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Abstract

Over the last two decades a growing interest in understanding what determines the redistributive role of tax-benefit systems has emerged worldwide. In the case of Italy, previous analyses were mainly focused on quantifying the contribution of marginal tax rates, deductions and tax credits to the redistributive capacity of personal income tax (PIT), while neglecting the effect on income redistribution of proportional taxes and income sources exempt from taxation such as tax-free cash benefits. This paper aims to fill this gap by applying two alternative Gini-based decomposition methodologies (Onrubia et al., 2014; Urban, 2014) to the redistributive effects of the Italian tax-benefit system over the period 2005-2018. The contribution of each tax-benefit instrument is quantified for several scenarios which diverge from each other in that they are representative of different degrees of extension of the tax-benefit system under examination.

JEL: D3, H2

Keywords: tax-benefit system; progressive taxation; decomposition approach; redistribution; EUROMOD

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1. Introduction

In recent years, the study of tax redistribution has been revived thanks to the increasing availability of exhaustive and comparable data sets at the micro level. This wealth of information has led to remarkable advances in static microsimulation modelling (Orcutt, 1957; O'Donoughe, 2014). Besides the development of the state-of-the-art tax-benefit microsimulation model EUROMOD (Surtherland and Figari, 2013), that is a powerful tool in terms of cross-country comparability, a variety of national models have flourished in a number of European countries.[1] A wide range of questions concerning income inequality measurements can now be addressed by social scientists in a comparative perspective both spatial and temporal. In this paper, microsimulation techniques provide the starting point for studying the effect of taxes and benefits on income redistribution.

When estimating the equalising effect of a tax-benefit system over different time periods, a careful analysis of the nature of the effects is necessary. A higher or lower level of income inequality can be the result of policy changes in the tax-benefit system under examination, as well as of changes not directly related to the structure of the tax-benefit system, such as differences in market income distribution or demographic characteristics (Bargain and Callan, 2010). Following this framework, it is possible to isolate the contribution of overall policy changes on income inequality levels from all other effects over time. But what do we know about the role played by each tax-benefit instrument in shaping redistribution? What tools most affect redistribution when focusing merely on PIT? At a broader level, do proportional taxes and tax-free cash benefits play a progressive effect on income inequality?

Despite the lack of homogeneity with which they have been addressed in terms of the methodological approaches adopted, these questions have attracted a growing attention all over the world over the past two decades (Creedy and Van de Ven, 2002; Immervoll et al., 2005; Urban, 2008; Kristjánsson, 2011; Verbist and Figari, 2013; Hümbelin and Farys, 2018; Morger and Schaltegger, 2018; Guilland et al., 2019). With regard to Italy, whose tax-benefit system is the object of this study, a wealth of evidence has been provided above all on the relative effect of PIT components. One of the earliest contribution to the field was Wagstaff and Van Doorslaer (2001), showing that progressivity of both gross and net tax liabilities were mainly due to rate and tax credit effects at the tax unit level during the mid-late 1980s. Moving to more recent research, and still keeping the individual as the unit of analysis, the contribution given by tax

credits and marginal tax rates was estimated to be 61.2% and 40.3% respectively of the net redistributive power of PIT by Di Caro (2018) using individual tax returns for the 2014 tax year, whilst deductions produced a much smaller positive effect (1.3%). Similar results were obtained by Barbetta et al. (2018) analysing a sample of tax reports for the 2011 tax year and with studies based on sample survey data both at the individual and household level (Boscolo, 2019).

Taking a broader view, Fuest et al. (2010) analysed the redistributive effect of tax-benefit systems in the enlarged EU by applying two decomposition approaches to the 2007 EU-SILC wave at the household level, namely the *sequential accounting approach* (SA) and the *factor source decomposition approach* (FSD), both implemented on the basis of the generalised entropy class of inequality indices (Shorrocks, 1980). In particular, Fuest et al. showed how the application of each method had contradictory policy implications. In relation to the Italian tax-benefit system, the authors suggested a predominant effect of public pensions and PIT in determining redistribution (38.3% and 25.0% respectively), accompanied by a small equalising effect of cash benefits (4.3%) and a negative impact of social insurance contributions (-3.0%) when using SA. With FSD, in contrast with the just mentioned evidence, the redistributive role played by public pensions was found to be negative (-15.3%) and the same for cash benefits (-1.5%), while PIT and social insurance contributions showed an equalising effect on income inequality (46.8% and 16.9% respectively). Fuest et al., while shedding light on the contribution of a number of tax-benefit instruments, focused on aggregate income variables such as the total sum of cash benefits rather than the total amount of state pensions paid.

