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High Inflation and Wage Rigidity:
The Implicit Response of the Italian Tax-Benefit System

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Abstract

We study the redistributive effect of inflation-induced revenue and expenditure variations in the Italian tax-benefit system in a context in which pensions and social transfers are indexed to inflation and nominal wage growth struggles to keep up. By means of the EUROMOD microsimulation model, we isolate the contribution of *i*) fiscal drag through the personal income tax, *ii*) indexation rules and policy changes regarding social insurance contributions and *iii*) pension and social transfer indexation rules related to the overall redistributive effect of the tax-benefit system and its vertical and horizontal components. The findings suggest that benefit indexation rules contribute to a non-negligible extent to income redistribution, that fiscal drag has a small regressive effect and that the implicit redistribution favours pensioners over private-sector employees.

JEL: D31; H23; H24.
Keywords: inflation; indexation; fiscal drag; redistribution; EUROMOD.

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1 Introduction

The present paper is about the redistributive effect of inflation-induced revenue and expenditure variations in the Italian tax-benefit system, a context in which pensions and social transfers are indexed to relatively high inflation and nominal wage growth struggles to keep up. In the past, periods of high inflation have encouraged governments to introduce indexation mechanisms for pensions and social transfers, and nowadays, almost all OECD countries have provided some form of indexation to cope with the loss of purchasing power. As seen through a between-category perspective, the joint effect of high inflation, combined with indexation for pensions and social transfers and stagnant wage growth, may have a number of important consequences in terms of public expenditure financing and income redistribution. The implicit response of the complex structure of taxes and benefits may give rise to a distribution of inflation-induced resources that has not yet received attention. This entails short- and long-term redistributive effects both across and within households in the context of ageing societies, inflationary pressures due to the transition to green economies and a lack of automatic mechanisms to adjust wages to inflation.

Italy represents an interesting case in the international context with respect to inflation-related matters. At the present moment, no indexation mechanism is foreseen for tax rules, except for income thresholds for the payment of social insurance contributions (SICs). Personal income tax (PIT) has historically played a crucial role in the redistribution of income, as in most European countries (Verbist and Figari, 2014). According to OECD statistics, the effective tax rate of PIT and SICs is jointly considered amongst the highest observed in developed economies in recent years, on average amounting to 53.8% for high-income earners in 2022.[1] Furthermore, the gradual subjection to substitute and more favourable tax regimes of several income sources previously included in the PIT base has contributed to making the PIT rather selective regarding employment and retirement income (Boscolo, 2021), on top of the large amount of aggregate tax evasion on self-employment income that still characterises the Italian context (Bazzoli et al., 2020). This adds a categorical dimension to the study of fiscal drag, which is further amplified by the heterogeneous adjustment to inflation by income source in the current Italian context. In contrast, the generality of pensions and social transfers are fully indexed to inflation, with two important exceptions: *i*) social insurance pensions, for which the adjustment is total up to four times the minimum pension amount and then diminishes gradually up to 10 times, and *ii*) the minimum income scheme (*Reddito di Cittadinanza* [RdC][2]), which provides no indexation-related adjustments. As reported by OECD statistics, Italy falls into the category of countries with the greatest level of public social spending in relation to GDP, with a ratio of 30.1% in 2022.[3] This high percentage and the differentiated adjustment to inflation for specific and opposite segments of the disposable income distribution may entail significant redistributive effects for the population as a whole.

This paper provides evidence of the extent to which the following determine income redistribution in the context of the high inflation and nominal wage rigidity that still characterise Italy: *i*) fiscal drag through the PIT, *ii*) SIC-related indexation rules and

[1] https://stats.oecd.org/index.aspx?DataSetCode=TABLE_I5.

[2] The RdC was in force until August 2023 for non-working households with all family members between the ages of 18 and 59 capable of working, and it is currently in force until December 2023 for households with at least one of the following members: *i*) disable members; *ii*) underage members; *iii*) individuals with at least 60 years of age.

[3] https://data.oecd.org/socialexp/social-spending.htm.

policy changes and *iii*) pension and social transfer indexation rules. We also shed light on inflation-induced resource distribution by population category. Using the EUROMOD microsimulation model and ad hoc uprating techniques, we simulate a baseline scenario that reflects the 2023 tax-benefit system and the underpinning macroeconomic context as closely as possible. In this system, inflation grows more rapidly than wages, setting the scene for fiscal drag to increase tax burdens and for pension and social transfer indexation rules to shape income inequality and compensate for the loss of purchasing power for specific population groups. Other non-retirement market income components and wealth assets grow as well, but in most cases to a lesser extent than prices. We compare the baseline scenario to two steady-state counterfactual scenarios in which there is no growth in prices in the 2022–2023 period and market income and wealth growth are stagnant. As a result, tax-benefit rules that change annually according to inflation are scaled back to the previous year, while everything else is kept constant as of 2023. These counterfactual scenarios vary according to whether we consider recent changes to pension contribution rates for employees as inflation-dependent policy changes. The comparison between scenarios is intended to identify the revenue and expenditure variations exclusively related to fiscal drag and benefit indexation rules. To isolate the contribution of inflation-induced taxes and benefit amounts to the redistributive effect, we implement the decomposition approach put forward by Urban (2014), which also allows distinguishing between vertical and horizontal effects.

The remainder of the paper is structured as follows. Section 2 provides a review of related studies. Section 3 describes policy scenarios and the empirical strategy adopted to isolate the contribution of fiscal drag and indexation rules to the redistributive effect in the Italian institutional context. Section 4 presents the results of the analysis. Section 5 offers concluding remarks.

2 Literature review

Our work falls into the category of research that aims to contribute to the understanding of tax-benefit indexation rules in relation to income redistribution.

Only a handful of studies have looked at the performance of automatic inflation-adjustment schemes in detail, starting with the seminal paper by Immervoll (2005). The author shows that inflation-induced erosions of nominally defined amounts built into relevant tax rules – what is defined as "bracket creep" – alter the distributional and revenue-generating properties of income taxes and SICs. Subsequently, Immervoll (2006) provides evidence of how bracket creep reduces tax progressivity and shows that if tax systems are left unindexed, fiscal drag increases marginal effective tax rates. Levy et al. (2010) find that if the income tax is not adjusted for inflation, redistribution increases as a result of higher tax burdens that prevail over the reduction in progressivity.

On a more comprehensive level, Sutherland et al. (2008) shed light on the long-term impact of uprating rules on income inequality and poverty rates. They demonstrate that fiscal drag plays a more minor role than benefit erosion for households at the bottom of the income distribution, and vice versa. Moreover, Paulus et al. (2020) assess the effect of tax benefit policy changes on household income distribution by separating indexation rules from structural policy changes. The indexation effect measures the extent to which fiscal drag and benefit erosion contribute to the overall impact of tax-benefit policy changes. They find that indexation not only has a positive effect on household incomes but contributes more to poverty and inequality reduction than structural policy reforms.

A broader range of studies have devoted attention to the welfare consequences of different indexation regimes of specific benefits, mainly social insurance pensions. In particular, Whitehouse (2009) points out that the effect of indexing pensions to price inflation rather than wage inflation is the reduction of pensioner incomes compared with those of the working-age population. Beetsma and Bucciol (2011) compare how differentiating indexation according to individual characteristics or market contingencies in Dutch pension funds determines welfare participants under unexpected demographic, economic and financial shocks. Hinrichs (2015) studied pension reforms in the aftermath of the financial crisis in 2008 and found that the switch to consumer price indexation rather than wage inflation exposes retirees to a higher risk of relative poverty as they get older, in addition to increasing social tensions and equality concerns (Baurin and Hindriks, 2023). Grech (2015) shows that changes in pension indexation between 1990 and 2009 have substantially reduced state pension generosity and pension wealth accumulation and that pension indexation below average wage growth also raises concerns about future poverty conditions among pensioners with full working careers. Díaz-Saavedra (2018) studied the fiscal and welfare consequences of indexing specific social transfers and pensions to inflation rather than the generality of benefits in Spain and pointed out the intergenerational conflict between current cohorts preferring full indexation of all pensions and future cohorts opting for indexation of disability benefits and minimum pensions only. On the intersections between welfare state characteristics and rising prices due to climate neutrality policies, Vandyck et al. (2021) shows that anchoring benefit indexation rules to price growth mitigates welfare losses for the poorest half of the population in EU countries, but not to an extent that sufficiently compensates for the counterbalancing and regressive effects induced by the reduction in expenditures in a budgetary neutral setting.

Finally, our work also relates to the strain of literature that looks at the contribution of single instruments to the vertical and horizontal effects of tax-benefit systems (Barbetta et al., 2018; Di Caro, 2020). In this regard, we add a further dimension by isolating the contribution of inflation-dependent tax and benefit amounts from inflation-independent amounts.

3 Institutional context and empirical strategy

In the Italian tax-benefit system, most social transfers and pensions are indexed based on the percentage variation between the average value of the Consumer Price Index for Families of Workers and Employees (FOI index, according to the Italian acronym) in the previous year $(t-1)$ and the corresponding value in $t-2$, for a definitive (provisional) rate $r = 8.1\%$ ($r_p = 7.3\%$) in 2023.[4] From this, it follows that in a year when prices are subject to steep increases, the purchasing power of benefits falls, as the indexation mechanism delays the adjustment to the subsequent year. Appendix A examines in great detail the tax-benefit rules that are updated yearly to account for inflation, including those left unindexed. In contrast to social insurance pensions, the PIT rules are not indexed and this gives room for fiscal drag to exercise its erosion effect.

[4]For accounting purposes, the provisional rate $r_p = 7.3\%$ applies to all pensions as of January 2023. The rate is obtained in the same fashion as r, but it is provisional since it is calculated in late $t-1$, with t equal to the year of pension receipt; therefore, the price variation is the result of estimates for a few months. The definitive rate usually equals r and is confirmed in November of the year of pension receipt, together with the provisional rate for $t+1$. Pension amounts are subject to adjustments by the end of 2023, based on the difference between r_p and r.

3.1 Data and policy scenarios

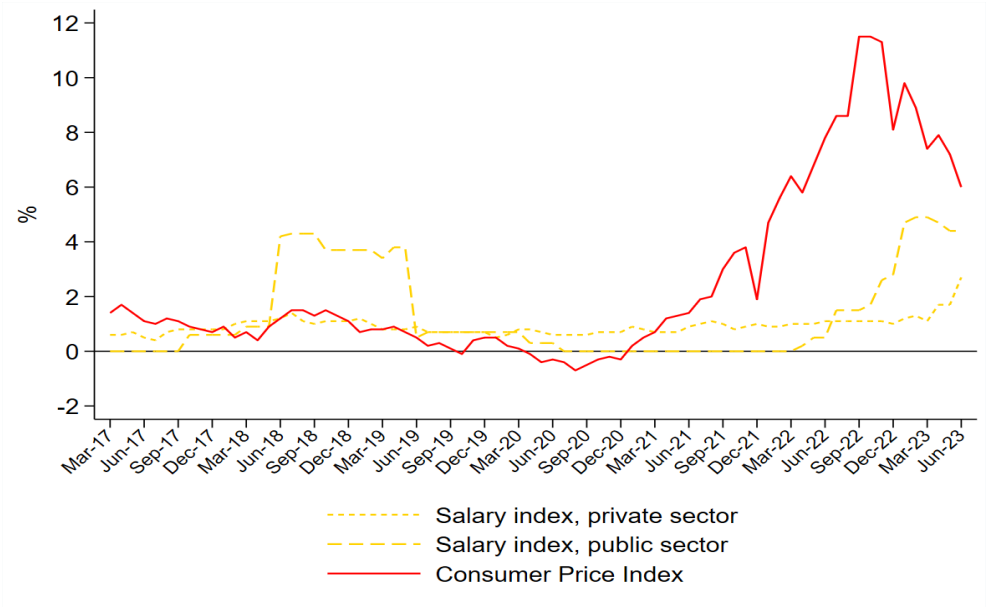
The simulations of the Italian tax-benefit system presented in this paper rely on the use of the EUROMOD static microsimulation model (Sutherland and Figari, 2013). The model allows for calculating taxes paid and benefits granted at the national and subnational levels in great detail for each European Union country. Pensions and social transfers included in the model are not always simulated but are in some cases taken from input data due to data availability constraints. The input data are drawn from the 2019 Italian cross-sectional component of the European Union Statistics on Income and Living Conditions survey, which contains detailed information about income, wealth and sociodemographic characteristics at both the individual and household levels. The dataset comprises data on 43,317 individuals living in 20,831 households, and income and wealth amounts refer to the year before the interview (2018). Time inconsistencies between monetary input data feeding the model – including non-simulated pensions and social transfers – and the policy year are corrected through the use of uprating factors, which is standard practice in static microsimulation modelling (Li et al., 2014). Behavioural responses to policy changes such as labour supply or tax avoidance adjustments to fiscal shocks are not included.

