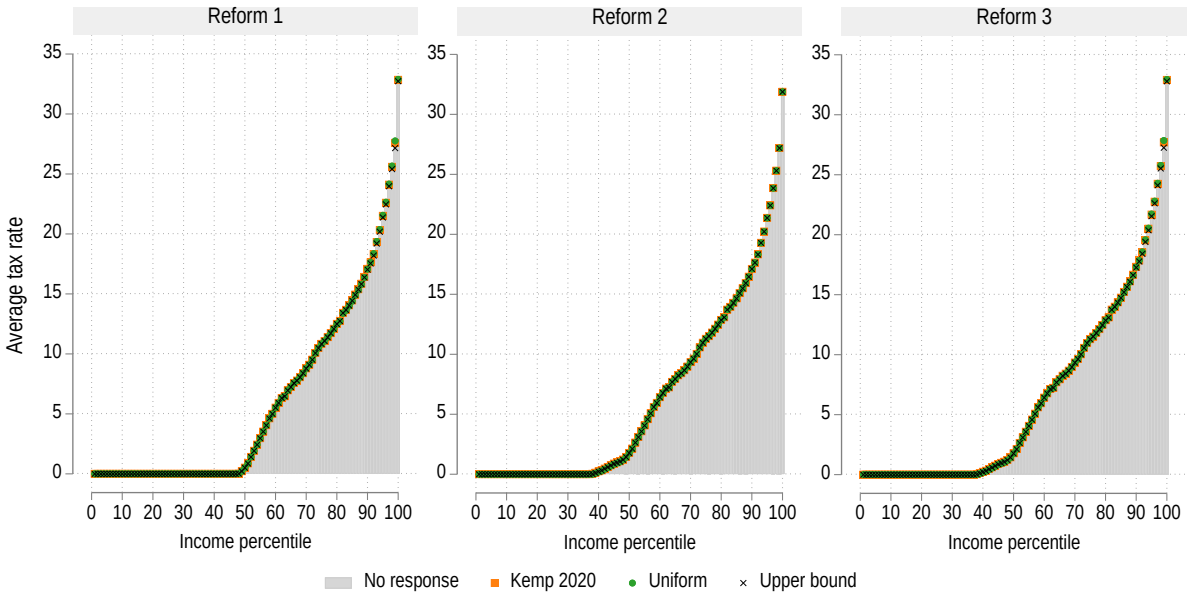
Figure A3.1: Relative change in final income (percentage of baseline) after considering behavioural response by reform and sensitivity scenario



Note: income percentiles are based on original income.

Source: authors' calculations using PITMOD v3.1.

Figure A3.2: Average tax rates after behavioural response by income percentile and sensitivity scenario



Note: income percentiles are based on original income.

Source: authors' calculations using PITMOD v3.1.

Table A3.1: Overview of redistributive and progressivity indicators after behavioural response by sensitivity scenario

	Reform 1				Reform 2				Reform 3			
	No response	'Kemp 2020'	Uniform	Upper bound	No response	'Kemp 2020'	Uniform	Upper bound	No response	'Kemp 2020'	Uniform	Upper bound
Gini original incomes	0.640	0.638	0.639	0.637	0.640	0.640	0.640	0.640	0.640	0.638	0.639	0.637
Gini final incomes	0.598	0.597	0.598	0.596	0.600	0.600	0.601	0.600	0.599	0.598	0.599	0.597
Vertical equity	0.042	0.041	0.041	0.041	0.040	0.040	0.040	0.040	0.041	0.041	0.041	0.040
Kakwani index	0.199	0.200	0.200	0.200	0.191	0.191	0.190	0.191	0.192	0.193	0.192	0.193
Average tax rate*	0.173	0.171	0.172	0.170	0.172	0.172	0.172	0.172	0.176	0.175	0.175	0.173
Re-ranking	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Reynolds–Smolensky index	0.041	0.041	0.041	0.041	0.040	0.040	0.039	0.040	0.041	0.041	0.041	0.040

Note: average tax rate in this table refers to the aggregated tax rate calculated based on the aggregated sum of original and final incomes.

Source: authors' calculations using PITMOD v3.1.

Table A3.2: Total personal income tax revenues and changes in revenues from personal income tax after behavioural response by sensitivity scenario

	Reform 1				Reform 2				Reform 3			
	No response	'Kemp 2020'	Uniform	Upper bound	No response	'Kemp 2020'	Uniform	Upper bound	No response	'Kemp 2020'	Uniform	Upper bound
Total in ZAR billion	492.0	486.8	488.2	481.6	491.6	491.6	491.5	491.6	500.7	495.5	496.9	490.3
Change in ZAR billion	9.1	3.9	5.4	-1.3	8.8	8.8	8.7	8.7	17.9	12.7	14.1	7.5
Change in %	1.9	0.8	1.1	-0.3	1.8	1.8	1.8	1.8	3.7	2.6	2.9	1.6

Source: authors' calculations using PITMOD v3.1.