To the best of our knowledge, no research has yet explored the contribution of proportional taxes and tax-free cash benefits to the redistributive effect of the Italian tax-benefit system at the level of specific measures. The aim of this paper is to fill this gap by applying two alternative Gini-based decomposition methodologies proposed in the literature (Onrubia et al., 2014; Urban, 2014) with different degrees of extension of the tax-benefit system under examination, referred to as scenarios. Each scenario was simulated by using the EUROMOD microsimulation model for the 2005 and 2018 tax year. This timeframe will allow us to investigate the differences in the redistributive power of each tax-benefit measure in light of the substantial legislative changes taking place in the time span chosen.

The study of how tax-benefit systems redistribute resources appears to be crucial in the Italian context considering the recent changes in the tax regime for the self-

employed (MEF, 2019) and the proposal[2] to phase in a flat tax scheme on personal income as the goal of the tax policy agenda of the current Parliament (Baldini and Rizzo, 2019b). Such a reform in Italy would have a significant effect: an increase in income inequality associated with a decrease in both progressivity and average tax rate effect, due to revenue losses of up to 50 billion euros in the most radical proposal (Baldini and Rizzo, 2019a). Since 'the tax system shall be progressive' as stated in Article 53 of the Italian Constitution, the importance of understanding the role played by progressive taxation in the redistribution of income acquires a renewed interest in light of a tax reform on personal income characterised by regressive redistributive consequences. In addition, it is necessary to bear in mind that VAT continues to be highly regressive with regard to the bottom income groups (Gastaldi et al., 2017). At the same time, the ongoing process of gradual erosion of the PIT base as a result of the subjection of certain income components to proportional taxation (Boscolo, 2019), often put forward as one of the justifications for the introduction of a flat tax scheme due to the loss of vertical and horizontal equity (Stevanato, 2016; Rossi, 2018), is important in this connection.

The paper is structured as follows. Section 2 outlines the data and methodological approach, focusing above all on the scenarios simulated and on the decomposition formulas employed in order to determine the relative contribution of each tax-benefit instrument. Section 3 presents the results of the analysis. Finally, Section 4 concludes the paper.

2. Data and methodological approach

As noted above, the analysis was carried out using the EUROMOD model for the two years considered. The data employed are the best-match data sets available for running the microsimulation model: the 2006 and 2016 European Union Statistics on Income and Living Condition (EU-SILC) for the simulation of the 2005 and 2018 tax years respectively. All scenarios discussed here were simulated by taking the household as the unit of analysis, made equivalent by means of the OECD modified scale.

An overview of the scenarios involved is presented in Table 1. Starting from Scenario 1, in this case the definition of gross income is given by the sum of all gross income components subject to PIT and regional surtax. Results from this first scenario are of interest for two reasons: on the one hand, given the availability of fully comparable studies based on administrative data (Barbetta, Pellegrino and Turati 2018; Di Caro

2018), they facilitate the macroeconomic validation of the model in terms of redistributive indices; on the other hand, substantial changes in the structure of PIT occurred during the period 2005-2018. Scenario 2 adds to the previous income definition all those income sources taxed at a proportional tax rate such as capital income and rental income from residential properties. The definition used in Scenario 3 adds to the sum of all income sources included in the previous two scenarios income sources exempt from taxation, mainly consisting of cash benefits, regardless of their non-means- or means-tested nature. Last but not least, Scenario 4 takes into account social insurance contributions from all sources (employee/self-employed as well as employer contributions).

Table 1. Description of the scenarios simulated

VARIABLE	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Gross income subject to progressive taxation before SICs				✓
Gross income subject to progressive taxation after SICs	✓	✓	✓	
Gross income subject to proportional taxes		✓	✓	✓
Tax-free cash non-means- and means-tested benefits			✓	✓
Other income sources exempt from taxation			✓	✓

2.1 Gini-based decomposition formulas

The decomposition formulas of the net/gross redistributive effect applied in this study are discussed below. The computation of the contribution given by each tax-benefit instrument is first carried out by applying the generalisation of the Pfähler–Lambert decomposition outlined by Onrubia et al. (2014) (hereinafter O14). This method makes it possible to associate with each tool available to the government a single effect on the gross redistributive capacity of the tax-benefit system as measured by the Reynolds-Smolensky index (hereinafter RS index), overcoming the need for a sequential order when measuring the contribution of tax expenditures.

