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The effect of fiscal drag on income distribution and work incentives

A microsimulation analysis on selected African countries

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Abstract: Although the effect of fiscal drag is well studied in the industrialized world, empirical evidence from developing economies remains limited. Against this backdrop, this study aims to explore the effect of fiscal drag on income distribution and work incentives. To this end, the study employs SOUTHMOD, the tax-benefit microsimulation model, for six African countries: Ethiopia, South Africa, Tanzania, Uganda, Mozambique, and Zambia. Three important conclusions are drawn from our empirical investigation. First, in the absence of proper tax parameter adjustment, the distribution of fiscal drag is determined by the liability progression of personal income tax in the pre-inflation period. Second, the impact of fiscal drag on the redistributive effects and progressivity of personal income taxes is differentiated among countries. On the one hand, it reduces the progressivity of personal income tax in Ethiopia, South Africa, Tanzania, Uganda, and Zambia; on the other hand, it improves progressivity in Mozambique. However, it decreases the redistributive effect of personal income tax only in Ethiopia, Tanzania, and Uganda. Third, fiscal drag reduces financial work incentives to increase earnings in all countries. Therefore, a comprehensive and frequent inflationary adjustment of tax parameters to circumvent fiscal drag would be welcome.

Key words: inflation, income tax, fiscal drag, redistributive effects, Africa, microsimulation

JEL classification: C81, D31, H24

Acknowledgements: The results presented here are based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4. The models are developed, maintained, and managed by UNU-WIDER in collaboration with ISER (University of Essex), SASPRI (Southern African Social Policy Research Institute), and local partners in selected developing countries (Ethiopia, Mozambique, South Africa, Tanzania, Uganda, and Zambia) within the scope of the SOUTHMOD project. This paper was presented at the SOUTHMOD workshop in 2020. We are grateful to everyone who has contributed to the development of SOUTHMOD. The authors are responsible for all remaining shortcomings. As the research is part of one author's PhD thesis, they will hold copyright.

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1 Introduction

There is considerable evidence that an increase in income inequality has accompanied the rapid economic growth registered globally over the last three decades. Kuznets (1955) argued that income inequality increases in the early stages of economic growth and then declines in the later stages. Empirical studies have established the relationship between economic growth and income inequality (Lorenzi 2016; Ravallion 2014). In the top income group, where wealth is a primary source, income is more elastic to economic growth than in the lower-income group, where labour income constitutes a prime share. The macroeconomic figures of African countries also show a similar pattern. Despite the substantial economic progress over the last 30 years, the inequality trend has been positive on the continent. Hence, Africa is the second most unequal continent, next to Latin America (IMF 2015; Mubila and Aissa 2012).

Income inequality, however, is not inevitable; instead, a trend towards greater inequality can be reversed. The most widely proposed policy option to address income inequality is introducing a more progressive income tax system (see, for instance, Atkinson 2015). However, one question that needs to be asked is why income inequality is still high in Africa, although countries have already introduced progressive income tax systems with a higher marginal rate for top income groups. For instance, South Africa, a giant economy with the most progressive income tax in Africa (Oxfam 2018), is one of the world's most unequal countries (Hundenborn et al. 2019; Sulla and Zikhali 2018). Therefore, it is likely that adopting progressive tax legislation alone does not reduce inequality in society.

In this context, rampant inflation, along with tax evasion and informality, has possibly impeded the effectiveness of tax policies implemented in African countries. Even though the average inflation rate was 8.5 per cent in sub-Saharan Africa in 2018 (IMF 2019), none of the countries in the region have implemented a consistent tax parameter indexation procedure. Tanzi (1980) stated that even a lower inflation rate could cause serious distortions over the long run. However, in the absence of inflationary adjustments, a progressive tax schedule produces a higher real tax burden or fiscal drag as nominal incomes rise (Aaron 1976; Tanzi 1980). Immervoll (2005) illustrates that, given the progressive tax system, a fall in the real value of tax parameters causes distortion for all taxpayers, particularly for those previously exempted from tax liability. For a selection of European countries, Immervoll (2005) finds fiscal drag, whereby growth in nominal incomes, given fixed tax parameters, increases the average tax rate and reduces progressivity but increases tax revenue. Since the rise in tax revenue dominates the reduction in progressivity, fiscal drag improved the equalizing property of taxes.

Thus far, research on fiscal drag is focused solely on industrialized economies. Despite moderate to high inflation and the absence of frequent inflationary adjustments on tax parameters, there is no microsimulation-based study of fiscal drag in Africa. The few existing studies that have applied multi-country tax-benefit microsimulation models, such as Bargain et al. (2019) and Gasior et al. (2018), are confined to examining the effect of tax-benefit policies on poverty and inequality in selected countries on the continent.

The main aim of this study is to fill this gap by exploring the effect of fiscal drag on tax burden, income redistribution, and work incentives in the following sub-Saharan countries: Ethiopia, Mozambique, South Africa, Tanzania, Uganda, and Zambia. More specifically, we attempt to address the following questions: (i) what determines the distribution of fiscal drag in the selected countries?; (ii) does fiscal drag improve or shrink the progressivity and redistributive effects of income taxes?; and (iii) what is the impact of fiscal drag on work incentives?

To this end, we employ SOUTHMOD national models based on the EUROMOD platform. We extend the decomposition method developed by Bargain and Callan (2010) to disentangle the impact of indexation from the change in non-monetary tax policy rules and population. The empirical findings of the study indicate that the failure to introduce a statutory inflationary adjustment on tax parameters results, despite the variation among countries, in a significant increase in tax burden. The distribution of fiscal drag is ultimately determined by the structure of tax schedules in the pre-inflation period. In addition, the study results show that fiscal drag reduces the progressivity of income tax in all countries other than Mozambique. However, it shrinks work incentives in all the selected counties.

The present study contributes to the literature in several ways. First, to the best of our knowledge, it is the first of its kind to focus on Africa; thus, it provides a unique opportunity to increase awareness of the impact of fiscal drag on a continent with a diverse level of income tax progressivity and inflation. This study adds to the knowledge on the size and distribution of fiscal drag under a more progressive tax system, such as those of South Africa and Tanzania, against a less progressive tax system, such as those of Ethiopia and Mozambique. Second, the selected countries are grouped under low income, lower middle income, and upper middle income (World Bank 2020a). Hence, this study reveals the effects of fiscal drag in different developing economies.

The remainder of this paper is organized as follows. The next section reviews related literature. Section 3 describes the microsimulation model, decomposition framework, and data used throughout the simulation process. The empirical findings of the study are presented in Section 4, and finally, Section 5 concludes the paper.

2 Literature review

We combine four different but related strands of literature on (i) cross-country microsimulation analysis of the redistributive effects of tax-benefit systems in Africa, (ii) fiscal drag and income distribution, (iii) decomposition of the overall policy effect to disentangle statutory indexation versus the effect of discretionary change in tax-benefit rules, and (iv) fiscal drag and work incentives.

Fiscal drag and its distributional effects have not been researched so far in Africa. Likewise, microsimulation-based tax-benefit studies are in their early stages. The studies by Gasior et al. (2018) and Bargain et al. (2019) are the only microsimulation-based multi-country tax and benefit analyses ever done on the continent. Both studies used SOUTHMOD models and covered six countries: Ethiopia, Ghana, Mozambique, South Africa, Tanzania, and Zambia. Gasior et al. (2018) examine the distributional role of tax and benefit systems. The findings show that the tax-benefit system in South Africa is the most redistributive. However, it fails to reduce poverty in the remaining countries. Bargain et al. (2019) simulate the tax-benefit system of the best (least) redistributive country—namely South Africa (Mozambique)—in relation to the remaining countries. This study quantifies the extent to which exporting the South African tax-benefit system would reduce poverty and inequality in the remaining countries. On the contrary, switching to Mozambique's tax-benefit system would increase poverty and inequality in South Africa. However, its potential distributive effect on the remaining countries was found to be insignificant.