Our empirical strategy builds on the identification of the rules that are partially or fully indexed to inflation in the Italian tax-benefit system. We simulate a baseline scenario that reflects as closely as possible the 2023 tax-benefit system as of June 30 and the underpinning macroeconomic context (hereinafter, Scenario I), in which inflation is relatively high following the steep increase in 2022, while wages, other non-retirement income components and wealth assets struggle to keep up with prices, but to a different extent, according to occupational status, income source and asset. Regarding wages, Figure 1 provides evidence on nominal wage rigidity in the Italian context. We assume that wage growth following the upward trend in inflation is guided by partial adjustments to prices rather than labour productivity growth.[5] We account for the slight increase in employee wages by anchoring employment income growth to the index for contractual hourly wages released by the Italian National Institute of Statistics (ISTAT) separately for the private and public sectors. We align earnings from self-employment to half of the price growth, considering both the lack of impediments to inflation adjustments and possible delays in the adjustments themselves, as well as the existence of minimum and maximum thresholds that apply to freelancers for the determination of their service prices. These thresholds were recently partially adjusted to inflation, but not for all categories. Financial wealth and related capital income are updated based on the average interest rate of state bonds, while housing wealth is relevant to our purposes only in the form of cadastral values, which are assumed to remain constant following a steep price increase. We also account for the misalignment between the reference year for means-testing purposes of simulated benefits (i.e. $t-2$ for the RdC, the *Assegno unico e universale* [AUU] and the *Assegno per il Nucleo Familiare* [ANF], and $t-1$ for the social pension) and the year of benefit receipt ($t = 2023$) by assuming that income and wealth components stay constant until 2023, except for the adjustment to monetary input data growth based on our uprating procedure. The unit-level values of these benefits are derived by running the model two more times – one execution for each year prior to 2023 – and uprating input data to the relevant reference year for the means testing of simulated benefits, while setting tax-

[5] Italy shows no sign of labour productivity growth, according to EUROSTAT statistics on nominal labour productivity growth per person employed. The annual variation in the 2017–2022 period is negative, except for 2021. Relating wage growth to price dynamics turns out to be realistic in the Italian context if wage growth can be generalised as a function of labour productivity and inflation.

benefit rules as of 30 June 2023 except for specific adjustments aimed at ensuring a reliable reconstruction of means-tested income components. The same procedure also applies to the simulation of the above benefits in counterfactual scenarios. We summarise the rates employed, related sources and the variables to which uprating applies in Appendix B and distinguish simulated pensions and social transfers from those derived from input data.

Figure 1 Wage and price growth – monthly variation with respect to *t–1*



Source: ISTAT statistics on contractual wages and prices.

The values derived from Scenario I are compared with the values obtained by running two steady-state counterfactual scenarios in which no growth in prices occurs in the 2022–2023 period, which implies no growth in income and wealth. As a result, simulated tax-benefit rules anchored to inflation are scaled back to the previous year $(t-1)$ while everything else is kept constant as of 2023 (t), to reflect the backward-looking structure of the indexation mechanism. As for those pensions and benefits that are taken from input data, their value remains constant with respect to the previous year. The uprating procedure is therefore applied to all scenarios, but to different extents, in order to impose differences in inflation-indexed pensions, social transfers and other monetary values. The counterfactual scenarios differ from one another with respect to the inclusion of the reduction in pension contribution rates for employees among inflation-dependent policy changes. The reduction was first introduced in 2022, amounting to 0.8 p.p. for the first half of the year and 2 p.p. for the second half, and included up to a gross labour income of €35,000 for contribution purposes per year. A further reduction (on top of the previous 2-percentage-point reduction) equal to 3 p.p. up to €25,000 and 2 p.p. between €25,000 and €35,000 was mandated for the first half of 2023. All of these changes in pension contribution rules have taken place during the current high inflation regime. Their nature and time of introduction may suggest that they would not have been implemented in the absence of inflation, even though no explicit reference was made by the government in relation to their implementation as inflation-dependent policy changes. We refer to Scenario NI2 when the changes to contribution rates are meant to compensate for the loss of purchasing power. In this case, the SIC rules are those in force before government intervention (i.e. the rules in 2021), but SIC thresholds are updated to 2023 according to current indexation rules and the dynamics of inflation in Scenario NI2. In contrast,

we refer to Scenario NI1 when changes to contribution rates are not primarily intended to adjust wages to inflation and are thus changes that would have been introduced even if inflation remained low. The rules for SICs in Scenario NI1 are the same as in Scenario I, except for the SIC thresholds that were not affected by SIC-related changes, which are scaled back to 2022. In Table 1, we summarise the main changes to inflation-dependent tax-benefit rules in the counterfactual scenarios.

Table 1 Main changes to inflation-dependent tax-benefit rules

Rule	**Scenario I**	**Scenario NI1**	**Scenario NI2**
Social insurance pensions:			
- r_p, provisional rate (%):			
$wp_{2022} \leq 4 * mp_{2022}$	7.3	0	0
$wp_{2022} > 4 * mp_{2022}$ *and* $wp_{2022} \leq 5 * mp_{2022}$	6.2	0	0
$wp_{2022} > 5 * mp_{2022}$ *and* $wp_{2022} \leq 6 * mp_{2022}$	3.9	0	0
$wp_{2022} > 6 * mp_{2022}$ *and* $wp_{2022} \leq 8 * mp_{2022}$	3.4	0	0
$wp_{2022} > 8 * mp_{2022}$ *and* $wp_{2022} \leq 10 * mp_{2022}$	2.7	0	0
$wp_{2022} > 10 * mp_{2022}$	2.3	0	0
SICs paid by employees:			
- Threshold contribution base:			
Minimum threshold	11,813	10,928	10,928
Maximum threshold	113,520	105,014	105,014
- SIC rates (%):			
$gw_{2023} \leq 25,000$	4.19	4.19	9.19
$gw_{2023} > 25,000$ *and* $gw_{2023} \leq 35,000$	5.19	5.19	9.19
$gw_{2023} > 35,000$ *and* $gw_{2023} \leq 48,279$	9.19	9.19	9.19
$gw_{2023} > 48,279$ *and* $gw_{2023} \leq 52,190$	9.19	10.19	10.19
$gw_{2023} > 52,190$	10.19	10.19	10.19
SICs paid by atypical workers:			
- Threshold contribution base:			
Maximum threshold	113,520	105,014	105,014
SICs paid by self-employed:			
- Threshold contribution base:			
Minimum threshold	17,504	16,243	16,243
Intermediate threshold	52,190	48,279	48,279
Maximum threshold	86,983	80,465	80,465
Social pension:			
- Thresholds:			
Basic amount	6,542.51	6,097.39	6,097.39
AUU:			
- Thresholds:			
Dependent children threshold	8,648	8,000	8,000
Minimum threshold	16,215	15,000	15,000
Maximum threshold	43,240	40,000	40,000

Note: wp_{2022}: sum of old-age/seniority pensions, survivors' pensions and incapacity pensions; mp_{2022}: minimum pension amount; gw_{2023}: monthly wage before employee-side contributions and PIT withholdings. All other changes to inflation-dependent rules follow the same logic (except for SICs, where changes are not exclusively related to automatic inflation adjustments). For example, the maximum base amount per underage child for the AUU is reduced from €189.19 per month to €175 in both counterfactual scenarios. SIC thresholds are reported in yearly terms for full-year working individuals.

3.2 Isolation of revenue and expenditure variations

To identify revenue changes (ΔT) between scenarios, we take the difference in effective tax rates at the unit level. This means that fiscal drag is generalised as the absolute tax

burden resulting from the percentage difference in the effective tax rate of a given tax following an increase in one or more taxable income components due to direct or indirect adjustments to inflation. This difference is calculated for SICs (ΔSIC) – separately for SICs paid by self-employed workers (ΔSIC_{SE}) and employees/atypical workers (ΔSIC_E) – and PIT (ΔPIT[6]), as no differences in effective tax rates arise from labour or rental income subject to proportional direct taxes (T_{Prop}) or cadastral values subject to the municipal property tax (T_{Mp}). More formally, we define fiscal drag as follows:

$$\begin{aligned} \Delta T_j &= \sum_{i=1}^{k} y_{j,i,I} * (er_{j,i,I} - er_{j,i,NI^*}) - \Delta Z \\ \Delta Z &= \begin{cases} 0, \ for\ \Delta SIC \\ er_{j,i,NI^*} * \left(y^M_{j,i,I} - y_{j,i,I}\right), for\ \Delta PIT \end{cases} \end{aligned} \tag{1}$$

where ΔT_j is the revenue increase (decrease) in the j-th compulsory payment – that is, taxes or SICs – due to the predominant effect of fiscal drag (reverse fiscal drag); $y_{j,i,I}$ is the tax/contribution base for the i-th taxpayer in Scenario I, that is, gross income after deductions for PIT and gross labour income for SICs; $er_{j,i,I}$ and er_{j,i,NI^*} are the effective tax/contribution rates in Scenario I and Scenario NI1 or Scenario NI2, respectively; ΔZ is a factor adjustment applied to ΔPIT to account for the sequentiality in the calculation of SICs and PIT for labour income recipients and ensures that the sum of all single-instrument revenue changes ($\Delta SIC + \Delta PIT$) is equal to the revenue change that would be obtained by relating total burdens from SICs and PIT to market income; and $y^M_{j,i,I}$ is the counterfactual PIT tax base that would be obtained by applying the SIC contribution rates in Scenario NI1 or Scenario NI2 to gross labour income for contribution purposes in Scenario I. $y^M_{j,i,I}$ differs from $y_{j,i,I}$ only for workers whose inflation-dependent increase in gross labour income leads to higher or lower contribution rates. A simplified example of the calculation of ΔZ is provided in Appendix C. For the sake of clarity, with regard to the comparison between Scenario I and Scenario NI2, ΔSIC_E is the result of the joint effect of inflation-dependent policy changes related to the reduction in contribution rates and threshold indexation in the absence of inflation. Furthermore, the resource erosion attributed to fiscal drag for self-employed workers may be slightly overestimated, as the EUROMOD model does not simulate the substitute tax regime on self-employment income. As a result, the latter is entirely subject to PIT for simulation purposes.