Following the order of the terms of the right-hand side in (1), the RS index can be broken down into three main aggregates: i) the sum of tax schedules; ii) the sum of tax credits; iii) the sum of exemptions, allowances and tax deductions. Each aggregate is given by the sum of its subcomponents, while each subcomponent is given by the product of the group weight, constant for all subcomponents of a specific aggregate, the individual weight and the Kakwani index (hereinafter K index). Y is the gross income, that is the sum of all income sources subject to (or exempt from) progressive

taxation according to the scenario; B is the total taxable income, given by the sum of taxable income components subject to PIT or substitute taxes; S stands for total gross liability; T is total net liability; S_i indicates the *i-th* tax schedule; C_i is the *i-th* tax credit; finally, D_i represents the *i-th* exemption, allowance or deduction of the tax system. The upper bar means that the variable is at its average value.

It is evident that tax-free cash benefits can be thought of as exemptions, an interpretation which is strengthened by the fact that several non-means-tested benefits are currently subject to progressive marginal tax rates (e.g. unemployment benefits). To simplify matters, taking only the first term on the right-hand side, the group weight is given by the $\overline{B}/(\bar{Y}-\bar{S})$; the individual weight is the proportion between the *i-th* tax schedule and total taxable income; $C_{B,Y}-C_{B-S_i,Y}$ is the difference between the concentration indices of taxable income and taxable income minus the *i-th* tax schedule respectively, both sorted by non-decreasing values of gross income – which we earlier defined as the Kakwani index. The same logic is then applied to the remaining terms in (1).

$$RS = \frac{\overline{B}}{\bar{Y}-\bar{S}}\sum_{i=1}^{l}\frac{\bar{S}_i}{\overline{B}}\left(C_{B,Y}-C_{B-S_i,Y}\right) - \frac{\bar{Y}}{\bar{Y}-\bar{T}}\sum_{i=1}^{m}\frac{\bar{C}_i}{\overline{Y}}\left(C_{Y-S,Y}-C_{Y-S-C_i,Y}\right) - \frac{\bar{Y}\bar{S}}{\overline{B}\left(\bar{Y}-\bar{S}\right)}\sum_{i=1}^{n}\frac{\overline{D}_i}{\overline{Y}}\left(G_Y-C_{Y-D_i,Y}\right) \quad (1)$$

The method proposed by O14 has recently received considerable attention in the Italian literature (Di Caro, 2017 and 2018; Barbetta et al., 2018; Boscolo, 2019). The desirable characteristic of allowing the decomposition on the common tax base of overall gross income, namely the sum of all mutually exclusive tax bases of a tax system, is important due to the policy implications that can be derived from its application.[3]

The decomposition formula presented in (1) is adopted to break down the RS index, capturing the reduction in inequality due to monetary transfers from better-off to worse-off income groups. Our interest is also extended to the horizontal effect as identified by the reranking term, R, to obtain a measure of the net redistributive effect of the tax-benefit system (hereinafter RE). This computation is carried out by using the non-unique method of estimation proposed in Duclos (1993) (hereinafter D93), making it possible to separate the part of the reranking effect due to net tax liabilities, R^T, from that due to tax-free income sources broadly defined (almost all cash benefits), R^{Ben}. In breaking down the reranking term, we assume that net tax liabilities come

first, rather than cash benefits. The reranking decomposition discussed in (2) is applied according to the scenario under examination.

$$R = R^T + R^{Ben} = (C_{Y-T,Y-T-Ben} - C_{Y-T,Y}) + (G_{Y-T} - C_{Y-T,Y-T-Ben}) \quad (2)$$

One requirement that needs to be met in order to obtain a proper decomposition of the vertical effect as described in (1) is to define total taxable income or total gross income as the sum of mutually exclusive components. In order to explain why this is needed, take the case of social insurance contributions (hereinafter SICs). These are levied on gross income, whereas gross income after SICs is subject to PIT. When adopting the method in (1), a problem arises in defining the common tax base. In the Italian tax-benefit system, self-employed SICs are deducted from gross income from employment after SICs subject to PIT to obtain taxable income. This would lead to an unjustified reduction of the common tax base since self-employed SICs are first included in taxable income and then deducted from it. In other words, the sum of the relative effects is equal to the redistributive effect of the corresponding tax system only if $Y = B + D$, according to the notation in (1). In order to satisfy this condition, a lower value of total taxable income than the actual one would be needed. Consequently, the results of the decomposition are likely to be biased by the remarkable amount of self-employed SICs granted in the form of deduction, amounting to 19.6 billion euros for the 2017 tax year according to aggregate tax returns. The lack of mutual exclusion between income sources therefore tends to distort the contribution of the measures analysed.