Nevertheless, the study of fiscal drag is well established in developed economies. Immervoll (2005) initiated a microsimulation approach to address fiscal drag, covering three European countries: Germany, the Netherlands, and the United Kingdom. This study explores how inflation-related tax burdens disrupt the distributional and revenue-generating capacity of income taxes and social

insurance contributions. The study finds that fiscal drag deteriorates the progressivity of income tax. This result is supported by the research conducted by Levy et al. (2010). Their findings show that in the absence of automatic inflation adjustment, fiscal drag weakens the progressivity property of income taxes in Brazil. Sutherland et al. (2008) examine the medium-period implications of existing uprating policies for tax-benefit parameters in the UK. Extending the existing indexation policies for the next 20 years would double child poverty but reduce the poverty rate among pensioners.

Unlike Immervoll (2005) and Sutherland et al. (2008), the recent study by Paulus et al. (2020) does not assess only the role of statutory adjustment on fiscal drag and benefit erosion. Instead, it evaluates the distributional effect of the actual indexation policies relative to possible indexation using inflation or changes in market income. To this end, Paulus et al. (2020) nest the decomposition method formalized by Bargain and Callan (2010) and dissect the direct policy effect into the indexation effect and structural policy reform. According to the study, indexation has a more pronounced effect in reducing poverty and inequality than discretionary policy reforms.

Similarly, no study to date has investigated the effect of fiscal drag on work incentives in Africa. The most noticeable contribution to this topic is that of Immervoll (2006). The author demonstrates how inflation-induced erosion on the tax bracket alters work incentives in Finland, Ireland, the Netherlands, and the UK. In the absence of proper adjustments to the tax schedule, exemptions, and deductions, fiscal drag increases marginal effective tax rates (METRs). Jara and Tumino (2013) examine the impact of tax-benefit systems on income inequality and work incentives in 27 EU member states. The study results highlight a trade-off between income redistribution and work incentives.

Relying on the above four strands of literature, we extend the analysis of fiscal drag in the African context. This study examines the effect of fiscal drag on income distribution and work incentives among countries with diverse income tax progressivity, inequality, and inflation levels. To this end, we decompose the change in nominal levels into the indexation effect and the effect of changes in market income. We add an empirical demonstration to the literature on the factor that determines the size and the relative distribution of fiscal drag.

3 Data and empirical methodology

3.1 Microsimulation approach

We employ a microsimulation approach to explore the effect of fiscal drag on income distribution and work incentives induced by income tax, as long as the tax parameters remain unadjusted. Orcutt et al. (1961) pioneered the adoption of microsimulation models in the 1950s to analyse the impact of social and economic policies based on survey data. Microsimulation models are suitable for analysing multiple microeconomic issues, but those for tax-benefit analysis were introduced in the 1980s and the efficiency and usability of tax-benefit microsimulation models have significantly improved over time (Figari et al. 2015).

Figari et al. (2015) defined microsimulation as a wide variety of modelling techniques that operate at the level of individual units (such as persons, firms, or vehicles), with rules applied to simulate changes in state or behaviour. Microsimulation models are grouped into three categories: static, dynamic, and behavioural. The static model holds when the characteristics of the units in the microdata remain unchanged over time; our study is included in this category. Static models enable the researcher to undertake both *ex ante* and *ex post* policy analyses. The first examines an alternative

tax regime by simulating counterfactual scenarios; the second explores the possible socioeconomic realities without the current tax system. The dynamic model applies when the micro-units change over time owing to exogenous factors (e.g., population ageing). This type of model primarily addresses research questions in which the time horizon of the policy effect is longer. Finally, the behavioural model uses micro-econometric models of individual preferences to simulate the effects of policy changes on human behaviour.

In this study the role of introducing an automatic indexation has been elaborated by applying the decomposition method proposed by Bargain and Callan (2010) to the data from SOUTHMOD national microsimulation models based on the EUROMOD platform. EUROMOD is the most widely used tax-benefit microsimulation model, covering 27 member countries of the European Union (Sutherland and Figari 2013). The EUROMOD platform has been customized to build microsimulation models for non-European countries throughout the SOUTHMOD project, which includes the six African countries included in this study (Decoster et al. 2019). The adopted procedures simulate the effect of possible price indexation by keeping non-monetary tax rules and the population constant. The study estimates necessary indicators based on two peculiar circumstances: the 'base case' (i.e., without indexation) and the 'indexation scenario' (i.e., simulation results produced after implementing the possible indexation procedure or 'counterfactual scenario').

The effect of fiscal drag on income distribution is shown by the gap in conventional indicators, such as the progressivity and redistribution indices, between the base case and the indexation scenario. Likewise, the study analyses the effect of fiscal drag on work incentives by computing the METRs for the base case and the indexation scenario. METRs represent the proportion of a marginal increase in earnings that is taxed away due to social insurance contributions and tax and benefit withdrawal. Analogous to Immervoll (2004) and Jara and Tumino (2013), we implement a 3 per cent increase in individual earnings, corresponding to one additional working hour per week for a full-time worker.

We calculate METRs at the individual level according to the following formula:

$$\mathrm{METR} = 1 - \frac{\mathrm{Y}_{\mathrm{h}}^{1} - \mathrm{Y}_{\mathrm{h}}^{0}}{\mathrm{E}_{\mathrm{i}}^{1} - \mathrm{E}_{\mathrm{i}}^{0}}$$

where the numerator measures the change in disposable income at the household level (with $\mathrm{Y}_{\mathrm{h}}^{1}$ representing the adjusted household disposable income and $\mathrm{Y}_{\mathrm{h}}^{0}$ the unadjusted household disposable income) and the denominator denotes the change in individual earnings.

3.2 Decomposition method

This study employs an extended version of Bargain and Callan's (2010) decomposition framework. This decomposition framework is applied to dissect the change in income distribution indices, particularly attributed to (i) tax-benefit structure changes, (ii) changes in nominal levels of market income and monetary parameters, and (iii) population changes. We extend this approach to address specific research questions.

Our study maintains the same notations used in Bargain and Callan (2010); accordingly, y is a matrix denoting the population of data that signifies the diverse demographic characteristics, market income, and so on. The variable p symbolizes the monetary parameters of the tax-benefit policies. α represents the benchmark indexation factor: in this regard, we use the consumer price index (CPI). Moreover, d stands for a tax-benefit function that is used to transform the gross

income of the household into disposable income. The distribution of disposable income is represented by $d_i(p_j, y_l)$, for the hypothetical scenario of the respective tax-benefit structure of year i, the tax-benefit monetary parameters of year j, and the population of year l. In this study, the letters, i, j, and l assume the value of either 0 or 1, with these values symbolizing the start- and end-period data, respectively. Finally, G denotes the summary indicator for a partial or the entire distribution of disposable income.

The total change in the income distribution index G between the start and end periods is:

$$\Delta G = G[d_1(p_1, y_1)] - G[d_0(p_0, y_0)] \quad (1)$$

The Bargain and Callan (2010) decomposition framework separates the total change in the income distribution index into the direct policy effect (conditional on end-period population, y_1), change in nominal levels, and change in demographic characteristics of the household as follows:

$$\underbrace{G[d_0(\alpha p_0, \alpha y_0)] - G[d_0(p_0, y_0)]}_{change\ in\ nominal\ levels} + \underbrace{G[d_0(\alpha p_0, y_1)] - G[d_0(\alpha p_0, \alpha y_0)]}_{other\ effects} +$$

$$\underbrace{G[d_1(p_1, y_1)] - G[d_0(\alpha p_0, y_1)]}_{direct\ policy\ effect} \quad (2)$$

where:

- 'change in nominal levels' represents the effect of updating market income and tax-benefit parameters with monetary values. Since tax-benefit systems are usually homogeneous of degree one or $d(\alpha p, \alpha y) = \alpha(p, y)$, the nominal effect remains zero;
- 'other effect' designates the effect of a population change;
- 'direct policy effect' shows the effect of a change in structural tax-benefit rules.