Similarly, the expenditure differential attributed to indexation rules (ΔB) is derived by taking the sum of differences between pensions and social transfers in Scenario I (B_I) and Scenario NI1 or Scenario NI2 (B_{NI^*}) at the unit level. For the purposes of our analysis, we divide benefits into six main aggregates: social insurance pensions (Sip), which are only partially indexed to inflation as retirement income increases; social assistance pensions (Sap), which include the social pension; family allowances (Fam); unemployment benefits and wage supplementation schemes (U); other social transfers indexed to inflation (Sot); and other social transfers that are not subject to any adjustment mechanism ($Other$), which only includes the RdC. From the above, it follows that

[6]In our simulations, the effective tax rate for PIT includes the additional burden from the regional surtax and the tax relief granted through the *Bonus IRPEF*. See Appendix A for legislative details about these measures.

$$B_{NI^*} + \Delta B = B_I$$
$$\Delta B = \Delta Sip + \Delta Sap + \underbrace{\Delta Fam}_{E(\Delta AUU)\neq 0 + E(\Delta ANF=0)} + \Delta U + \Delta Sot + \underbrace{\Delta Other}_{E(\Delta Other)=0} \quad (2)$$

Namely, the benefits in Scenario I equal the sum of differences in benefits between scenarios plus the benefits in Scenario NI1 or Scenario NI2. The difference between scenarios of the RdC is expected to equal zero, $E\left(\Delta B_{Other} = 0\right)$, given the related means-testing procedure (which refers to the income and wealth profiles in $t-2$), the lack of adjustment to price growth for benefit amounts and thresholds and the uprating scheme at the basis of our analysis. The finding of no benefit erosion for the RdC is in line with what one would expect from the study of the legislation. No benefit variation is expected for the ANF either.[7] At the present stage, the social bonuses for energy-related expenses are neither simulated by the EUROMOD model nor drawn from input data.[8]

3.3 The contribution of fiscal drag and benefit indexation rules to the redistributive effect

We aim to isolate the contribution of inflation-induced revenue and expenditure variations to the redistributive effect of the Italian tax-benefit system. The decomposition approach put forward by Urban (2014) is used for this purpose. It is based on the earlier contributions of Kakwani (1984) and Lerman and Yitzhaki (1985) and is suited to studying the contributions of tax-benefit instruments to a marginal change in the redistributive effect ($\widehat{RE}$) and its vertical and horizontal effects ($\widehat{VE}$ and $\widehat{HE}$, respectively). To the best of our knowledge, it is the only *complete* and *unique* approach standing on solid normative grounds. The approach is "complete", as it provides a decomposition for both vertical and horizontal effects, while "unique" refers to the ability to yield single contributions for all tax-benefit instruments without adding instruments sequentially. Furthermore, the use of marginal methods may sound rather appealing to policymakers seeking to support household purchasing power in times of soaring prices via marginal changes to indexation rules. We concisely formalise the decomposition approach in Appendix D. We perform the decomposition for Scenario I. In other words, the comparison between scenarios is intended to capture only the differences in taxes and benefits due to fiscal drag and indexation. Recalling (1) and (2), we consider ΔPIT, $\Delta SICs$ and each term in ΔB as tax-benefit instruments separate from inflation-independent liabilities (i.e. $T_I - \Delta T$, where T_I stands for revenue in Scenario I) and benefits before indexation. This implies that the indexation-related increase in social insurance pensions is included among

[7] We simulate tax-benefit rules as of 30 June 2023, except for ad hoc adjustments, to account for the absence of inflation growth in counterfactual scenarios and to correctly calculate the benefit amounts of specific means-tested measures. The ANF for households without children has a peculiar indexation mechanism, as described in Appendix A. Thresholds and benefit amounts are uprated from July 1 of the year of benefit receipt and not from January 1, as is the case for all other inflation-indexed benefits. This implies no change in ANF-related rules between scenarios.

[8] These bonuses are aimed at alleviating the cost of energy-related expenses for households in financial need. They consist of three bonuses (one for each energy-related expense, i.e. gas, electricity and water) and were introduced in 2021 following steep increases in energy prices. Rather strict entitlement conditions apply. Means-tested thresholds for only the gas and electricity bonuses were significantly increased in 2023. The bonuses for electricity and gas amount to a maximum of €64.31 and €43.68 on a quarterly basis, respectively. Finally, the water bonus provides a free supply of 18.25 cubic meters for each household member on a yearly basis (roughly €25 in 2022, on average).

benefits – and not among income components assimilated to market income – to isolate the redistributive effect of indexation rules. In contrast, social insurance pensions before indexation fall into the category of market income components. The same reasoning also applies to work-related benefits.

4 Results

All results are obtained by taking as the unit of analysis the individual with income equivalised through the modified OECD equivalence scale, except where explicitly stated otherwise. We first focus on tax-benefit instrument contributions to total inflation-induced resources and to a marginal change in the redistributive effect. In doing so, we provide insight into the inequality-reducing or inequality-increasing nature of inflation-induced revenue and expenditure variations. Then follows a detailed analysis of the distribution of inflation-induced nominal gains and losses by population category.

4.1 Contributions of tax-benefit instruments

Table 2 presents non-equivalised total gains and losses in 2023 induced by the presence of inflation for each inflation-dependent tax-benefit instrument. The net sum of resources (i.e. $\Delta B - \Delta T$, or more simply, the nominal net gain) amounts to €24.9 billion when the recent changes to employee-related contribution rates are considered as inflation-dependent policy changes and to €15.3 billion otherwise. The greatest contribution to the net gain is derived from indexation rules for social insurance pensions (€16.6 billion, involving 10.9 million households). The erosion of resources attributed to fiscal drag varies according to the comparison considered. The comparison between Scenario I and Scenario NI1 (hereinafter indicated by C1 or Comparison no. 1), in which Scenario NI1 is the counterfactual scenario whose contribution rates equal those in effect as of 2023, unveils a resource drain of €5.8 billion, out of which €4.8 billion is from PIT. In contrast, the comparison between Scenario I and Scenario NI2 (hereinafter C2 or Comparison no. 2) – which includes the changes to contribution rates among policy changes that would not have happened in the absence of inflation – highlights an erosion of €9.2 billion from PIT and €0.2 billion from SICs paid by the self-employed. The inflation-induced variation for SICs paid by employees and atypical workers amounts to –€13.2 billion in C2 and €0.7 billion in C1. This means that the increase in revenue associated with fiscal drag in C2 is offset by the reduction in contribution rates.

Table 3 reports instrument contributions to a marginal change in the redistributive effect and its subeffectswhi for both scenario comparisons. The first thing to note about the findings is that PIT alone accounts for more than half of the redistributive effect, regardless of fiscal drag. This relates to the role that PIT has historically played in the Italian tax-benefit system. The view that sees PIT as the primary instrument to achieve redistribution has always been predominant over the view that devolves to social transfers the redistribution of income. Second, the inequality-decreasing effect of proportional direct taxes may at first appear counterintuitive. However, the ownership of income components subject to flat rates is more frequent among better-off households and increases with disposable income. Third, SICs paid by self-employed workers present a rather regressive nature, which is mainly attributable to horizontal inequities. This is explained by the relatively high contribution rates faced by self-employed workers below the minimum

income threshold set for the payment of SICs. Among poor households, taxes and benefits are more likely to entail marked horizontal inequity effects, as even modest amounts can contribute significantly to the reordering of units from gross to disposable income. Caution is therefore needed in the interpretation of such a regressive effect, as we cannot observe whether the contributions due are actually paid. The results presented here for self-employed workers relate to the intended effects of the tax-benefit system assuming full tax compliance on declared income. Finally, social transfers provide significant contributions to the horizontal effect as well. This is especially the case for social assistance pensions and the RdC. Recipient households are highly concentrated among the poorest, both measures being targeted at poor segments of the population.

Table 2 Contributions of tax-benefit instruments to nominal net gains

Instrument	**Comparison no. 1**			**Comparison no. 2**		
	€ (bn)	% disposable income I	Frequency (No. hh)	€ (bn)	% disposable income I	Frequency (No. hh)
ΔSIC_E	0.747	0.09	5.713	-13.204	-1.58	12.775
ΔSIC_{SE}	0.199	0.02	4.702	0.199	0.02	4.702
ΔPIT	4.820	0.58	21.715	9.247	1.10	21.728
ΔSip	16.610	1.98	10.937	16.610	1.98	10.937
ΔU	0.046	0.01	0.029	0.046	0.01	0.029
ΔSap	2.109	0.25	3.530	2.104	0.25	3.530
ΔAUU	2.122	0.25	7.956	2.122	0.25	7.956
ΔSot	0.212	0.03	0.764	0.212	0.03	0.764
$\Delta B - \Delta T$	15.334	1.83	–	24.853	2.97	–

Note: Values in non-equivalised terms. Households in millions. Source: Authors' elaborations of EUROMOD outputs.

Fiscal drag through PIT shows a small inequality-increasing effect amounting to –0.6% of the redistributive power in C2, which is due to a positive contribution to the horizontal inequity effect and to a negative contribution to the vertical equity effect. This means that fiscal drag makes unequal taxpayers, in terms of ability to pay, even more unequal, with the latter being prevalent over the former. In contrast, the redistributive loss is less relevant in C1 (–0.4%) and is driven almost equally by both effects. The difference in the redistributive magnitude between scenario comparisons relates primarily to the inclusion of the reduction in contribution rates for employees among inflation-dependent policy changes in C2. This also determines the positive and non-negligible impact on income inequality of the variation in SICs paid by employees and atypical workers, for which the contribution to the redistributive effect is equal to 1.9%. Fiscal drag for SICs paid by self-employed workers contributes negatively to income redistribution, but to a very modest extent.

Table 3 Contributions of tax-benefit instruments to $\widehat{RE}$, $\widehat{VE}$ and $\widehat{HE}$

Instrument	Comparison no. 1						Comparison no. 2					
	$\widehat{RE}$		$\widehat{VE}$		$\widehat{HE}$		$\widehat{RE}$		$\widehat{VE}$		$\widehat{HE}$	
	Abs.	%	Abs.	%	Abs.	%	Abs.	%	Abs.	%	Abs.	%
$SIC_{E,I} - \Delta SIC_E$	0.802	8.5	1.021	7.8	0.220	6.1	0.635	6.7	0.824	6.3	0.189	5.2
ΔSIC_E	0.008	0.1	0.012	0.1	0.004	0.1	0.175	1.9	0.209	1.6	0.034	0.9
$SIC_{SE,I} - \Delta SIC_{SE}$	-0.791	-8.4	-0.099	-0.8	0.693	19.2	-0.791	-8.4	-0.099	-0.8	0.693	19.2
ΔSIC_{SE}	-0.009	-0.1	-0.006	0.0	0.003	0.1	-0.009	-0.1	-0.006	0.0	0.003	0.1
$PIT_I - \Delta PIT$	5.245	55.7	6.139	47.1	0.893	24.8	5.263	55.9	6.161	47.3	0.899	24.9
ΔPIT	-0.037	-0.4	-0.019	-0.1	0.018	0.5	-0.055	-0.6	-0.042	-0.3	0.013	0.4
$T_{Prop,I}$	0.438	4.7	0.491	3.8	0.053	1.5	0.438	4.7	0.491	3.8	0.053	1.5
$T_{Mp,I}$	0.014	0.1	0.375	2.9	0.362	10.0	0.014	0.1	0.375	2.9	0.362	10.0
ΔSip	0.153	1.6	0.190	1.5	0.037	1.0	0.153	1.6	0.190	1.5	0.037	1.0
ΔU	-0.002	0.0	-0.002	0.0	0	0	-0.002	0.0	-0.002	0.0	0	0
Sap_{NI^*}	0.863	9.2	1.518	11.7	0.655	18.2	0.863	9.2	1.518	11.7	0.655	18.2
ΔSap	0.111	1.2	0.164	1.3	0.053	1.5	0.111	1.2	0.164	1.3	0.053	1.5
AUU_{NI^*}	1.246	13.2	1.463	11.2	0.217	6.0	1.246	13.2	1.463	11.2	0.217	6.0
ΔAUU	0.106	1.1	0.124	1.0	0.018	0.5	0.106	1.1	0.124	1.0	0.018	0.5
Sot_{NI^*}	0.062	0.7	0.155	1.2	0.093	2.6	0.062	0.7	0.155	1.2	0.093	2.6
ΔSot	0.007	0.1	0.015	0.1	0.008	0.2	0.007	0.1	0.015	0.1	0.008	0.2
RdC_I	1.198	12.7	1.479	11.4	0.281	7.8	1.198	12.7	1.479	11.4	0.281	7.8
Total	9.414	100.0	13.020	100.0	3.606	100.0	9.414	100.0	13.020	100.0	3.606	100.0

Note: Absolute values were multiplied by 100 for layout purposes. The subscript "I" ("NI*") indicates that the tax-benefit instrument is derived from Scenario I (Scenario NI1 or Scenario NI2, according to the scenario comparison considered). Source: Authors' elaborations of EUROMOD outputs.