To deal with these issues, the decomposition method proposed by Urban (2014) (hereinafter U14) seems to be particularly useful. Based on the earlier contributions of Kakwani (1984) and Lerman and Yitzhaki (1985), it offers a reliable approach to studying the contribution of taxes and benefits to marginal changes in vertical and horizontal effects of a tax-benefit system. Its analytical power makes it a useful tool for policy and decision-making process, since it provides an empirical framework to isolate the determinants of marginal changes in the net redistributive effect of a tax-benefit system conditional on the actual redistributive capacity of such a system. Unlike the previous method, it does not require compliance with the mutual exclusion property. Imposing proportional changes in pre-tax/benefit income, total taxes and total benefits for all income units,[4] a single figure is computed for each tax-benefit instrument for the change in both the vertical and horizontal effect. Based on the notation in (1)-(2), an extended formalisation of the method is given below:

$$\delta RE \;=\; \delta V - \;\delta H \;=\; \left(\sum_{i=1}^{l}\delta V_{T_i} + \sum_{i=1}^{m}\delta V_{Ben_i}\right) \;-\; \left(\sum_{i=1}^{l}\delta H_{T_i} + \sum_{i=1}^{m}\delta H_{Ben_i}\right) \tag{3}$$

$$\sum_{i=1}^{l}\delta V_{T_i} = \sum_{i=1}^{l}\frac{\bar{T}_i}{\bar{Y}-\overline{Ben}}\frac{C_{T_i,Y-Ben}-C_{Y-T,Y-Ben}}{G_{Y-Ben}-C_{Y-T,Y-Ben}}\dot{V} \tag{4}$$

$$\sum_{i=1}^{m}\delta V_{Ben_i} = \sum_{i=1}^{m}\frac{\overline{Ben}_i}{\bar{Y}-\overline{Ben}}\frac{C_{Y-T,Y-Ben}-C_{Ben_i,Y-Ben}}{G_{Y-Ben}-C_{Y-T,Y-Ben}}\dot{V} \tag{5}$$

$$\sum_{i=1}^{l}\delta H_{T_i} = \sum_{i=1}^{l}\frac{\bar{T}_i}{\bar{Y}-\overline{Ben}}\frac{(C_{T_i,Y-Ben}-C_{T_i,Y-T})+(G_{Y-T}-C_{Y-T,Y-Ben})}{(G_{Y-Ben}-C_{Y-T,Y-Ben})-(C_{Y-Ben,Y-T}-G_{Y-T})}\dot{H} \tag{6}$$

$$\sum_{i=1}^{m}\delta H_{Ben_i} = \sum_{i=1}^{m}\frac{\overline{Ben}_i}{\bar{Y}-\overline{Ben}}\frac{(C_{Ben_i,Y-T}-C_{Ben_i,Y-Ben})-(G_{Y-T}-C_{Y-T,Y-Ben})}{(G_{Y-Ben}-C_{Y-T,Y-Ben})-(C_{Y-Ben,Y-T}-G_{Y-T})}\dot{H} \tag{7}$$

$$\begin{aligned}\dot{V} = -\frac{(\bar{Y}-\overline{Ben})(1+\beta)}{\bar{Y}-\bar{T}}(G_{Y-Ben}-C_{Y-T,Y-Ben}) = \\ = \frac{-\bar{T}(1+\beta)}{\bar{Y}-\bar{T}}(C_{T,Y-Ben}-C_{Y-T,Y-Ben}) + \frac{\overline{Ben}(1+\beta)}{\bar{Y}-\bar{T}}(C_{Ben,Y-Ben}-C_{Y-T,Y-Ben})\end{aligned} \tag{8}$$