We are interested in examining how fiscal drag affects income distribution and work incentives in the absence of automatic tax parameter adjustment. An inflation-induced tax burden can be entirely removed by increasing the tax parameters at the base period using benchmark indexation. The fiscal drag effect is computed from the difference in income distribution indices using the base period parameter and tax parameters indexed for inflation. The impact of indexation can be seen as long as tax policy structures, income, and demographic characteristics are kept fixed. To this end, we extend Bargain and Callan's (2010) decomposition framework to dissect the change in nominal levels, the first part of Equation 2, into two subcomponents, the indexation effect and the effect of change in market income.

$$\underbrace{G[d_0(\alpha p_0, \alpha y_0)] - G[d_0(p_0, \alpha y_0)]}_{indexation\ effect} + \underbrace{G[d_0(p_0, \alpha y_0)] - G[d_0(p_0, y_0)]}_{effect\ of\ changes\ in\ income} \quad (3)$$

The extended decomposition procedure, Equation 3, permits a complete dissection of the indexation effect from the other triggering factors for the change in disposable income. This enables us to separately simulate the effect of indexing monetary parameters for inflation, keeping tax-benefit policy structure, income, and demographic characteristics constant. This procedure retains the demographic characteristics fixed at period 0 but adopts the nominal market income prevailing in period 1 by inflating the value at period 0 using a benchmark price index. Generally, the first portion of the indexation effect in Equation 3, $G[d_0(\alpha p_0, \alpha y_0)]$, produces the desired statistic in the indexation scenario. The second part, $G[d_0(p_0, \alpha y_0)]$, shows the base case statistic.

In what follows, as per the aim of this study, we report only the simulation results based on the 'indexation effect' part of the decomposition.

3.3 Data and countries

The sub-Saharan countries covered in the study are Ethiopia, Mozambique, South Africa, Tanzania, Uganda, and Zambia.

The input microdata used in this paper contain comprehensive information on demographic features, employment status, and income at household and individual level. Partial descriptions of the input microdata, like the type of survey, year of collection, and household and individual sample size, are presented in Table 1. The table reports the country-specific tax-benefit microsimulation models that correspond to selected countries: ETMOD, MOZMOD, SAMOD, TAZMOD, UGAMOD, and MicroZAMOD. The study used the most recent version of the microsimulation models available at the time of writing.

Table 1: Input microdata and microsimulation models

Countries	Source of microdata	Survey year	Household	Individuals	Model and version
Ethiopia	Socioeconomic Survey	2014	5,262	23,776	ETMOD v. 1.0
Mozambique	Household Budget Survey	2015	21,879	109,107	MOZMOD v. 2.6
South Africa	Living Conditions Survey	2014	23,380	88,908	SAMOD v. 6.9
Tanzania	Household Budget Survey	2012	10,186	46,593	TAZMOD v. 1.8
Uganda	National Household Survey	2016	15,721	74,422	UGAMOD v. 1.4
Zambia	Living Conditions Monitoring Survey	2015	12,251	62,880	MicroZAMOD v. 2.4

Source: authors' construction based on SOUTHMOD country reports (Castelo et al. 2021; Leyaro et al. 2019; Mengistu et al. 2017; Nakamba-Kabaso et al. 2020; Waiswa et al. 2020; Wright et al. 2018).

The selected countries show diverse macroeconomic features: they represent low-income, lower-middle-income, and upper-middle-income economies, with inflation and tax–GDP ratios from moderate to high levels.

Table 2 presents the vital economy-wide characteristics of the selected countries, such as CPI, GDP per capita, and tax to GDP ratio from 2012 to 2019.

Countries exhibit sizeable differences in nominal per capita income. According to Table 2, the per capita income is relatively higher in South Africa, even substantially greater than the sum of the remaining countries. South Africa is grouped among upper-middle-income economies. Tanzania and Zambia take the second rank in terms of per capita income; both are clustered among lower-middle-income economies. Tanzania has broken the deadlock by meeting the World Bank (2020a) US$1,035 threshold for avoiding the low-income trap, while Zambia has maintained its position despite inconsistencies over years. Ethiopia, Mozambique, and Uganda are categorized among low-income economies. Per capita income exhibits a similar pattern in that of Mozambique and Uganda; it grew in 2014 and then declined till it eventually revived in 2017. The decade-long double-digit economic growth registered in Ethiopia is a reason for maintaining an increase in per capita income over years.

Table 2: Macroeconomic indicators in the selected countries

Countries	2012	2013	2014	2015	2016	2017	2018	2019
GDP per capita								
Ethiopia	467	500	567	641	717	769	772	858
Mozambique	658	664	674	590	429	461	499	492
South Africa	7,501	6,832	6,433	5,735	5,273	6,132	6,374	6,001
Tanzania	868	970	1,030	948	966	1,005	1,061	1,122
Uganda	784	804	876	840	731	747	767	777
Zambia	1,763	1,879	1,763	1,338	1,281	1,535	1,556	1,291
CPI								
Ethiopia			548	603	668	745	849	
Mozambique	106	111	114	115	138	115	120	123
South Africa	78	82	88	92	98	103	107	112
Tanzania	81	87	93	98	104	109	112	
Uganda				150	158	167	172	177
Zambia	122	131	141	151	183	196	210	223
Annual inflation rate								
Ethiopia				10.04	10.78	11.53	13.96	
Mozambique		4.72	2.70	0.88	20.00	16.67	4.35	2.50
South Africa		5.13	7.32	4.55	6.52	5.10	3.88	4.67
Tanzania		7.41	6.90	5.38	6.12	4.81	2.75	
Uganda					5.33	5.70	2.99	2.91
Zambia		7.38	7.63	7.09	21.19	7.10	7.14	6.19
Tax–GDP ratio								
Ethiopia	9	9	9	8	8	8	8	8
Mozambique	19	22	24	20	20	22	22	22
South Africa	26	26	27	27	27	27	27	27
Tanzania	10	11	11	10	11	12	11	11
Uganda	10	10	11	11	11	12	12	11
Zambia	15	14	16	14	13	15	16	15

Source: authors' construction based on World Bank (2020b).

Inflation, a change in CPI in consecutive years, is the other macroeconomic indicator reported in Table 2. It has been higher in Ethiopia and Zambia and highly volatile in Mozambique. In 2016, inflation reached 20 per cent in Mozambique but surprisingly, the country experienced severe deflation in 2017. On the contrary, South Africa, Tanzania, and Uganda experienced relatively lower and more stable inflation. Even though moderate and higher inflation is common in the selected countries, none have so far implemented full-scale indexation.

Finally, Table 2 presents a key fiscal policy indicator, namely, the tax-GDP ratio. A low ratio implies that countries do not collect tax revenue effectively. Tax collection is relatively higher in Mozambique and South Africa achieving a back-to-back 22 and 27 per cent tax–GDP ratio, respectively. The revenue-generating potential is very poor in the remaining countries; Ethiopia holds the lowest rank, with an 8 per cent tax–GDP ratio for five years in a row. The existing huge informality in the selected countries partially explains the poor tax revenue collection trend.

The information displayed in Table 3 provides the rationale behind selecting countries for the study.

The table shows the statutory updates of tax parameters with the monetary value provided by the tax authorities in the sampled countries. Despite overall inflation from the start to the end period of the study ranging from 7 per cent to 55 per cent, inflationary adjustments in all countries are not comprehensive or routine. Although South Africa practises parameter adjustment more often than the remaining countries, it lacks consistency and completeness. Its tax thresholds remained unadjusted for 2019, and the annual adjustment excludes the top three tax brackets. Also, the new actual tax parameters in the country are much lower than those with indexations based on CPI. The nominal parameters in the Zambian tax system were updated twice between 2010 and 2017. The income tax parameters with nominal for Ethiopia hadn't gone through an amendment for over a decade till the federal income tax proclamation for the year 2016 repealed the outdated 2002 version. The tax parameters in the Mozambique, Tanzania, and Uganda tax systems were most recently updated in 2013, 2010, and 2015, respectively.