Given the empirical strategy adopted in this paper, the effect of benefit indexation rules is the same in both scenario comparisons. Social assistance pensions (i.e. the social pension and disability benefits), the RdC and family allowances are the instruments that contribute the most to determining redistribution on the benefit side.[9] Their joint contribution to the redistributive effect (including inflation-induced variations) is equal to 34.7%. The overall inequality-decreasing effect of indexation rules, considering all pensions and social transfers, amounts to 4.0%. The greatest contribution comes from indexation rules for social insurance pensions (1.6%), whose redistributive effect is mostly determined by the contribution to the vertical effect; this is followed by indexation rules for social assistance pensions and the AUU, which have contributions to income redistribution of 1.2% and 1.1%, respectively.

4.2 Inflation-induced resource distribution by population category

We look at how inflation-induced nominal gains and losses are distributed along the equivalised disposable income distribution and by prevalent income. This helps provide a better understanding of the contribution of fiscal drag and indexation rules to the redistributive effect. Alongside the nominal net gain attributed to inflation-induced resources, we report the variation in nominal disposable income between scenarios (ΔY_d). The comparison between the two aggregates offers some insight into the extent to which fiscal drag and indexation rules – rather than adjustments to inflation of non-retirement market income components – explain nominal disposable income differences.

The inequality-decreasing property of jointly considered inflation-induced revenue and expenditure variations can be seen more clearly in Figure 2. Net gains significantly contribute to disposable income differences for both scenario comparisons. They slightly increase up to low-medium income positions and then fall sharply for the richest half of the population. The lack of indexation for the RdC may play a decisive role in explaining the inverted V-shaped pattern of net gains. The resources channelled through indexation rules for the AUU and social assistance pensions account for a large share of indexation-related benefit gains for the poorest income groups only, while indexation rules for social insurance pensions provide more support to low-medium income individuals, which is in line with the higher incidence of recipients in that specific segment of the income distribution. A series of factors contributes to the distributional pattern of PIT fiscal drag across income groups, including the indexation mechanism for social insurance pensions; the excessive burden in effective marginal tax rates for low-medium income taxpayers (Di Nicola et al., 2018), which results in steep increases in average tax rates; and the selective nature of the reduction in contribution rates in C2, which acts as an offsetting factor for the same taxpayers, according to our definition of fiscal drag through PIT.[10] The aggregate loss observed for SICs paid by self-employed workers is mostly due

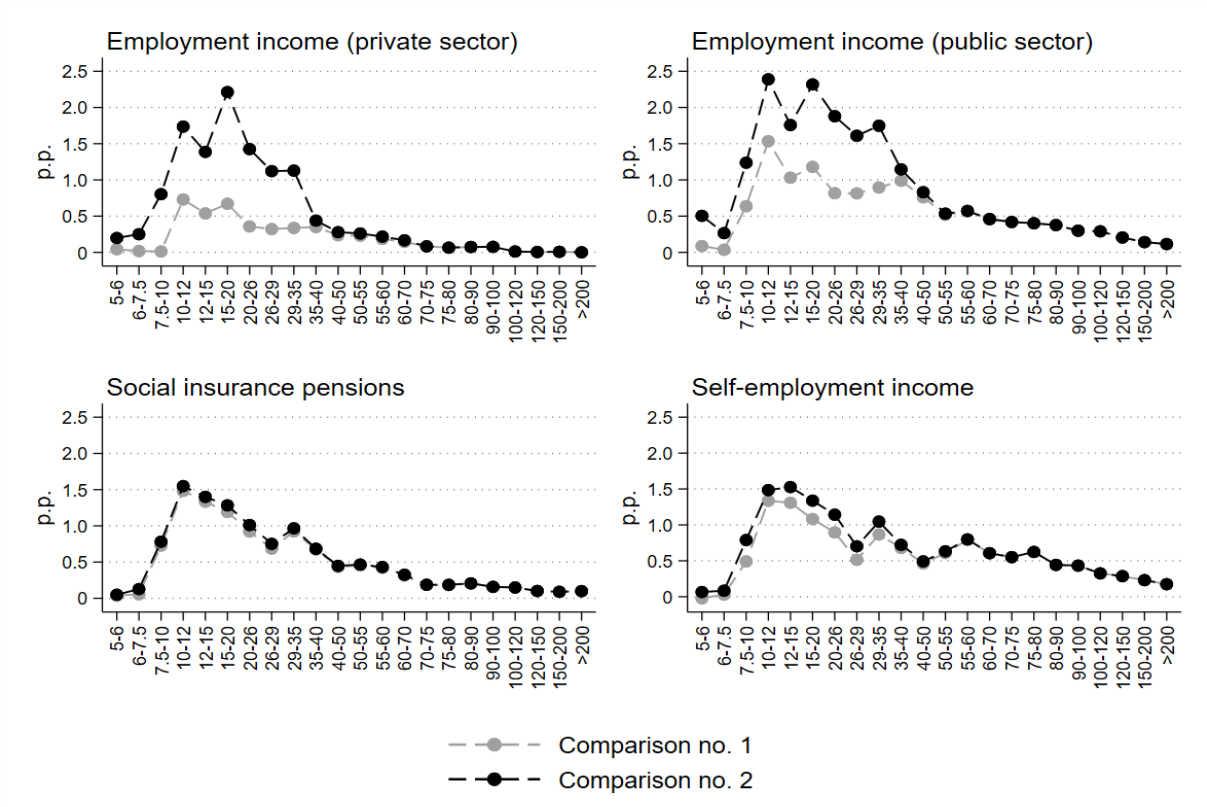
[9] Following Lerman and Yitzhaki (1994) and Urban (2014), we can point out the differences in instrument contributions to disposable income with respect to instrument contributions to the redistributive effect, which is a rule-of-thumb solution for drawing preliminary conclusions about the progressive nature of taxes and benefits net of their incidence on disposable income. The comparison sheds new light on the progressivity of the RdC and social assistance pensions. The ratios between their contributions to the redistributive effect and to equivalised disposable income are 10:1 and 4:1, respectively, while the ratio for PIT is 3:1.

[10] The small inequality-increasing effect of PIT fiscal drag is confirmed by the difference between the Gini index of equivalised disposable income in Scenario I (0.3045) and the same measure but assuming

to the higher tax burden borne by workers with earnings below the minimum statutory thresholds, while the increasing gain for SICs paid by employees and atypical workers in C2 confirms that the inequality-decreasing effect of the reduction in contribution rates is essentially guided by the average decrease in contributions.

The grouping of individuals by prevalent income in Figure 3 highlights the greater inflation-induced gain granted to pensioners and social transfer recipients. The net gain of pensioners accounts for 5.5% of the group-specific equivalised disposable income in Scenario I and greatly contributes to disposable income differences between scenarios.[11] Regardless of the scenario comparison considered, this translates into a less burdensome loss in relative purchasing power for the second most numerous group (i.e. pensioners) compared to the largest group (i.e. private sector employees), although to a different extent. In fact, disposable income differences are greater by roughly 1.1 p.p. in C2 and 2.6 p.p. in C1 for pensioners with respect to private sector employees. Employees, especially public sector ones, are the most affected by PIT fiscal drag but only when considering the recent changes to contribution rates as inflation-dependent policy changes. This can be better appreciated by looking at the average increase in non-equivalised PIT tax burdens in Figure 4. The reduction in contribution rates implies an increase in employees' taxable income that more than compensates for the differentiated (and less favourable) adjustment to inflation granted to social insurance pensions and self-employment income.

Figure 4 Average increase in PIT tax burden by prevalent income

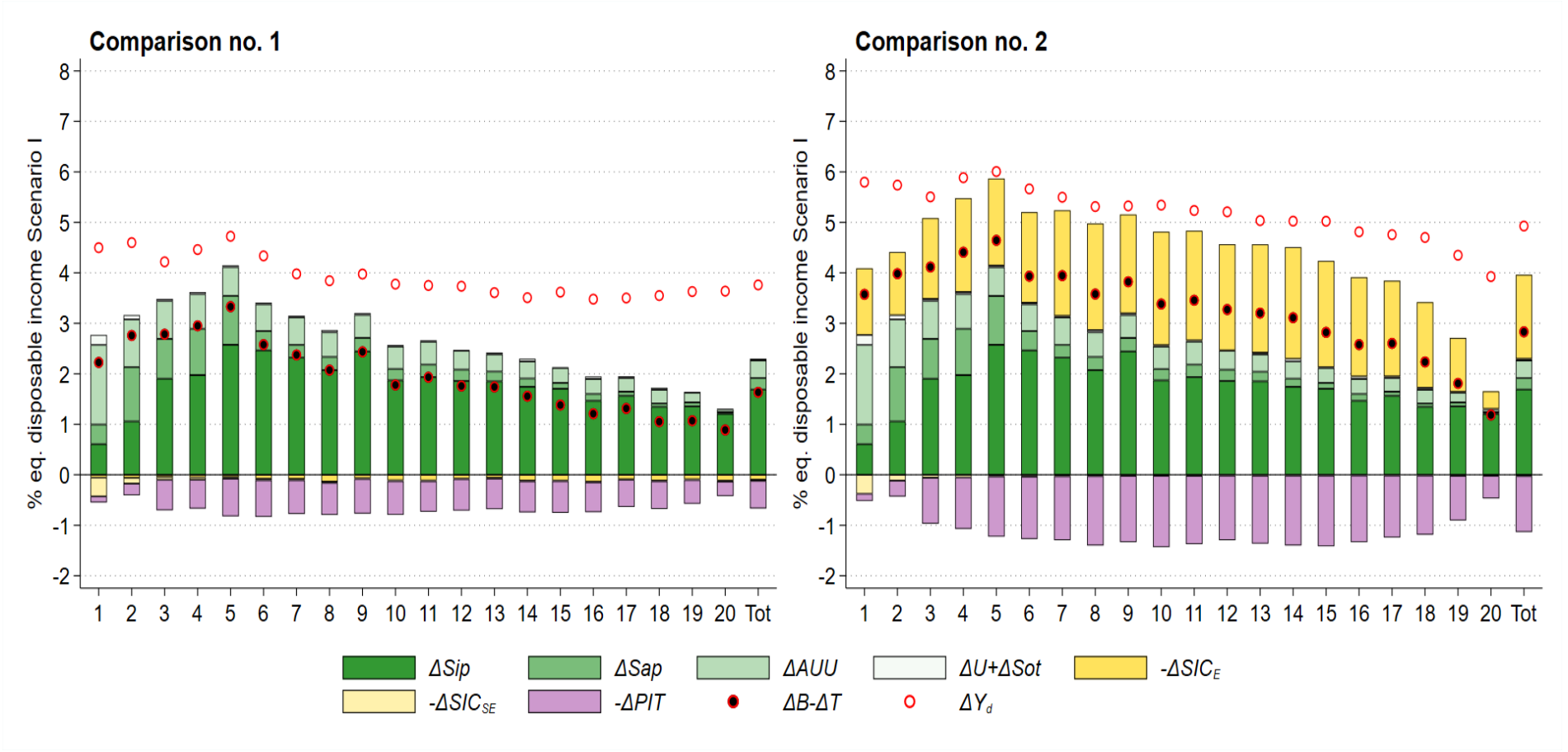


Note: Values in non-equivalised terms. PIT taxable income on the x-axis in thousands of euros. Source: Authors' elaborations of EUROMOD outputs.

no fiscal drag effect (0.3040), which leads to an increase in disposable income.