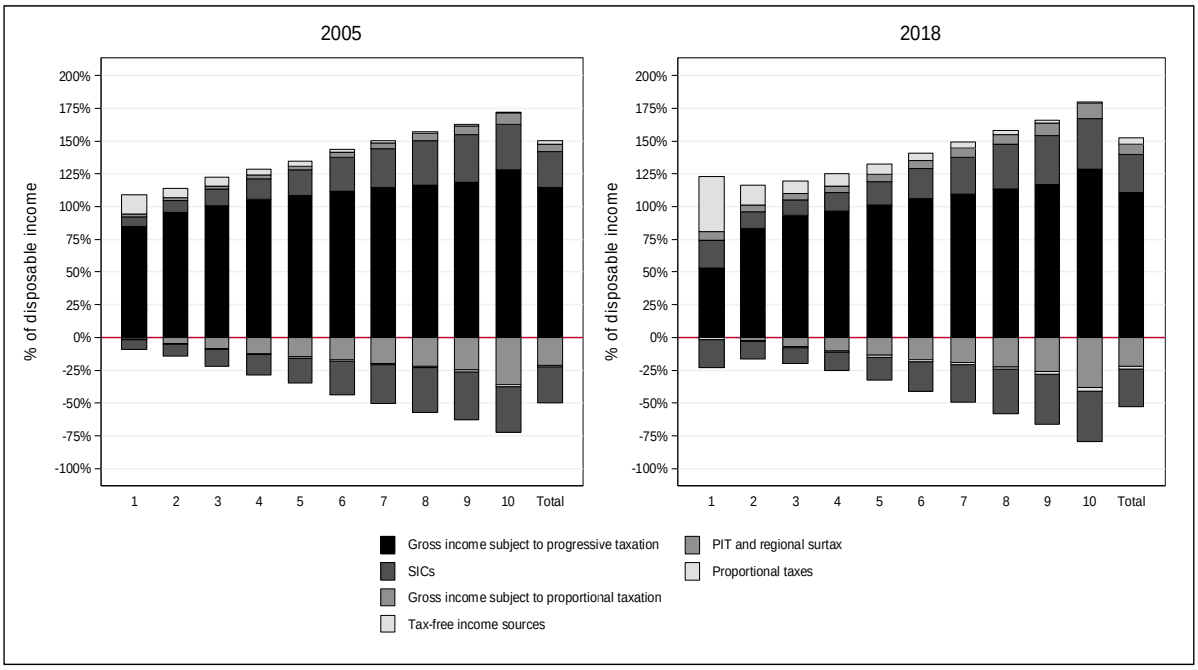
$$\begin{aligned}\dot{H} = \frac{(\bar{Y}-\overline{Ben})(1+\beta)}{\bar{Y}-\bar{T}}(C_{Y-Ben,Y-T}-G_{Y-T}) - \frac{(\bar{Y}-\overline{Ben})(1+\beta)}{\bar{Y}-\bar{T}}(G_{Y-Ben}-C_{Y-T,Y-Ben}) \\ = \left[\frac{\bar{T}(1+\beta)}{\bar{Y}-\bar{T}}(C_{T,Y-Ben}-C_{Y-T,Y-Ben}) - \frac{-\bar{T}(1+\beta)}{\bar{Y}-\bar{T}}(C_{T,Y-T}-G_{Y-T})\right] \\ + \left[\frac{\overline{Ben}(1+\beta)}{\bar{Y}-\bar{T}}(C_{Ben,Y-Ben}-C_{Y-T,Y-Ben}) - \frac{\overline{Ben}(1+\beta)}{\bar{Y}-\bar{T}}(C_{Ben,Y-T}-G_{Y-T})\right]\end{aligned} \tag{9}$$

where δ indicates that we are now breaking down the change into vertical and horizontal effects; $\boldsymbol{Ben_i}$ is the *i-th* income source exempt from progressive taxation; $\boldsymbol{\beta}$ stands for the proportional change imposed and it is embedded within the methodology when an upper dot lies above the terms. In line with O14, it should be noted that the decomposition formulas just presented rely on the prevalent normative view on vertical equity, requiring a non-decreasing level of taxes minus benefits for non-decreasing values of pre-fiscal income in relative rather than absolute terms, as assumed in the alternative view (Urban 2014).

3. Data analysis

Before moving on to the discussion of the application of the Gini-based decomposition approaches, some general results may be presented concerning the comparative analysis within a given timeframe. This may be useful in order to better understand the context in which the analysis of the relative contribution of tax-benefit instruments takes place.