Table 3: Income tax indexation and inflation

Countries	Start period	End period	α	Statutory indexation	Model and version
Ethiopia	2014	2018	1.55	2014 and 2017	ETMOD version 1.0
Mozambique	2015	2019	1.07	2015	MOZMOD version 2.6
South Africa	2014	2019	1.28	2014, 2015, 2016, 2017, and 2018	SAMOD version 6.9
Tanzania	2012	2018	1.39	2012	TAZMOD version 1.8
Uganda	2016	2019	1.12	2016	UGAMOD version 1.4
Zambia	2015	2019	1.47	2015 and 2017	MicroZAMOD version 2.4

Source: authors' construction based on SOUTHMOD country reports (Castelo et al. 2021; Leyaro et al. 2019; Mengistu et al. 2017; Nakamba-Kabaso et al. 2020; Waiswa et al. 2020;Wright et al. 2018).

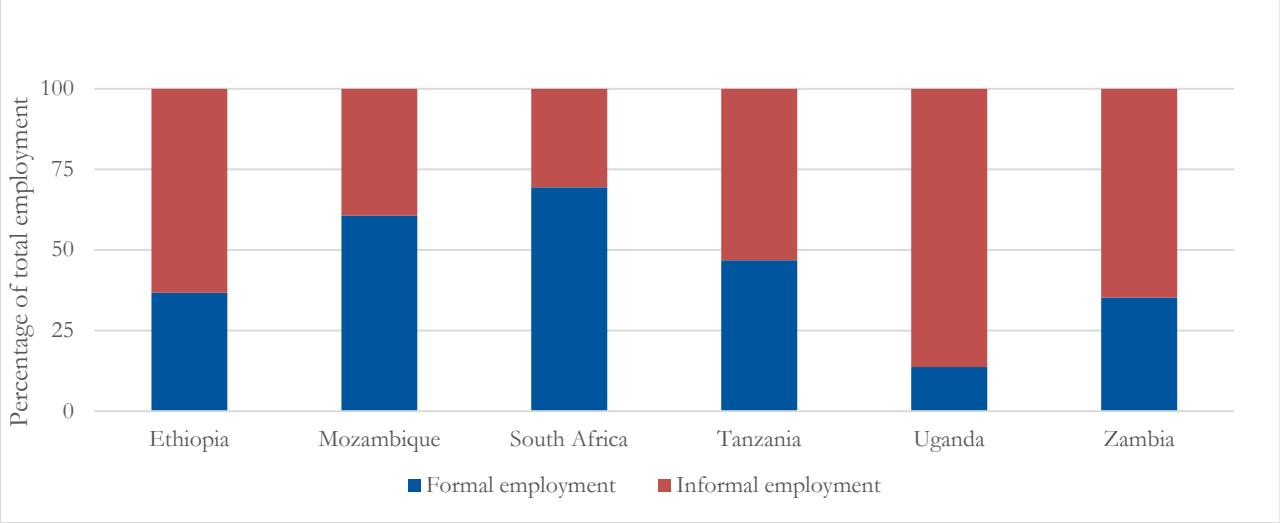
Based on data reported in Table 3, we simulate the counterfactual indexation scenario by inflating the tax parameters with monetary value at the start period using α, where parameter α is the ratio of CPI at the end period to the start period of analysis. Non-monetary tax policy rules and population data for the start period are retained in both the base case and the indexation scenario to disentangle the effect of indexing tax parameters with monetary value. The policy systems included in each country's model determine the start and end periods.

4 Empirical results and discussion

This section presents the main findings on the impact of inflation-related fiscal drag on income distribution and work incentives. Considering the vast number of individuals with zero original income as well as huge non-taxable agricultural income in the considered countries, the analysis focuses solely on the taxpayers with positive taxable income by legislation at the start period plus on individuals who would be exempted in hypothetical scenario but eventually dragged to the tax bracket at base case due to inflation (i.e., the sample of 'taxpayers' at the end period). Direct taxes in this study encompass both personal income tax (PIT) and social insurance contributions (SIC). The analysis addresses where and why fiscal drag ends up being either regressive or progressive. Moreover, the effects of the adjustment of tax parameters on the progressivity and redistribution of income tax is thoroughly examined. Finally, this section discusses the effects of indexation on work incentives faced at the intensive labour supply margin.

In order to validate the simulations of PIT and SIC in the baseline scenario, considering the sizeable level of informality in the selected countries, this study makes a proper adjustment of the tax base before simulating the effect of fiscal drag. In this respect, all statistics presented in this study are specific to the formal sector only. We use the ratio of formal employment reported in national statistics to the total number of individuals with more than zero earnings to separate formal employment from informal employment. Figure 1 shows how the share of formal employment varies between countries. Apart from in Mozambique and South Africa, the formal sector accounts for less than 50 per cent of the employment share.

Figure 1: Share of formal and informal employment at start period



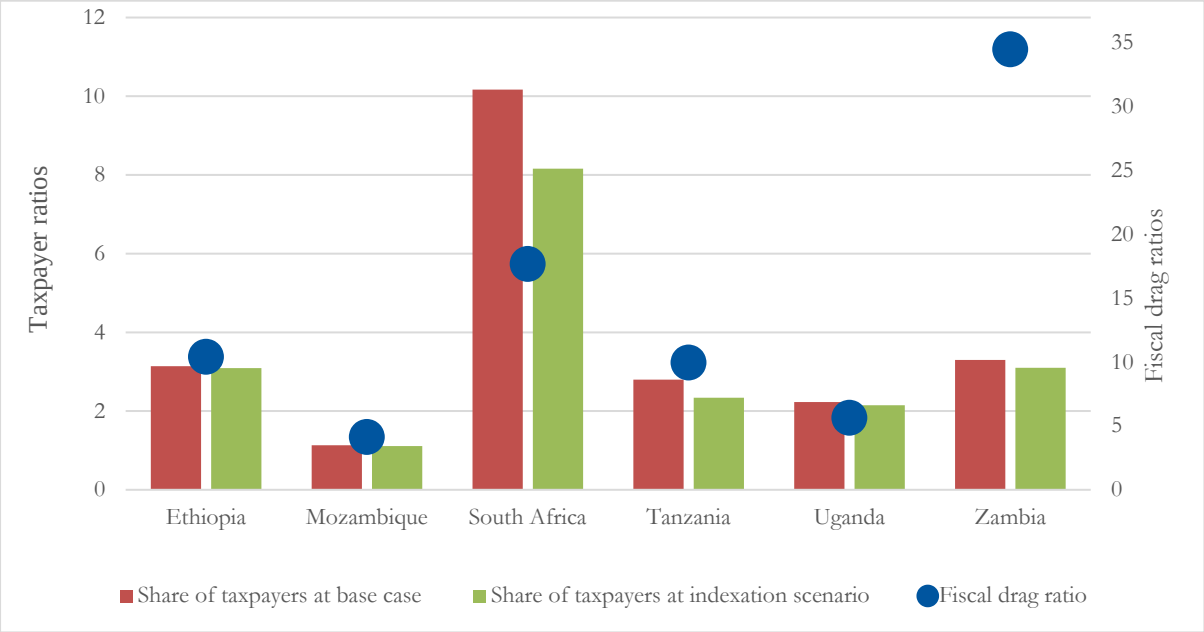
Source: authors' illustration based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4.

4.1 Fiscal drag

Fiscal drag is the increase in real tax revenue due to the rise in nominal income within a progressive tax system. Considering multiple tax bands with increasing marginal tax rates, inflation shrinks disposable income unless proper inflation-oriented adjustments are made to tax schedules, exemptions, and deductions (Aaron 1976; Tanzi 1980). In the absence of corrective measures, most taxpayers experience higher average tax, and some of them, whose income is closer to the upper limit of the current tax band, face a higher marginal tax rate (Immervoll 2006).