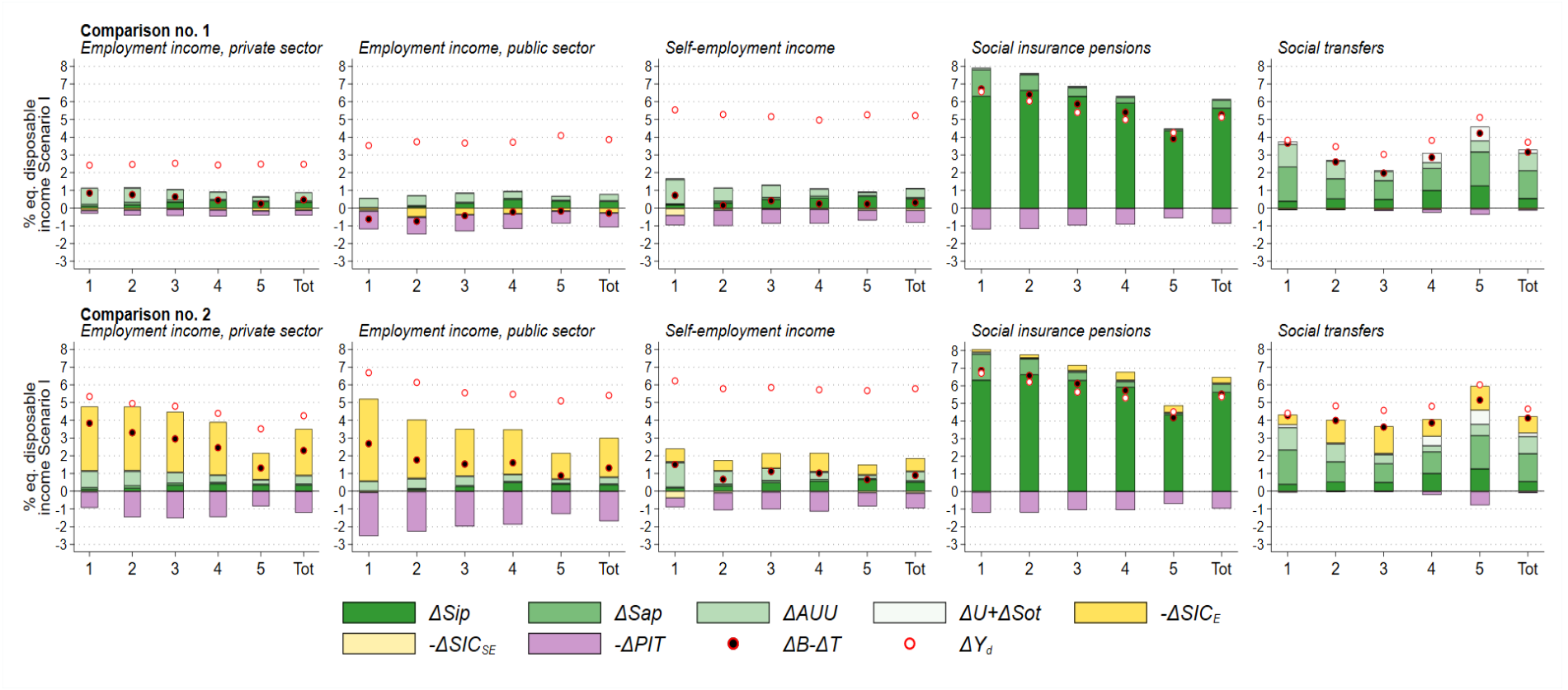
[11] The greater nominal net gain over the difference in disposable income for pensioners may initially appear unusual but signals the low incidence of receipt of non-retirement market income components among pensioner households.

Figure 2 Inflation-induced resource distribution by equivalised disposable income ventile



Note: Income quantiles on the x-axis. Source: Authors' elaborations of EUROMOD outputs.

Figure 3 Inflation-induced resource distribution by prevalent income at the household level and equivalised disposable income quintile



Note: Income quantiles on the x-axis; these are calculated including all individuals, as in Figure 2. Source: Authors' elaborations of EUROMOD outputs.

5 Conclusions

In this paper, we exploit the current context of high inflation and nominal wage rigidity in Italy to shed light on the contribution of *i*) fiscal drag through the PIT, *ii*) SIC-related indexation rules and policy changes and *iii*) benefit indexation rules to the redistributive effect of the tax-benefit system and its vertical and horizontal effects. We also provide evidence of inflation-induced resource distribution by population category. Building on the identification of inflation-dependent tax-benefit rules, we propose a comprehensive methodology for the study of inflation-related effects on nominal disposable income that can also be applied to other countries.

We estimate that inflation-induced nominal net gains can be summed to €24.9 or €15.3 billion, depending on whether or not we consider recent changes to pension contribution rates for employees as inflation-dependent policy changes. PIT fiscal drag has a small inequality-increasing effect of up to –0.6% of the redistributive effect, which depends on both a negative contribution to the vertical equity effect and a positive contribution to the horizontal inequity effect. The revenue variation for SICs paid by employees and atypical workers has a positive impact on income redistribution only if recent changes to contribution rates are meant to compensate for the loss of purchasing power. The inequality-decreasing effect of benefit indexation rules amounts to up to 4.0% of the redistributive effect when the contribution of indexation rules for social insurance pensions is equal to 1.6%. Following a steep increase in prices, no short-term benefit erosion effect is foreseen, due to the peculiarities of means-testing procedures in the Italian context.

Pensioners and social transfer recipients are the categories that benefit the most in terms of inflation-induced resources. This translates into a less burdensome loss in relative purchasing power for pensioners compared to private sector employees, respectively the second and first largest groups in the population. In the current context of ageing societies and rising inflation expectations, this may call for a partial adjustment to inflation for wages in the private sector to neutralise the accumulation of excessive differences in real disposable income between categories and to slow down the increase in public pension debt.

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Appendix A Inflation-dependent tax-benefit rules (as of 30 June 2023)

Social insurance pensions

The indexation mechanism has undergone various minor changes throughout the last thirty years, suggesting that partial adjustments to inflation for social insurance pensions are intended as a tool to cope with year-to-year public finance contingencies. However, the mechanism entails a redistributive element that favours pension recipients up to middle-income groups and subjects only a few better-off individuals to significant partial adjustments. For the sake of clarity, we provide the details of the indexation:

$$wp_{2023} = \begin{cases} wp_{2022} * (1 + r_p)\,, \ if \ wp_{2022} \leq 4 * mp_{2022} \\ wp_{2022} * [1 + (r_p * 85\%)]\,, \ if \ wp_{2022} > 4 * mp_{2022} \ and \ wp_{2022} \leq 5 * mp_{2022} \\ wp_{2022} * [1 + (r_p * 53\%)]\,, \ if \ wp_{2022} > 5 * mp_{2022} \ and \ wp_{2022} \leq 6 * mp_{2022} \\ wp_{2022} * [1 + (r_p * 47\%)]\,, \ if \ wp_{2022} > 6 * mp_{2022} \ and \ wp_{2022} \leq 8 * mp_{2022} \\ wp_{2022} * [1 + (r_p * 37\%)]\,, \ if \ wp_{2022} > 8 * mp_{2022} \ and \ wp_{2022} \leq 10 * mp_{2022} \\ wp_{2022} * [1 + (r_p * 32\%)]\,, \ if \ wp_{2022} > 10 * mp_{2022} \end{cases} \tag{A1}$$

where wp_{2023} (wp_{2022}) is the sum of old-age/seniority pensions, survivors' pensions and incapacity pensions – that is, social insurance or work-related pensions – in 2023 (2022), including pension increases related to indexation, and mp_{2022} is the minimum pension amount, equal to €525.38 per month in 2022 and increased according to r_p for the following year. This is the threshold fixed by law up to which work-related pensions are integrated, conditional on a means-testing procedure that takes account of the spouse's income (similar to the one for the social pension described later). The increase in social insurance pensions to account for inflation is proportionally distributed among the pensions included in *wp*. Furthermore, social insurance pensions below or equal to the minimum pension in 2023 are further increased by 1.5% for recipients below 75 years of age and by 6.4% otherwise. This increase is granted as an extraordinary exception to alleviate the cost of living under the current high inflation regime.

Social insurance contributions (SICs)

In a pay-as-you-go pension system like the Italian one, retirement benefits are borne by current workers through the payment of SICs. If pension amounts are indexed to inflation, even if only partially, it seems reasonable that SIC thresholds vary accordingly in order to neutralise pension expenditure increases. As salaries generally do not adjust immediately to inflation spikes without the implementation of automatic adjustments, revenue neutrality is hard to achieve in practice without further intervention. The rules for the payment of SICs on earned income differ according to the income source (*i.e.* employment income, income from temporary jobs or self-employment income), sector of activity, number of working individuals at the firm level and job position. The contribution base for SICs cannot be lower (higher) than a minimum (maximum) threshold mandated by law for both employees and self-employed workers (excluding those in certain bodies, such as lawyers, accountants, notaries, etc.). SICs are borne by employers to the extent of roughly three-fourths of the overall amount due, with employees being responsible for the remaining portion. Self-employed individuals are subject to contribution rates and rules that vary according to the professional pension fund they contribute to. Without claiming to be exhaustive, below we summarise the calculation of pension contributions for full-year working individuals on a yearly basis, taking as reference the rules for SICs