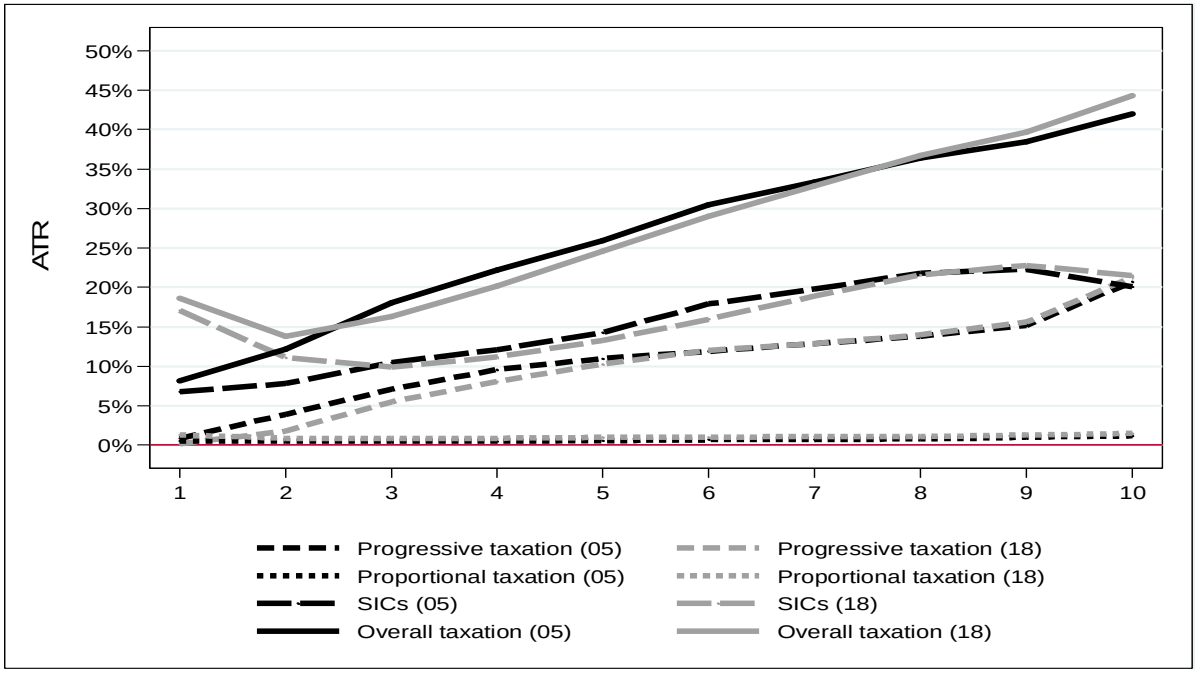
Figure 1. Income composition of equavalised gross household income by decile



It is important to specify how income components of disposable income were distributed and what changes occurred in the period 2005-2018. Figure 1 is intended to provide an answer by breaking down disposable income per decile of equivalised gross household income into six components based on the different tax regimes in force for both years. In terms of disposable income a greater weight is now attributed to income sources exempt from tax, above all for the bottom two income groups: their incidence almost tripled during the time span observed for the worse-off decile, increasing from 14.7% to 41.9%, while the second lowest income group experienced a lower increase in relative terms since tax-free income sources doubled, increasing from 7.2% to 15.1%. Despite its limited incidence on disposable income, the proportion of gross income subject to proportional taxes changed over the period under examination from 5.4% to 8.0% when considering the population as a whole. By subtracting the overall amount of taxes and SICs from tax-free income sources along the income

distribution, it is also possible to establish which income groups presented on average a positive net position, considered as the difference between what a household receives in the form of cash benefits and other tax-free income components minus total net liability. Only the poorest decile had a positive net position equal to 19.0% and 5.9% of disposable income in 2005 and 2018 respectively. The other groups along the income distribution presented a negative balance, generally becoming wider with increasing levels of gross income. However, income groups for the 2018 tax year contributed more in net terms than in 2005 except for the ninth and tenth deciles.

Figure 2. Average tax rate for the 2005 and 2018 tax years by decile of equivalised gross household income in Scenario 4



In addition to the slight changes in income composition over the period 2005-2018, it is important to consider how total tax burdens varied among income groups before moving on to the examination of further results. As shown in Figure 2, again taking deciles of equivalised gross household income as the basis for the calculation, the tax incidence curves of overall taxation in each period present a similar shape, moving upwards from the third decile. Tax burdens varied substantially in the left tail of the distribution over the period under examination, where the increased incidence of SICs on total gross income for the poorest 20% in 2018 results in an overall curve with a V-shaped form. In addition, the lower incidence for 2018 among the low-medium and medium income groups, amounting to -2% in the fourth decile, is offset by the heavier

burden concentrated in the right tail of the distribution. The temporal comparison therefore suggests a further general result: middle income groups seem to have benefited most from the changes taking place in the tax curve over the period 2005-2018 at the expense of households located in the tails of the income distribution, that in relative terms paid a higher amount of tax in 2018 than in 2005.