Most developed countries commenced an automatic indexation procedure in their tax-benefit system a long time ago. For instance, Canada introduced an inflationary adjustment on tax brackets in 1974, while Australia launched it in 1976 (Tanzi 1980). Empirical studies have demonstrated that the presence of an automatic indexation permits the removal of the entire additional tax burden due to inflation. The study by Paulus et al. (2020) witnesses that indexation reduced poverty and inequalities in selected EU countries. Despite tenacious price increases over the years, the six African countries included in this study failed to introduce full-scale statutory indexation into their tax-benefit systems. For instance, the recent discretionary reforms on tax bands adopted in South Africa lack consistency and completeness. The failure to introduce automatic indexation resulted in considerable fiscal drag in all the countries included in this study.

Figure 2: Fiscal drag and taxpayers affected



Note: the taxpayer ratios (left-hand y-axis) denote the percentage of taxed individuals over the total population; the fiscal drag ratio (right-hand y-axis) is the difference between income tax revenue at the base case and in the indexation scenario, relative to income tax revenue at the base case.

Source: authors' illustration based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

Figure 2 highlights two important indicators of the study: taxpayers' and fiscal drag ratios. The taxpayer ratios (left-hand y-axis) denote the percentage of taxed individuals over the total population. The fiscal drag ratio (right-hand y axis) represents the percentage increase in real income tax revenue in the base case with respect to the indexation scenario.

Figure 2 shows the taxpayers ratio for the base case and the indexation scenario. The taxpayer ratio in the base case comprises those obliged to pay tax, while the nominal tax parameters are left unadjusted for inflation. However, the taxpayer's ratio in the indexation scenario reports only those individuals who would be taxed if the tax parameters are adjusted for inflation. Hence, the indexation scenario would retain the real value of tax thresholds as originally determined by legislation and eventually have relatively fewer taxpayers.

Figure 2 shows that inflation causes a significant increase in the number of taxpayers in South Africa, and to a lesser extent in Tanzania and Zambia. The percentage of individuals who would be exempted in the indexation scenario but pushed into paying tax in the base case is higher in South Africa, around 25 per cent. This made it interesting to decompose the increase in the taxpayer's real tax burden in the base case, separating taxed individuals from exempted ones in the indexation scenario. Table 4 presents the share of fiscal drag that accrues to taxpayers by legislation—that is, common taxpayers in the base case and indexation scenario or taxpayers keeping the real value of tax brackets as originally determined by legislation—and to those who would be exempted in the counterfactual scenario but dragged into the tax bracket by inflation in the base case. Our findings show that a very small percentage of fiscal drag is attributed to an increase in the number of taxpayers due to inflation. Rather, taxpayers by legislation face the largest share of fiscal drag. The percentage of fiscal drag faced by individuals taxed only in the base case is relatively higher in South Africa, Tanzania, and Zambia.

Table 4: Decomposition of fiscal drag between taxpayers by legislation and taxpayers who would be exempted from tax at indexation scenario

Countries	Ethiopia	Mozambique	South Africa	Tanzania	Uganda	Zambia
Taxpayers only at base case	0.41	0.99	5.90	3.32	0.81	4.89
Taxpayers by legislation	99.59	99.01	94.10	96.68	99.19	95.11

Source: authors' construction based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

As shown in Figure 2, the size of the fiscal drag varies broadly among the selected countries. It represents over 34 per cent of PIT in Zambia, while it accounts for nearly 4 per cent of PIT in the base case in Mozambique. Our findings show that the size of fiscal drag is relatively smaller in comparison with the magnitude of inflation registered in the sampled countries. For instance, 55 per cent of inflation in Ethiopia (Table 3) prompted only a 10 per cent fiscal drag. This can be explained by a substantial gap between the level of tax exemption and the average gross income of non-taxpayers. Thus, a large number of individuals will be exempted from tax despite higher inflation.

There is no single factor that dictates the magnitude of the tax burden. However, this study identifies that the size of fiscal drag can be better explained by inflation-driven alteration in taxpayers' distribution and the corresponding change in the average tax rate between the base case and the indexation scenario. The increase in the population of taxpayers and the shift in taxpayers to the higher tax bracket characterize the change in the distribution of taxpayers.

To provide evidence on the relationship between fiscal drag and the change in the distribution of taxpayers, Table 5 illustrates how taxpayers are distributed in the base case and the indexation scenario, by quintiles of equivalized disposable income fixed in the base case.

Table 5: Percentage distribution of taxpayers, by income quintile groups

Quintiles	Ethiopia		Mozambique		South Africa		Tanzania		Uganda		Zambia	
	Base	Index	Base	Index	Base	Index	Base	Index	Base	Index	Base	Index
1	2.67	1.90	5.38	5.51	0.03	0.04	0.00	0.00	0.00	0.00	2.58	2.75
	[0.65]	[0.49]	[0.87]	[0.89]	[0.03]	[0.04]	[0.00]	[0.00]	[0.00]	[0.00]	[0.47]	[0.50]
2	5.09	5.04	5.22	5.36	0.07	0.03	0.00	0.00	0.57	0.25	2.78	2.96
	[1.01]	[1.01]	[0.84]	[0.86]	[0.04]	[0.03]	[0.00]	[0.00]	[0.27]	[0.17]	[0.52]	[0.55]
3	10.42	10.58	4.40	4.51	2.20	0.76	0.67	0.26	5.51	4.27	3.78	4.03
	[1.50]	[1.52]	[0.89]	[0.92]	[0.21]	[0.12]	[0.25]	[0.20]	[0.74]	[0.67]	[0.58]	[0.62]
4	19.82	20.08	15.31	15.70	21.50	14.90	19.56	13.16	26.54	26.12	9.01	9.25
	[1.70]	[1.72]	[1.40]	[1.44]	[0.56]	[0.56]	[1.29]	[1.20]	[1.63]	[1.66]	[0.88]	[0.92]
5	62.01	62.40	69.70	68.92	76.20	84.27	79.77	86.57	67.38	69.36	81.85	81.01
	[2.10]	[2.12]	[1.72]	[1.76]	[0.60]	[0.58]	[1.31]	[1.22]	[1.70]	[1.73]	[1.17]	[1.23]

Note: standard errors reported in square brackets.

Source: authors' construction based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

The gap between taxpayers in the base case and in the indexation scenario in Table 5 represents the percentage of individuals in the quintiles who would be exempted in the counterfactual scenario but dragged into the tax bracket by inflation in the base case or percentage of taxpayers who moved to higher marginal tax rates due to inflation. The percentage of taxpayers between the first and the fourth quintiles for the base case is higher than that of the indexation scenario for Ethiopia, South Africa, Tanzania, and Uganda. This implies that fiscal drag affects taxpayers in the lower and middle tax schedules. In particular, the increase in the percentage of taxpayers in these

quintiles of the base case is related to the individuals who would be exempted in the indexation scenario but pushed into the tax bracket by inflation. Moreover, a sharp decrease in the percentage of taxpayers in the top quintile of the base case signals the role of the indexation procedure in reshuffling the tax burden to higher-income earners by excluding those who were pushed into tax brackets due to inflation. In contrast, the percentages of taxpayers in the bottom four quintiles for the base case are significantly lower than those in the indexation scenario in Mozambique and Zambia. In addition, the percentage of taxpayers in the top quintile for the base case surpassed the equivalent figure for the indexation scenario. Given a trivial increase in the number of taxpayers due to inflation, some regular taxpayers moved from the bottom to the top quintiles. Eventually, the indexation procedure shifts these taxpayers back to the bottom quintiles.

The taxpayers' distributional statistics discussed so far do not provide a full picture of the disparity in fiscal drag size among countries. Therefore, we should consider changes in the average tax rate. Table 6 presents the average tax rate for the base case and the indexation scenario by quintiles of equivalized disposable income fixed in the base case. It sufficiently complements the change in taxpayer distribution discussed so far in determining the size of fiscal drag in selected countries.