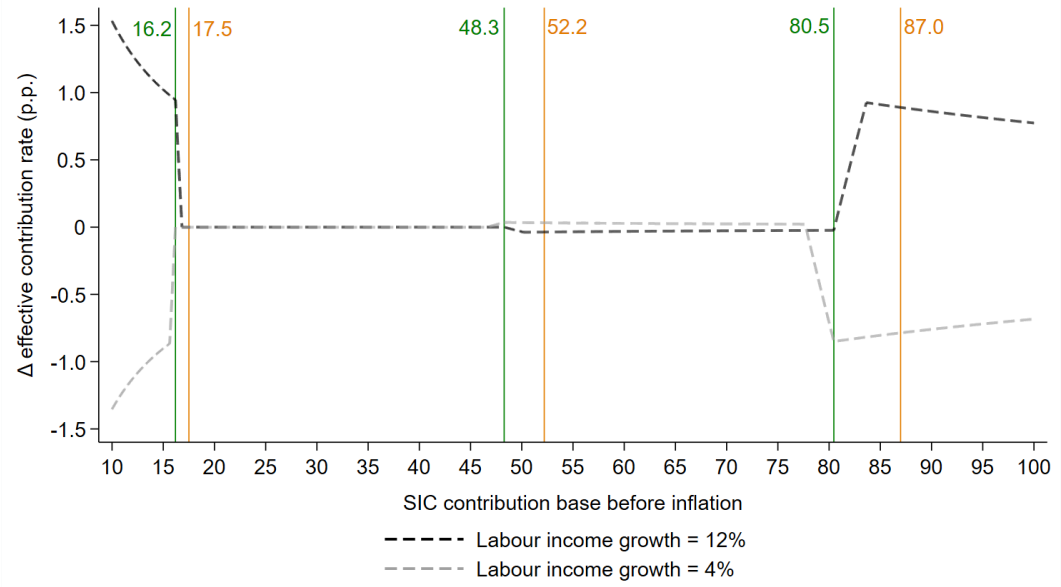
paid by employees in industrial firms with 15-50 employees; for the self-employed, we report the SICs due by craftsmen, but similar contribution rates and thresholds apply also to retailers and farmers.

$$SICs^{e}_{2023} = \begin{cases} 11,813 * 4.19\%, \ if \ gw_{2023} \leq 11,813 \\ gw_{2023} * 4.19\%, \ if \ gw_{2023} > 11,813 \ and \ gw_{2023} \leq 25,000 \\ gw_{2023} * 5.19\%, \ if \ gw_{2023} > 25,000 \ and \ gw_{2023} \leq 35,000 \\ gw_{2023} * 9.19\%, \ if \ gw_{2023} > 35,000 \ and \ gw_{2023} \leq 52,190 \\ 52,190 * 9.19\% + (gw_{2023} - 52,190) * 10.19\%, \ if \ gw_{2023} > 52,190 \ and \ gw_{2023} \leq 113,520 \\ 52,190 * 9.19\% + (113,520 - 52,190) * 10.19\%, \ if \ gw_{2023} > 113,520 \end{cases} \tag{A2}$$

$$SICs^{se}_{2023} = \begin{cases} 17,504 * 24\%, \ if \ yse_{2023} \leq 17,504 \\ yse_{2023} * 24\%, \ if \ yse_{2023} > 17,504 \ and \ yse_{2023} \leq 52,190 \\ 52,190 * 24\% + (yse_{2023} - 52,190) * 25\%, \ if \ yse_{2023} > 52,190 \ and \ yse_{2023} \leq 86,983 \\ 52,190 * 24\% + (86,983 - 52,190) * 25\%, \ if \ yse_{2023} > 86,983 \end{cases} \tag{A3}$$

where $SICs^{e}_{2023}$ and $SICs^{se}_{2023}$ are the contributions due by employees and self-employed workers, respectively; gw_{2023} is the monthly wage before employee-side contributions and PIT withholdings; yse_{2023} is self-employment income after deducting activity-related costs; and the conditions in (A2) and (A3) stand for the SIC-related inflation-dependent thresholds in force in 2023, which are updated based on r. For self-employed workers with an age equal to or below 21 years, the contribution rates in (A3) are reduced by 1.2 p.p. Finally, workers in temporary jobs (*i.e.* atypical workers or *co.co.co.*, according to the Italian acronym) are subject to a contribution rate of 11.67% and contributions are not due for income above €113,520 in annual terms, which is the maximum threshold in (A2) multiplied by 12.

Figure A1 (Reserve) Fiscal drag through SICs paid by self-employed workers



Note: The solid green (orange) lines represent the income thresholds set for the payment of self-employed SICs before (after) indexation, taking $r = 8.1\%$. Values on the x-axis are in thousands of euros. Source: Authors' elaborations.

Figure A1 provides an example of the interplay between labour income growth and contribution rules applied to SICs paid by self-employed workers. Following an inflation-dependent increase in the SIC contribution base, if labour income grows at a slower pace than r, then the taxpayers at the two ends of the distribution – where the minimum and maximum contribution thresholds lay – pay lower contribution rates, and vice versa. In contrast, the taxpayers between the intermediate threshold and the maximum threshold pay a slightly higher rate, and vice versa. This is simply to show that the decrease in relative liabilities because of inflation – what we define as reverse fiscal drag – is as theoretically plausible as fiscal drag in a setting with minimum and maximum thresholds.

The social pension

This measure (*Assegno sociale*, sp_{2023}) is a tax-free social assistance benefit targeted to mostly non-disabled poor individuals with an age equal to or above 67 years (*i.e.* the current age requirement for the old-age retirement scheme). As such, no contributory history is required. Other eligibility conditions include citizenship – conditioning receipt upon specific legal requirements for non-Italian citizens – and residence status. The monthly amount is set to a maximum of €503.27 in 2023, as obtained with the uprating factor r_p, and like most pension benefits it is granted for 13 months. The income thresholds for means-testing purposes are also updated based on r_p. The means-tested income refers to $t-1$, except for new recipients, whose income refers to the same year of benefit receipt (t). In what follows, we summarise the calculation of the social pension, distinguishing between unmarried and married individuals.

$$sp^{UM}_{2023} = \left\{ \begin{array}{c} 0, \ if \ ysp^{I}_{2022} \geq 6,542.51 \\ \underbrace{(6,542.51 - ysp^{I}_{2022})/13}_{sp^{I}}, \ if \ ysp^{I}_{2022} \geq 0 \ and \ ysp^{I}_{2022} < 6,542.51 \end{array} \right\} \tag{A4}$$

$$sp^{M}_{2023} = \left\{ \begin{array}{c} 0, \ if \ ysp^{I}_{2022} \geq 6,542.51 \ or \ ysp^{C}_{2022} \geq 13,085.02 \\ min(sp^{I}, \ \underbrace{(13,085.02 - ysp^{C}_{2022})/13}_{sp^{C}}), \ if \ ysp^{I}_{2022} < 6,542.51 \ and \ ysp^{C}_{2022} < 13,085.02 \end{array} \right\} \tag{A5}$$

where sp^{UM}_{2023} and sp^{M}_{2023} are the benefit amounts for unmarried and married individuals, respectively; ysp^{I}_{2022} is the reference income[12] for means testing at the individual level. For married recipients, besides complying with means testing at the individual level, the sum of the spouses' reference income (ysp^{C}_{2022}) must be lower than two times the upper-income threshold in (A4), and the benefit amount is the lowest amount obtained through the individual-level computation (sp^{I}) or the couple-level computation (sp^{C}).

Disability benefits

These are granted to Italian citizens and foreigners holding long-term residence permits with reduced work ability and without any contributory history, in contrast to incapacity pensions, where recipients are employees or self-employed workers with a contributory history of at least five years (three out of five paid in the five years preceding the pension request). Additional conditions other than citizenship status and past working status also

[12]The income subject to means testing is the sum of all income sources except one-third of the social insurance pension computed under the pay-as-you-go system, the arrears subject to separate taxation, the redundancy benefit, family allowances, the cadastral value of the main residence, the social pension, the accompanying benefit, allowances related to disabilities and the war pension.

apply relative to the type of disability benefit under consideration, such as age, disability extent and working ability. These benefits are generally means tested – and the reference year for income subject to means testing refers to the year of benefit receipt (t) for new recipients or $t-1$ otherwise – and fully inflation-indexed according to r_p. The legislation on disability benefits is rather fragmented. We refer the reader to Ceriani et al. (2022) for a brief summary of the main disability benefits foreseen by the Italian legislation and relevant conditions for receipt.

Unemployment benefits and wage supplementation schemes
The system of benefits related to the end and temporary suspension of work activity targets employees and atypical workers, and specific and more favourable rules apply to employees in the agricultural sector with respect to eligible individuals in other sectors. We limit our focus to ordinary measures, these being the most sizeable in terms of expenditure and the most common among employees.

The ordinary unemployment benefit (*Nuova prestazione di Assicurazione Sociale per l'Impiego*, NASpI) is granted to employees who have paid contributions to unemployment insurance for at least 13 weeks in the previous four years and have worked 30 days in the year before the date of work suspension. Further conditions concern the cause of dismissal and resignation in specific cases where the employee resigns due to good cause. The benefit is granted for up to half of the number of contribution weeks in the previous four years and is reduced monthly by 3% after the fourth month. In what follows, we briefly outline the calculation of the benefit.

$$ub_{2023} = \begin{cases} \overline{wg} * 0.75, \ if \ \overline{wg} \leq 1,352.19 \\ min\left(1,352.19 * 0.75 + (\overline{wg} - 1,352.19) * 0.25, 1,470.99\right), \ if \ \overline{wg} > 1,352.19 \end{cases} \tag{A6}$$

where $\overline{wg}$ is the four-year backward average monthly wage before employee-side contributions and PIT withholdings; amounts and thresholds in (A6) are updated yearly to account for inflation based on r. The benefit cannot exceed a maximum amount – equal to €1,470.99 in 2023 – and is subject to a rate of 5.84% for SIC-related purposes and to PIT. The benefit formula is embedded with a regressive element since unemployed individuals with $\overline{wg}$ close to or above pre-inflation-adjusted income thresholds see the greatest increase in the benefit amount, due to inflation, supposing that $\overline{wg}$ is little affected by the inflation adjustment.

The ordinary wage supplementation scheme (*Trattamento di integrazione salariale ordinaria*, CIGO) is a measure intended to lessen the impact of negative macroeconomic conditions by allowing firms to retain workers on reduced-hour schedules instead of opting for dismissal. Eligibility conditions apply at the firm level, and all employees of a beneficiary firm can be subject to the scheme. The benefit amounts to 80% of the wage lost for job suspension, up to a maximum wage-related monthly threshold updated to inflation according to r, which is equal to €1,321.53 in 2023. The same contribution rate as the ordinary unemployment benefit applies, and the benefit is taxable. Also in this case, the benefit formula favours only medium- and high-income earners among retained workers.

Family allowances
These benefits have recently undergone a major revision in Italy. From March 2022, the introduction of the Universal Children Allowance (*Assegno unico e universale*, AUU) has replaced a number of measures for the support of parenthood and childbearing. The new

system overcomes issues related to welfare selectivity according to the income level and working status of the applicant household member, as self-employed workers with dependent children have historically been excluded. The benefit varies based on a means-testing criterion that accounts for both income and wealth at the household level (*Indicatore della Situazione Economica Equivalente*, ISEE).[13] The reference year for means-tested income and wealth assets refers to $t-2$ with respect to the year of benefit receipt (t). The base amount per dependent child, which varies according to child characteristics and the number of children in the household, is constant up to an ISEE value of €16,215 and then decreases gradually up to an ISEE value of €43,240, where the minimum amount is set. Specific increases apply on top of base amounts and refer to the extent of disability among dependent children, the number of children, the working status of both parents and the mother's age. Both benefit amounts and thresholds for means testing are updated with the rate r, in line with most inflation-indexed social transfers.

Not all the benefits previously in force have been totally replaced by the introduction of AUU. The main measure aimed at supporting households with dependent children and households without children but with specific requirements in terms of household composition and the disability status of certain members is still active for the latter category only. The *Assegno per il Nucleo Familiare* (ANF) targets households with employees, retired employees and unemployed individuals and with a household income below inflation-indexed thresholds updated according to r. The uprating of thresholds and benefit amounts has effects from July 1st of a given year (t) to June 30th of the following year ($t+1$). The relevant income for means testing refers to $t-1$ and is valid for benefit receipt until June 30th in $t+1$ (before the subsequent adjustment to inflation). The means-testing procedure does not take into account wealth assets, and relevant income is a less comprehensive aggregate with respect to that employed for AUU.