The analysis now turns to the results of the application of the Gini-based decomposition approaches. Based on the notation adopted in Section 2, the net redistributive effect of a tax-benefit system can be divided into three components as follows (Reynolds and Smolensky, 1977):

$$RE = RS - R = \left[\frac{t}{1-t}(C_{T,Y} - G_Y)\right] - (G_{Y-T} - C_{Y-T,Y}) \tag{11}$$

where the first term between square brackets, $t/1-t$, is the average tax rate effect related to the RS index, capturing the redistributive effect of a tax-benefit system without taking account of horizontal adjustments along the income distribution. The second term in square brackets is the K index and provides a measure of departure from proportionality of what is defined from time to time as total taxes according to the scenario under examination. Finally, the last term in round brackets stands for the reranking term, R. With these notations, changes in the net redistributive effect can be driven by substantial increases (decreases) in the average tax rate keeping constant the level of progressivity achieved by the tax-benefit system and vice versa.

Table 2 shows the most widely used indices in measuring income redistribution for each scenario, once again taking the equivalent household as the unit of analysis. First, it is crucial to stress the fact that pre-tax Gini indices (G_Y) under Scenario 1 diverge substantially over time. Gross income subject to PIT for the 2018 tax year, 66.4% of which was given by the sum of income from employment and self-employment, is found to be less equally distributed than its counterpart for the year 2005: the difference in the Gini index is significant and almost equal to 0.05 points. Despite this remarkable difference, when repeating the calculation with a comprehensive definition of gross income as in Scenario 4, the 2018 tax-system still presents a higher level of income inequality, but this is lower than for the year 2005. The difference is now 0.026 points due to an increase of the 2005 pre-tax Gini index over the period of 2.5% and to a 2.7% fall of the index in 2018.

Table 2. Redistributive indices in each scenario (indices multiplied by 100)

INDEX	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	2005	2018	2005	2018	2005	2018	2005	2018
G_Y: pre-tax Gini index	36.73	41.41	37.25	41.35	35.94	38.75	37.65	40.30
G_{Y-T}: post-tax Gini index	32.14	36.61	32.85	36.89	31.43	34.01	31.43	34.01
RE: net redistributive effect	4.60	4.81	4.40	4.47	4.51	4.74	6.22	6.30
$C_{T,Y}$: conc. index of taxes	57.04	61.00	56.40	59.32	56.19	58.98	51.55	53.85
K: Kakwani index	20.31	19.59	19.15	17.97	20.25	20.23	13.90	13.55
t: average tax rate	18.64	19.94	18.87	20.16	18.44	19.31	33.38	34.50
$t/(1-t)$: average tax rate effect	22.91	24.91	23.26	25.25	22.61	23.95	50.11	52.67
$C_{Y-T,Y}$: conc. index of net income	32.09	36.54	32.80	36.82	31.36	33.91	30.68	33.17
R: reranking or horizontal effect	0.05	0.07	0.05	0.07	0.07	0.10	0.75	0.84
RS: vertical effect	4.65	4.88	4.45	4.54	4.58	4.84	6.97	7.14
$GPit$: Gross income subject to PIT	100.0	100.0	95.5	93.3	93.1	89.3	76.2	72.5
$\%RS^{O14}$: PIT and surtax	101.3	101.5	100.9	96.2	93.1	80.1	-*	-*
$\%\delta V^{U13}$: PIT and surtax	100.0	100.0	94.8	94.4	73.4	61.5	43.2	40.2
$\%\delta RE^{U13}$: PIT and surtax	100.0	100.0	94.6	93.9	79.0	67.7	56.7	52.2

* No value is reported since the application of O14 for Scenario 4 would lead to biased results due to the lack of compliance with the mutual exclusion property as explained in Subsection 2.1.