Table 6: Distribution of the ratio of average tax rate, by income quintiles

Quintiles	Ethiopia		Mozambique		South Africa		Tanzania		Uganda		Zambia	
	Base	Index	Base	Index	Base	Index	Base	Index	Base	Index	Base	Index
1	9.47	7.42	15.35	15.35	3.84	1.21	2.06	0.36	0.58	0.27	3.48	3.48
	[0.47]	[0.41]	[1.77]	[1.77]	[0.10]	[0.08]	[0.11]	[0.08]	[0.12]	[0.07]	[0.24]	[0.24]
2	11.35	9.17	9.75	9.75	7.16	4.46	4.61	2.57	4.63	3.26	5.54	1.79
	[0.56]	[0.47]	[1.10]	[1.10]	[0.14]	[0.13]	[0.22]	[0.14]	[0.54]	[0.43]	[0.57]	[0.19]
3	14.64	11.94	5.17	4.95	10.54	7.34	8.36	4.91	10.49	8.55	11.81	5.55
	[0.43]	[0.41]	[1.02]	[1.06]	[0.19]	[0.18]	[0.25]	[0.19]	[0.44]	[0.45]	[0.36]	[0.31]
4	15.48	12.56	4.58	3.89	14.81	11.51	12.98	9.38	15.26	13.83	16.26	9.96
	[0.71]	[0.58]	[0.36]	[0.36]	[0.26]	[0.26]	[0.54]	[0.53]	[0.38]	[0.41]	[0.36]	[0.34]
5	27.08	25.05	17.47	16.87	24.48	21.63	23.30	22.14	22.17	21.64	19.12	14.51
	[0.99]	[1.14]	[1.08]	[1.11]	[0.50]	[0.55]	[0.55]	[0.58]	[0.46]	[0.49]	[0.33]	[0.35]

Note: standard errors reported in square brackets.

Source: authors' construction based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

The results in Tables 5 and 6 indicate that a country that exhibits a greater increase in the number of taxpayers and the average tax rate along the corresponding quintiles in the base case relative to the indexation scenario ends up with higher fiscal drag. For instance, inflation in Zambia resulted in a higher increase in the number of taxpayers and the average tax in the top quintile than in Mozambique. Hence, the former has a higher fiscal drag than the latter. Generally, the highest fiscal drag ratio has been reported in Zambia (Figure 2). This corresponds with the greatest increase from the second up to the fifth quintiles' tax rate shifting from the indexation scenario to the base case.

In Ethiopia, Tanzania, and Uganda, there is a slight shift from being exempted to being taxpayers moving from the indexation scenario to the base case (Figure 2 and Table 5). A minor increase in the average tax rate (Table 6) in the bottom and middle quintiles causes a moderate fiscal drag. A massive shift from a higher percentage of taxpayers who face a higher marginal tax rate due to inflation, and an increase in the average tax rate in the base case relative to the indexation scenario, contribute meaningfully to the higher fiscal drag in South Africa. Further, the variation in the level of fiscal drag among these countries is explained by respective increases in the average tax rate in the middle quintiles. For instance, the greater increase in average tax in the third and fourth quintiles in Ethiopia, South Africa, and Tanzania results in a higher fiscal drag ratio (Figure 3) than

those of Mozambique and Uganda. As discussed so far, the failure to introduce an automatic inflationary adjustment in the selected countries resulted in a sizeable fiscal drag. Although most taxpayers face an increase in the tax burden to some extent, some suffered more than others. According to Table 7, which illustrates the ratio of fiscal drag to PIT in the base case by quintiles of equivalized disposable income fixed in the base case, the percentage of fiscal drag to income tax in the base case is higher in the bottom quintiles in Ethiopia, South Africa, Tanzania, Uganda, and Zambia. On the other hand, the percentage is higher in the top quintiles for Mozambique.

Table 7: The ratio of fiscal drag to income tax at base case, by income quintiles

Quintiles	Ethiopia	Mozambique	South Africa	Tanzania	Uganda	Zambia
1	21.65	0.00	68.46	82.38	52.36	0.00
	[0.52]		[1.31]	[3.45]	[2.66]	
2	19.17	0.00	37.69	44.31	29.55	68.00
	[0.21]		[0.74]	[0.53]	[1.16]	[2.86]
3	18.39	4.15	30.12	41.27	18.46	53.00
	[0.59]	[1.69]	[0.52]	[0.68]	[0.98]	[1.35]
4	18.90	15.02	22.27	28.09	9.36	38.82
	[0.07]	[1.23]	[0.40]	[1.18]	[0.56]	[0.78]
5	7.48	3.42	11.86	4.86	2.34	23.89
	[0.92]	[0.56]	[0.46]	[0.36]	[0.18]	[0.62]

Note: standard errors reported in square brackets.

Source: authors' construction based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

It is pertinent to address the importance of the shape of tax schedules amid the rise in the real tax burden. Tax deductions and tax credit at the initial real value and the number and width of tax brackets collectively determine the distribution of fiscal drag. This study examines the correlation between the local progressivity of PIT before the inflation period and fiscal drag across quintiles. We label 'before inflation' based on a unique simulation procedure using the start period data (Table 3). We measure the structure of tax brackets using liability progression or the elasticity of tax burden, defined as the ratio of the percentage change in tax liability to the percentage change in income:

$$\text{Liability progression} = \frac{\frac{T_1 - T_0}{I_1 - I_0}}{\frac{T_0}{I_0}} = \frac{T_1 - T_0}{I_1 - I_0} \times \frac{I_0}{T_0}$$

Like METR, the liability progression is computed considering a three per cent increase in income. T_1 and I_1 denote adjusted income tax and original income, respectively, while T_0 and I_0 represent unadjusted income tax and original income, respectively. The liability progression will equal 1 when the tax is proportional, exceed 1 when the tax is progressive, and be less than 1 when the tax is regressive (Musgrave and Thin 1948).

Table 8 illustrates the distribution of liability progression before the inflation scenario by quintiles of equivalized disposable income fixed in the base case. The findings indicate that the equalizing property of PIT varies across countries. The initial shape of Mozambique's tax schedule is regressive for low-income groups but progressive for higher-income groups. On the other hand, the tax schedules in Ethiopia, South Africa, Tanzania, Uganda, and Zambia are more progressive in the bottom quintiles. The liability progressions at the bottom quintiles in South Africa, Tanzania, and Uganda are higher than in the other countries.

Table 8: Liability progression at pre-inflation scenario

Quintiles	Ethiopia	Mozambique	South Africa	Tanzania	Uganda	Zambia
1	1.91	—	7.17	5.72	7.36	—
2	1.82	—	3.36	2.60	5.22	2.81
3	1.59	0.91	2.75	2.47	3.64	4.55
4	1.70	3.55	2.13	2.10	2.23	2.72
5	1.55	1.65	1.65	1.40	1.45	1.87

Source: authors' construction based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

The percentage distribution of fiscal drag (Table 7) coincides with the liability progression. In countries with higher liability progression in the bottom quintiles—Ethiopia, South Africa, Tanzania, Uganda, and Zambia—fiscal drag decreases from the bottom to the top quintiles. In Mozambique, where liability progression is higher in the top quintiles, fiscal drag increases from the bottom to the top quintiles. This implies that when progressivity of income tax decreases (increases), moving from the bottom to the top quintiles, the fiscal drag will decrease (increase). Similarly to the findings of Immervoll (2005), our findings indicate that the quintile distribution of fiscal drag is heavily determined by the distribution of liability progression.

4.2 Indexation and redistributive effects

This subsection discusses how the progressivity and the overall redistributive role of income tax are altered by introducing automatic indexation for inflation. As is common in the literature (e.g., Figari and Verbist 2014), we employ the Kakwani progressivity index (π^k) and the redistribution index (π^{RE}) for direct taxes in the base case and the indexation scenario. The redistributive index includes vertical equity and reranking effects. Exploring the redistributive impact of fiscal drag, our findings enable us to mark the inflation-induced PIT burden as either progressive or regressive. Finally, we decompose the overall progressivity into PIT and SIC parts.