The PIT and related surtaxes, and the substitute tax regime on self-employment income
The Italian PIT – known as *IRPEF*, *Imposta sul reddito delle persone fisiche* – does not adjust tax brackets and income/expenditure thresholds for deductions and tax credits to inflation. Since its introduction in 1974, several changes have followed regarding the exclusion of certain income sources from the tax base and their contextual subjection to substitute proportional tax regimes (e.g. self-employment income subject to the *regime forfetario*, rental income, productivity bonuses, etc). The gradual exclusion of these income sources from the PIT base has not only limited the application of progressivity to specific categories (*i.e.* employees and retirees) but has also confined the adverse effect of fiscal drag on these same categories.

The calculation of the PIT is summarised in (A7) for the 2023 year. Taxable income (Y_t) is obtained by subtracting deductions (D) from gross income (Y_{PIT}). Next, the determination of gross tax liability (T_g) is made by multiplying the set of tax rates (t) by

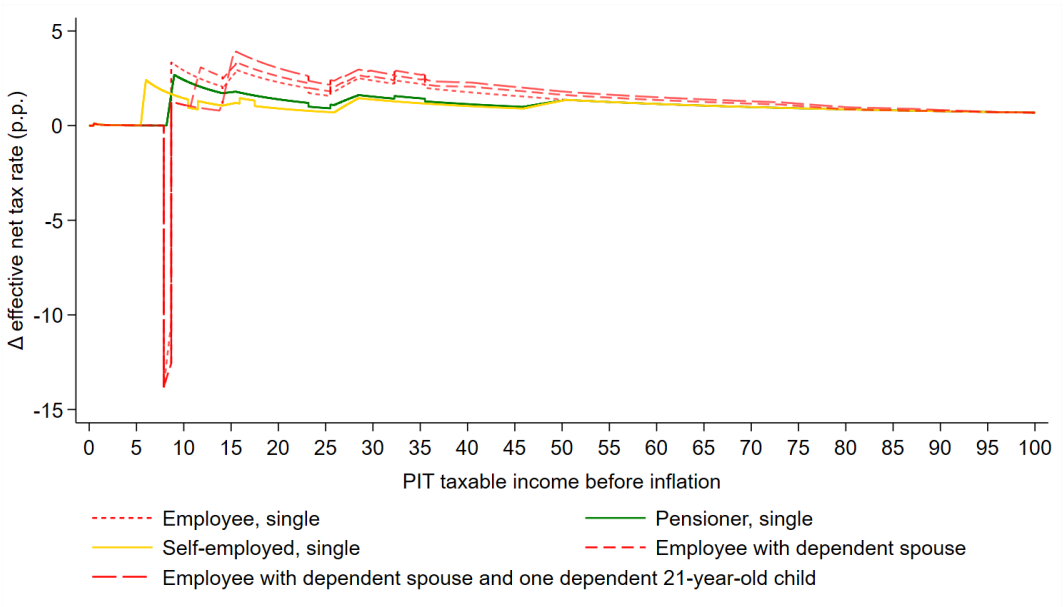
[13] The ISEE means-testing criterion is calculated as follows: $ISEE = (ISR + 20\% * ISP)/EQ$. ISR is the index that accounts for income and is the sum of all gross household income components net of SICs and a series of allowances related to alimony payments, health expenses for disabled relatives, labour income costs, the rent for households living in rental accommodation and household members' disability status. ISP is the sum of household wealth components, including both financial and housing assets, net of specific asset-related deductions and allowances. $EQ = nh^{0.65}$ is the equivalence scale for households with fewer than six members, with nh equal to the number of household members; for households with more members, $EQ = 5^{0.65} + (nh-5) * 0.35$. Additional increases apply to the equivalence scale according to the number of children and the presence of underage children, combined with the parents' working status.

taxable income. Finally, the net tax liability (T_n) is given by subtracting tax credits (C) from T_g.

$$Y_{PIT} - D = Y_t,\ Y_t * t = T_g,\ T_g - C = T_n$$
$$t = \begin{cases} 23\%: \ 0 < Y_t \leq 15.000 \\ 25\%: \ 15.000 < Y_t \leq 28.000 \\ 35\%: \ 28.000 < Y_t \leq 50.000 \\ 43\%: \ Y_t > 50.000 \end{cases} \tag{A7}$$

Deductions and tax credits are crucial elements in the calculation of liabilities due. While the former represents roughly €34.4 billion according to tax return statistics for 2021, most of which comes from SICs paid by self-employed workers (€17.1 billion) and the cadastral value of the main residence (€9.2 billion), tax credits represent almost twice as much (€66.6 billion). However, despite the plethora of tax credits characterising the present system of personal taxation, only a few contribute significantly (on average) to reducing gross liabilities. Tax credits for labour or retirement income comprise the bulk of total tax credits, for a value of €44.8 billion. On the other hand, tax credits for dependent family members also play a significant role in lowering the liabilities of specific groups of the population, amounting to €11.4 billion. The erosion of resources induced by fiscal drag is further aggravated by the decreasing structure of the tax credits for income sources and dependent family members as gross income increases, as well as by the lack of indexation for the vast majority of expenditure thresholds employed in the calculation of deductions and tax credits.

Figure A2 (Reverse) Fiscal drag through PIT



Note: Effective net tax rates were derived by subtracting the *Bonus IRPEF* from PIT burden. The above examples are based on representative full-year working or retired taxpayers whose PIT taxable income is made up of labour or retirement income only. Parents of children younger than 21 years of age are not entitled to the dependent children tax credit. Values on the x-axis are in thousands of euros. Source: Authors' elaborations.

Strictly related to the PIT is the *Bonus IRPEF*, which is a non-indexed refundable tax credit for employees and atypical workers with gross income subject to PIT lower than €15,000 and with gross PIT liabilities net of the earned income tax credit (T_g^M) higher than zero. The interplay between the PIT structure and the bonus may yield

reverse fiscal drag. Figure A2 shows the difference in effective net PIT tax rates for representative taxpayers following a ten-percent inflation-dependent increase in labour or retirement income. We observe that employees whose increase in taxable income leads to positive T_g^M – that is, when taxable income overtakes €8,145, which corresponds to the no-tax area threshold for single employees – present lower effective tax rates up to a taxable income after inflation of roughly €9,000. The incidence of fiscal drag generally decreases with increasing taxable income starting from low-medium income positions, reflecting the logarithmic shape of the tax incidence curve.

The PIT surtaxes at the regional and municipal levels can also present a progressive structure. Their payment is limited to taxpayers with positive PIT liabilities and a taxable income higher than exemption thresholds set at the sub-national level, with Y_t being the tax base for both surtaxes. The base tax rate of the regional surtax is set to 1.23% and can be increased up to 3.33%, while the tax rate of the municipal surtax cannot exceed 0.8%. It is possible to differentiate tax rates in such a way that high-earning taxpayers pay a higher amount, but this must be done by setting tax rates according to the income brackets presented in (A7).

The substitute tax regime for self-employment income – currently known as the *regime forfetario* – was introduced in 2001 and has seen several modifications and a gradual loosening of eligibility requirements. Before its (partial) subjection to proportional taxation, self-employment income was entirely included in the PIT base. The maximum sales volume in order to opt for the tax regime in the current year amounts to €85,000 and refers to the previous year. The tax liability is calculated by applying a tax rate of 15% on earnings net of activity costs and SICs. The tax rate is reduced to 5% for the first five business years in the case of taxpayers meeting specific requirements, that is, business was not carried out during the previous three years or was not the continuation of an activity previously carried out in the form of salaried employment. Roughly one third of self-employed workers opt for the substitute tax regime rather than the PIT. The backward-looking structure of the access mechanism delays the possible exclusion from the tax regime to the subsequent year.

Appendix B Uprating factors for scenario comparison, base index values in 2018 (= 100)

Index	Scenario I			Scenario NI1/NI2			Source	Main uses
	2021	2022	2023	2021	2022	2023		
Salary index for the private sector	102.4	103.3	104.8	102.4	102.4	102.4	Index for contractual hourly wages in the private sector (ISTAT); yearly variation up to 2022; the index value for 2023 is the variation between the value for 1st half of 2023 and the yearly value for 2022	Employment income, private pensions, fringe benefits, arrears and severance pay, income from temporary jobs, private transfers, maintenance payments (−), income of children under 16
Salary index for the public sector	102.1	103.2	107.1	102.1	102.1	102.1	Index for contractual hourly wages in the public sector (ISTAT); yearly variation up to 2022; the index value for 2023 is the variation between the value for 1st half of 2023 and the yearly value for 2022	Employment income, private pensions, fringe benefits
Self-employment income index	102.7	106.9	109.7	102.7	102.7	102.7	2019–2021: average self-employment income from tax returns data (Italian Department of Finance); 2022–2023: own assumptions, 50% CPI variation	Self-employment income
Cadastral income index	102.2	102.2	102.2	102.2	102.2	102.2	2019–2021: FOI index (ISTAT), yearly variation; 2022–2023: own assumptions, 0% CPI variation	Imputed cadastral value of the main residence and other buildings
Interest rate index	101.6	103.4	107.0	101.6	101.6	101.6	Average interest rate of state bonds (Italian Department of the Treasury); yearly variation up to 2022; the index value for 2023 is the variation between the value for 1st half 2023 and the yearly value for 2022	Dividends, interests on deposits, interests on state bonds, interests on other bonds, financial capital
Consumer Price Index (CPI)	102.1	110.3	116.0	102.1	102.1	102.1	FOI index (ISTAT); yearly variation up to 2022; the index value for 2023 is the variation between the value for 1st half 2023 and the yearly value for 2022	Mortgage payments (interests and capital), refurbishment expenses and related tax credit, rent paid and received
Index for benefit indexation	100.2	102.1	110.3 (109.5*)	100.2	102.1	102.1	FOI index (ISTAT); the value reported for each year is the yearly variation between the previous year $(t-1)$ and $t-2$ in accordance to current indexation rules	Old-age/seniority pensions (I), survivors' pensions (I), incapacity pensions (I), social pension (S), disability benefits (I), family allowances (S), work-related benefits (I)**, other benefits (I)

Note: (I) means that the benefit is included in the model but is taken from input data; (S) indicates that the benefit is simulated by the model. The indexation mechanism for social insurance pensions is fully simulated. The RdC is also simulated, but it is not included in the above table, as it does not incorporate any adjustment mechanism to inflation. * The value between round brackets is based on the provisional rate $r_p = 7.3\%$ and applies only to pension amounts. ** The uprating procedure for unemployment benefits is applied only to recipients of high benefit amounts in order to reflect to some extent the indexation mechanism currently in place (see Appendix A).

Appendix C Factor adjustment for fiscal drag calculation

In what follows, we briefly illustrate the calculation of the factor adjustment related to fiscal drag through PIT, that is, what we have indicated with ΔZ. Suppose that gross income for contribution purposes (Y_{SICs}) equals 100, adjusts fully to inflation and is entirely made of labour income. As a result, post-inflation income increases proportionally by 10%. The rise in inflation results in a 2-percentage-point increase in the effective contribution rate (t_{SICs}). PIT taxable income, which is defined as $Y_{PIT} = Y_{SICs} - Y_{SICs} * t_{SICs}$, is therefore higher in the post-inflation scenario, and this leads to a 4-percentage-point increase in the effective PIT tax rate (t_{PIT}).