Assuming no reranking in the income order due to the tax system, the redistributive effect (π^{RS}) is measured by the Reynolds and Smolensky (1977) index. The index matches the difference between the Gini coefficient of pre-tax income and the concentration coefficient of post-tax income: $\pi^{RS} = G^X - C^N$. The Reynolds and Smolensky index resembles vertical equity if there is no reranking, while the Kakwani progressivity index is computed by the difference between the concentration coefficient of taxes and the Gini coefficient of pre-tax income: $\pi^k = C^T - G^X$. There is a direct relationship between the redistributive effect and the Kakwani progressivity index. π^{RS} is a function of π^k and the average tax rate (γ): $\pi^{RS} = \pi^k * \frac{\gamma}{(1-\gamma)}$.

If the tax system bears a reranking in the income order, the redistributive effect will be different from vertical equity. In such a case, the total redistributive effect (π^{RE}) is measured by the difference between the Gini coefficient of pre-tax income and the Gini coefficient of post-tax income: $\pi^{RE} = G^X - G^N$.

The progressivity statistics for the base case and the indexation scenario are presented in Table 9. In the absence of inflationary adjustment, fiscal drag reduces the progressivity index in Ethiopia, South Africa, Tanzania, Uganda, and Zambia. It increases the real tax revenue, dragging those individuals who would be exempted in the counterfactual scenario into the tax bracket and increasing the average tax rate for taxpayers by legislation. Conversely, indexation upholds the disproportionality between tax liability and income across the income distribution.

Table 9: Kakwani progressivity index and average tax rates, base case and indexation scenario

Countries	Base case		Indexation scenario	
	Kakwani index	Average tax rate	Kakwani index	Average tax rate
Ethiopia	0.113 [0.01]	0.275 [0.01]	0.128 [0.01]	0.252 [0.01]
Mozambique	0.136 [0.01]	0.168 [0.01]	0.132 [0.01]	0.157 [0.01]
South Africa	0.234 [0.00]	0.173 [0.00]	0.282 [0.00]	0.143 [0.00]
Tanzania	0.173 [0.01]	0.208 [0.01]	0.206 [0.01]	0.190 [0.01]
Uganda	0.167 [0.01]	0.213 [0.00]	0.182 [0.01]	0.204 [0.01]
Zambia	0.132 [0.01]	0.189 [0.00]	0.171 [0.01]	0.138 [0.00]

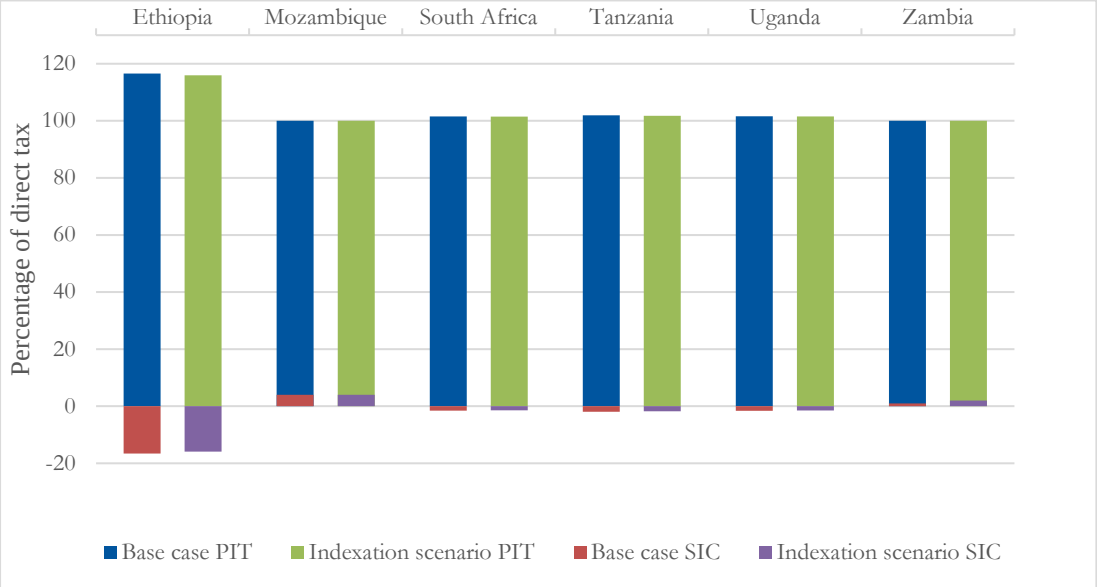
Note: standard errors reported in square brackets.

Source: authors' construction based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

The results in Table 9 also show that fiscal drag increases the progressivity index in Mozambique. Thus, a shift in the share of tax liability from high- to low-income taxpayers due to indexation in this country is demonstrated by a decrease in the percentage of taxpayers in the top quintile in Table 5. Therefore, fiscal drag fosters the equalizing property of PIT in Mozambique. In general, fiscal drag is progressive (regressive) in countries with lower (higher) liability progression of PIT before the inflation period at the bottom quintiles (Table 8).

We also examine the overall direct tax progressivity contribution made by two of the most important taxes, PIT and SIC, in the selected countries. This decomposition helps to identify the most equalizing tax policy tools. Figure 3 shows the percentage share of PIT and SIC in the overall progressivity of direct taxes for the base case and the indexation scenario.

Figure 3: Decomposition of progressivity of direct taxes: personal income tax and social insurance contribution, in base case and indexation scenario



Source: authors' illustration based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

Two findings can be drawn from Figure 3. First, the progressivity contribution of PIT dominates that of SIC in both the base case and the indexation scenario. Second, regardless of the variation in magnitude, PIT positively contributes to overall progressivity in all countries. SIC negatively contributes to direct tax progressivity in Ethiopia and to a lesser extent in South Africa, Tanzania, and Uganda. Therefore, the overall progressivity of direct taxes in these countries would be slightly higher if SIC did not exist. Employees in Ethiopia, who are liable for SIC, earn less money than those who are self-employed. This could explain why the overall progressivity contribution of SIC in Ethiopia is negative and large.

The overall redistributive effect of direct taxes in both the base case and the indexation scenario is presented in Table 10. We compute the redistributive indices and the Gini coefficient of disposable income over the taxpayer population. The former is the difference between the Gini coefficient of pre-tax income and the Gini coefficient of disposable income and shows that overall, there is little redistribution across the considered countries. The redistributive effect of direct taxes is higher in South Africa and lower in Mozambique in the base case. Apart from in South Africa and Zambia, fiscal drag reduces the redistributive effect of direct taxes in all countries, with a regressive increase in the real tax burden. A higher proportional increase in average tax relative to the fall in the Kakwani progressivity index (Table 9) causes a slight improvement in the redistribution index in South Africa and Zambia. Similarly, fiscal drag increases the redistribution index for Mozambique. An upsurge in the redistributive effect in this country is attributed to an increase in the Kakwani progressivity index due to fiscal drag. However, the effect of fiscal drag on the redistribution index and the Gini coefficient is minimal in all countries.

Table 10: Redistributive effect of direct taxes, in base case and indexation scenario

Countries	Base case		Indexation scenario	
	π^{RE}	Gini	π^{RE}	Gini
Ethiopia	0.041 [0.00]	52.75 [0.02]	0.042 [0.00]	52.64 [0.02]
Mozambique	0.027 [0.00]	61.55 [0.02]	0.026 [0.01]	61.58 [0.02]
South Africa	0.048 [0.00]	35.46 [0.01]	0.047 [0.00]	35.61 [0.01]
Tanzania	0.045 [0.00]	54.68 [0.01]	0.048 [0.00]	54.38 [0.01]
Uganda	0.045 [0.00]	45.07 [0.01]	0.046 [0.00]	44.92 [0.01]
Zambia	0.029 [0.00]	36.18 [0.00]	0.027 [0.00]	36.44 [0.01]

Note: standard errors reported in square brackets.

Source: authors' construction based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

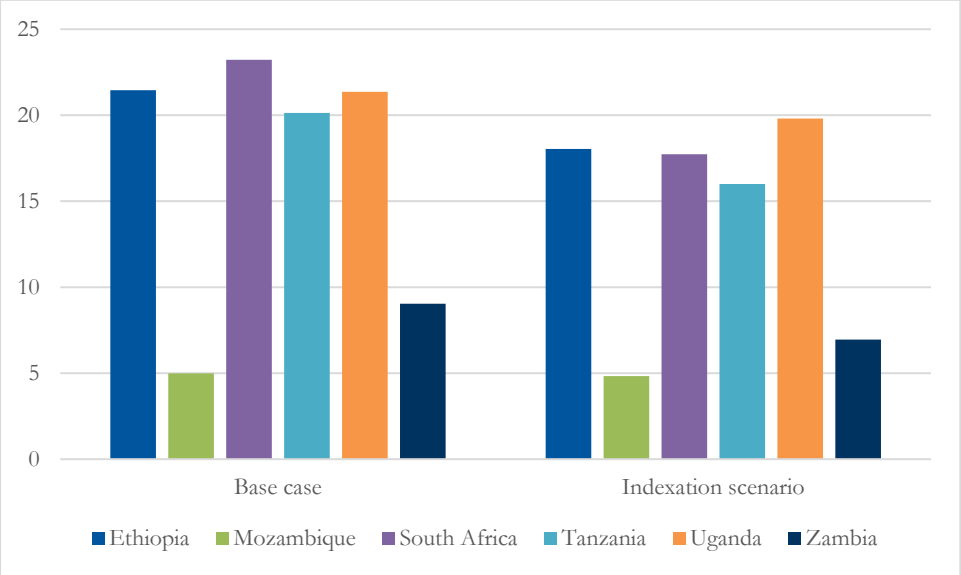
4.3 Indexation and work incentives

This section discusses the effect of fiscal drag on the work incentives faced at the intensive margin of labour supply measured by METRs. Figure 4 shows the level of METR in the six countries of the study in both the base case and the indexation scenario. The results show that fiscal drag increases the METR in all countries covered by the study. The rise in METR may be triggered by an increase in the average tax rate following an increase in nominal income. The higher the METR, the lower the financial incentive to raise income, by either working more hours or finding a job with better pay (OECD 2007). Therefore, fiscal drag in all countries is accompanied by a fall in work incentives. This result corroborates the findings of Immervoll (2006). However, the gap between METR in the base case and in the indexation scenario varies across countries. The biggest

shift in METR due to fiscal drag is recorded in South Africa, then, following in descending order, Tanzania, Ethiopia, Zambia, Uganda, and Mozambique.

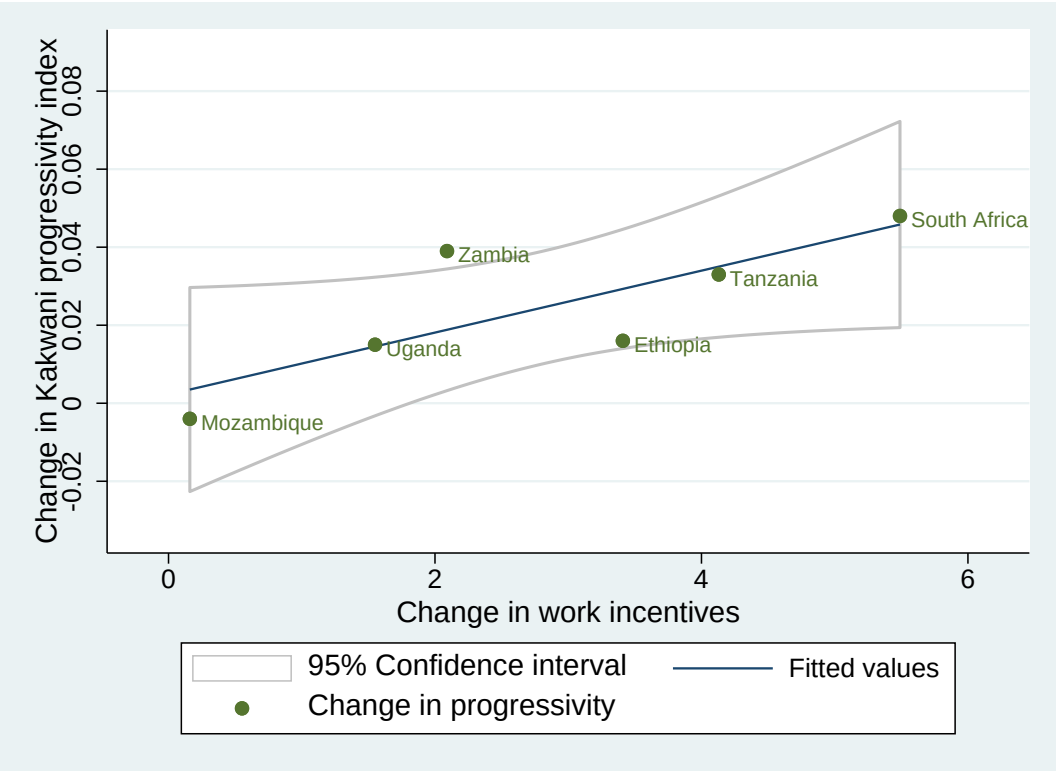
We explore the joint dynamics of work incentives and the progressivity of the tax system due to indexing tax schedules, exemptions, and deductions for inflation. Figure 6 presents the change in the Kakwani progressivity index and work incentives created by introducing the counterfactual indexation procedure. Accordingly, indexation simultaneously fosters progressivity and work incentives in Ethiopia, South Africa, Tanzania, Uganda, and Zambia, where fiscal drag is regressive. On the other hand, indexation weakens progressivity but enhances work incentives in the country with progressive fiscal drag, Mozambique. The relationship between the change in progressivity and work incentives is statistically significant in all countries except Zambia.

Figure 4: METR, in base case and indexation scenario



Source: authors' illustration based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

Figure 5: Change in progressivity and work incentives



Source: authors' illustration based on ETMOD v. 1.0, MOZMOD v. 2.6, SAMOD v. 6.9, TAZMOD v. 1.8, UGAMOD v. 1.4, and MicroZAMOD v. 2.4 data.

5 Conclusion

This study examines the magnitude and distribution of inflation-driven fiscal drag and its effect on income distribution and work incentives in the context of sub-Saharan African countries. It explores how the number of taxpayers and the average tax rate alter across the income distribution following a rise in nominal income. To this end, we use survey datasets from six African countries that are at different levels of economic development and are characterized by heterogeneous tax systems, namely, Ethiopia, Mozambique, South Africa, Tanzania, Uganda, and Zambia. We employ a tax-benefit microsimulation approach underpinned by national models and evaluate the effect of a counterfactual indexation procedure by extending the decomposition framework originally developed by Bargain and Callan (2010).

The following conclusions can be drawn from our empirical investigation. First, this study identifies that the size of fiscal drag is considerably explained by inflation-triggered changes in the distribution of taxpayers and average tax rates across quintiles. Second, the relative distribution of the additional tax burden due to the increase in nominal income is ultimately determined by the liability progression of PIT in the pre-inflation period. Hence, fiscal drag is regressive in Ethiopia, South Africa, Tanzania, Uganda, and Zambia. However, it is progressive in Mozambique. Third, in the absence of inflationary adjustment on tax parameters, fiscal drag reduces the progressivity of PIT in all countries except Mozambique. Despite the fall in progressivity in South Africa and Zambia, the increase in tax liability due to inflation improves the equalizing property of direct taxes. Fourth, the progressivity contribution of PIT dominates that of SIC in both the base case and the indexation scenario. Finally, fiscal drag deteriorates financial work incentives to increase earnings in all the sampled countries.

These findings suggest the importance of introducing a statutory adjustment to monetary tax policy parameters. Indexation would allow countries to remove, or at least reduce, the inflation-induced burden on taxpayers. In addition, it would allow countries to retain the redistributive property of tax policies as initially determined by legislation by averting the sudden increase in the number of taxpayers and in tax rates due to the rise in nominal income. Countries can also foster financial work incentives to increase earnings by introducing a comprehensive and regular nominal tax parameter indexation system.

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