	(a) **Pre-inflation scenario**	**(b)** **Post-inflation scenario**
Y_{SICs}	100	110
t_{SICs}	10%	12%
$SICs$	10	13.2
Y_{PIT}	90	96.8
t_{PIT}	10%	14%
PIT	9	13.552
Y	81	83.248
t	19%	24.32%

We denote inflation-dependent revenue variations such that $Y^b_{SICs} * \left(t^b - t^a\right) = \Delta SICs + \Delta PIT$, where t is the percentage-point difference in total tax burdens in relative terms and the superscripts a and b indicate that we are referring to the pre- and post-inflation scenarios, respectively. Recalling the sequentiality in the calculation of SICs and PIT – that is, the calculation of SICs always comes before the calculation of PIT, and pension contributions affect PIT taxable income – the latter identity holds if and only if ΔPIT is reduced by $\Delta Z = t^a_{PIT} * \left(Y^M_{PIT} - Y^b_{PIT}\right)$, where Y^M_{PIT} is the post-inflation counterfactual PIT tax base that one would obtain if there were no increases in contribution rates following an inflation-dependent increase in Y_{SICs}. Given our example and the equation set in (1), we have that:

$$Y^b_{SICs} * \left(t^b - t^a\right) = 110 * (0.2432 - 0.19) = 5.852$$

$$\Delta SICs + \Delta PIT = \underbrace{Y^b_{SICs} * \left(t^b_{SICs} - t^a_{SICs}\right)}_{\Delta SICs} + \left[\underbrace{Y^b_{PIT} * \left(t^b_{PIT} - t^a_{PIT}\right) - \underbrace{t^a_{PIT} * \left(Y^M_{PIT} - Y^b_{PIT}\right)}_{\Delta Z}}_{\Delta PIT}\right] =$$

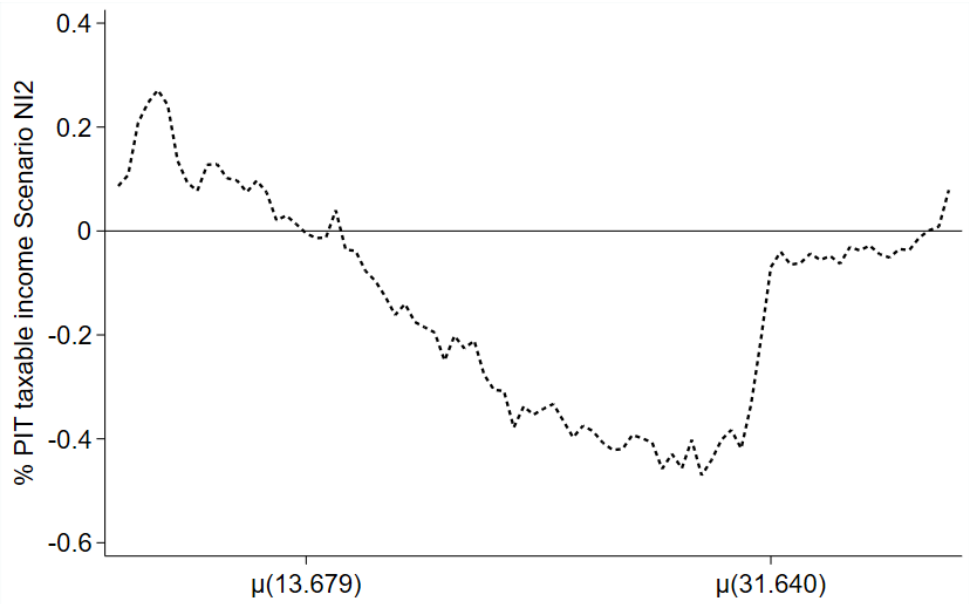
$$= 110 * (0.12 - 0.10) + [96.8 * (0.14 - 0.10) - 0.10 * (99 - 96.8)] = 5.852 \tag{C1}$$

After rearranging, ΔPIT can be expressed as the absolute tax burden resulting from the difference in post-inflation amounts between due liabilities and liabilities that would be due if there were no relative variations in SICs. More formally:

$$\Delta PIT = Y^b_{PIT} * t^b_{PIT} - Y^M_{PIT} * t^a_{PIT} \tag{C2}$$

Figure C1 shows the distribution of ΔZ as derived in Comparison no. 2 across centiles of PIT taxable income in Scenario NI2. We expect to find a negative sign and a non-negligible magnitude for ΔZ in the middle part of the income distribution as a result of a lower counterfactual post-inflation PIT tax base, given the reduction in contribution rates for employees between scenarios and its nature of inflation-dependent policy change. This is confirmed by the distribution below, where the mean values on the x-axis delimit, with good approximation, the income interval interested by the changes in contribution rates.

Figure C1 ΔZ by centile of PIT taxable income in Scenario NI2, Comparison no. 2



Note: Values in non-equivalised terms. Values on the x-axis stand for the mean values of PIT taxable income in Scenario NI2 for selected centiles. Source: Authors' elaborations of EUROMOD outputs.

Appendix D Urban (2014)'s decomposition approach

From Lerman and Yitzhaki (1985), we know that the sum of changes in Gini indices of post-tax/benefit income (Y_d) as a response to proportional increases in pre-tax/benefit income (Y_g), taxes (T) and benefits (B) is equal to zero, as expressed in (D1), where the superscript indicates the variable proportionally incremented.

$$\begin{gathered} \widehat{G}_{Y_d}^{Y_g} + \widehat{G}_{Y_d}^{T} + \widehat{G}_{Y_d}^{B} = 0 \\ \frac{\overline{\mu_{Y_g}}}{\mu_{Y_d}} \left(C_{Y_g,Y_d} - G_{Y_d}\right) + \frac{-\overline{\mu_T}}{\mu_{Y_d}} \left(C_{T,Y_d} - G_{Y_d}\right) + \frac{\overline{\mu_B}}{\mu_{Y_d}} \left(C_{B,Y_d} - G_{Y_d}\right) = 0 \end{gathered} \tag{D1}$$

where μ stands for the mean; the upper bar indicates that the variable is proportionally incremented, therefore $\overline{\mu_{Y_g}} = \mu_{Y_g}(1+\alpha)$, where α is the proportional increase (e.g. $\alpha = 0.01$); and $C_{a,b}$ is the concentration index of a generic variable a ordered by non-decreasing values of a generic variable b.

The property in (D1) also holds for the sum of changes in concentration indices of Y_d as a response to proportional increases in Y_g, T and B:

$$\begin{gathered} \widehat{C}_{Y_d,Y_g}^{Y_g} + \widehat{C}_{Y_d,Y_g}^{T} + \widehat{C}_{Y_d,Y_g}^{B} = 0 \\ \frac{\overline{\mu_{Y_g}}}{\mu_{Y_d}} \left(G_{Y_g} - C_{Y_d,Y_g}\right) + \frac{-\overline{\mu_T}}{\mu_{Y_d}} \left(C_{T,Y_g} - C_{Y_d,Y_g}\right) + \frac{\overline{\mu_B}}{\mu_{Y_d}} \left(C_{B,Y_g} - C_{Y_d,Y_g}\right) = 0 \end{gathered} \tag{D2}$$

Finally, recall that $\widehat{G}_{Y_g}^{Y_g} = \widehat{G}_{Y_g}^{T} = \widehat{G}_{Y_g}^{B} = 0$, or equivalently:

$$\widehat{G}_{Y_g}^{Y_g} + \widehat{G}_{Y_g}^{T} + \widehat{G}_{Y_g}^{B} = 0 \tag{D3}$$

Following Kakwani (1984), the redistributive effect of a tax-benefit system is given as follows:

$$RE = VE - HE = \left(G_{Y_g} - C_{Y_d}\right) - \left(G_{Y_d} - C_{Y_d}\right) \tag{D4}$$

where VE and HE are the vertical and horizontal effects, respectively. Combining these with the identities in (D1), (D2) and (D3), we have:

$$\begin{gathered} \widehat{VE} = -\widehat{C}_{Y_d,Y_g}^{Y_g} = \widehat{C}_{Y_d,Y_g}^{T} + \widehat{C}_{Y_d,Y_g}^{B} \\ \widehat{HE} = \widehat{G}_{Y_d}^{Y_g} - \widehat{C}_{Y_d,Y_g}^{Y_g} = \left(\widehat{C}_{Y_d,Y_g}^{T} - \widehat{G}_{Y_d}^{T}\right) + \left(\widehat{C}_{Y_d,Y_g}^{B} - \widehat{G}_{Y_d}^{B}\right) \end{gathered} \tag{D5}$$

where $\widehat{VE}$ and $\widehat{HE}$ are the marginal changes in the vertical and horizontal effects, respectively.

Given the above, we decompose a marginal change in the redistributive effect as follows:

$$\widehat{RE} = \widehat{VE} - \widehat{HE} = \left(\sum\nolimits_{i=1}^{l} \widehat{VE}_{T_i} - \sum\nolimits_{i=1}^{m} \widehat{VE}_{B_i}\right) - \left(\sum\nolimits_{i=1}^{l} \widehat{HE}_{T_i} - \sum\nolimits_{i=1}^{m} \widehat{HE}_{B_i}\right) \tag{D6}$$

where T_i is the *i-th* tax, including SICs; and B_i is the *i-th* benefit. The *relative* contributions of total taxes and benefits are broken down into the sum of single instruments' contributions by using (D1), (D2) and (D3) to rewrite the equation set in (D5). After substituting, scaling up by the factor $\mu_{Y_d}/\overline{\mu_{Y_g}}$ and rearranging, we have:

$$\begin{aligned}\sum_{i=1}^{l}\widehat{VE}_{T_i} &= \sum_{i=1}^{l}\frac{\overline{\mu_{T_i}}}{\overline{\mu_{Y_g}}}\frac{C_{T_i,Y_g}-C_{Y_d,Y_g}}{G_{Y_g}-C_{Y_d,Y_g}}\\ \sum_{i=1}^{m}\widehat{VE}_{B_i} &= \sum_{i=1}^{m}\frac{\overline{\mu_{B_i}}}{\overline{\mu_{Y_g}}}\frac{C_{Y_d,Y_g}-C_{B_i,Y_g}}{G_{Y_g}-C_{Y_d,Y_g}}\end{aligned} \tag{D7}$$

$$\begin{aligned}\sum_{i=1}^{l}\widehat{HE}_{T_i} &= \sum_{i=1}^{l}\frac{\overline{\mu_{T_i}}}{\overline{\mu_{Y_g}}}\frac{\left(C_{T_i,Y_g}-C_{T_i,Y_d}\right)+G_{Y_d}-C_{Y_d,Y_g}}{\left(G_{Y_d}-C_{Y_d,Y_g}\right)+\left(C_{Y_g,Y_d}-G_{Y_d}\right)}\\ \sum_{i=1}^{m}\widehat{HE}_{B_i} &= \sum_{i=1}^{m}\frac{\overline{\mu_{B_i}}}{\overline{\mu_{Y_g}}}\frac{\left(C_{B_i,Y_d}-C_{B_i,Y_g}\right)+G_{Y_d}-C_{Y_d,Y_g}}{\left(G_{Y_d}-C_{Y_d,Y_g}\right)+\left(C_{Y_g,Y_d}-G_{Y_d}\right)}\end{aligned} \tag{D8}$$

To obtain *absolute* contributions, we multiply the right-hand side of the equations in (D7) and (D8) by $\widehat{VE}$ and $\widehat{HE}$, respectively.