Second, still with regard to the comparison between the first and last of the scenarios, the redistributive power of the tax-benefit system is more than 30% higher in both years (ΔRE_{05}^{S1-S4}: 35.2% $\rightarrow$ ΔRE_{18}^{S1-S4}: 31.0%)[5]. As summarised by the post-tax Gini index (G_{Y-T}), inequality in disposable income is higher for the 2018 tax year consistently with previous findings on pre-tax income inequality. Looking at the determinants of RE, the degree of progressivity of PIT declined slightly over the period under examination (K_{05}^{S1}: 0.2031 $\rightarrow$ K_{18}^{S1}: 0.1959), while the average tax rate increased by 1.3% (t_{05}^{S1}: 18.64% $\rightarrow$ t_{18}^{S1}: 19.94%). The higher value of RE_{18}^{S1} in absolute terms should therefore be attributed to the predominance of the average tax rate effect over the progressivity effect. As expected, the average tax rate effect still plays the key role in determining the redistributive effect in Scenario 4 for both tax-benefit systems due to its remarkable increase (Δt_{05}^{S1-S4}: 79.1% $\rightarrow$ Δt_{18}^{S1-S4}: 73.0%), an effect partially offset by a decrease in the departure from proportionality (ΔK_{05}^{S1-S4}: -31.6% $\rightarrow$ ΔK_{18}^{S1-S4}: -30.8%) and by a growing importance of the reranking term (R_{05}^{S4}: 0.75 $\rightarrow$ R_{18}^{S4}: 0.84).

When taking a wider view of Scenarios 2 and 3, it is first worth noting that progressivity diminishes as expected when including income sources subject to proportional taxation (ΔK_{05}^{S1-S2}: -5.7% $\rightarrow$ ΔK_{18}^{S1-S2}: -8.3%), due to a decrease in the

net redistributive effect (ΔRE_{05}^{S1-S2}: -4.3% $\rightarrow$ ΔRE_{18}^{S1-S2}: -7.1%) which is not offset by the slightly increased average tax rate (Δt_{05}^{S1-S2}: 1.2% $\rightarrow$ Δt_{18}^{S1-S2}: 1.1%). Furthermore, SICs seem to play a crucial role in shaping the progressivity of the Italian tax-benefit system above all in 2005 since the level does not vary substantially from Scenario 1 to Scenario 3 (ΔK_{05}^{S1-S3}: -0.3%). As far as the 2018 tax year is concerned, the more pronounced positive effect of income sources exempt from taxation on progressivity (ΔK_{05}^{S2-S3}: 5.7% $\rightarrow$ ΔK_{18}^{S2-S3}: 12.6%) seems to cointain the reduction of the latter under Scenario 4.

As noted in the introduction, the ratio of gross income subject to PIT on total gross income (defined as *GPit* in Table 2) shows a decrease of 3.8% in Scenario 3 (3.7% in Scenario 4) over the period under examination, meaning that a higher fraction of income is now exempt from progressive taxation. But what seems even more interesting is the consequent reduction in the contribution of progressive taxation to the redistributive effect depending on the decomposition approach adopted. Supposing the absence of horizontal movements along the income distribution, PIT and regional surtax jointly considered amount to 80.1% of RS_{18}^{S3} and 61.5% of δV_{18}^{S3} when employing O14 and U14 respectively. These contributions are both lower by more than 10% than the corresponding figures for the 2005 tax year ($RS_{05}^{O14,S3}$: 93.1%; $\delta V_{05}^{U13,S3}$: 73.4%). The contribution of progressive taxation to marginal changes in RE, in other words the sum of both vertical and horizontal changes, is then similarly reduced over the time period (δRE_{05}^{U13}: 79.0% $\rightarrow$ δRE_{18}^{U13} : 67.7%). When including SICs in the computation as in Scenario 4, PIT and regional surtax amount to 40.2% of δV_{18}^{S4} and 52.5% of δRE_{18}^{S4}, in both cases lower than the results for the 2005 tax period (δV_{05}^{S4}: 43.3%; δRE_{05}^{S4}: 56.7%). To state it clearly: in relative terms progressive taxation as defined by the 2018 Italian tax-benefit system now contributes less than 15 years ago to reducing income inequality according to the decomposition approaches adopted in this study. This reduced contribution to the redistributive effect does not warrant the claim that progressive taxation makes no difference in achieving redistributive goals, since it still plays a substantial role, regardless of the methodology adopted. However, the implication of the figures presented above is that progressive taxation would potentially contribute to a lower extent than its actual redistributive capacity (as computed by using O14) when enhancing redistribution via proportional changes for all income units. As a result, its reduced influence conditional on the existing composition of the tax-benefit system suggests that a significant role in determining redistribution can also be pursued by instruments other than progressive taxation.

3.1 The relative contribution of tax-benefit instruments applying Onrubia et al. (2014)

As mentioned in the introduction, progressive taxation underwent major changes over the period chosen. The most important change goes back to the provisions of the 2007 Finance Act, (Ceriani and Gigliarano, 2010): the 'no-tax-area and progressivity' allowance (D_1), graduated on the basis of the type of income earned, and tax allowances for dependent family members (D_2) were replaced with a system of similar tax credits; the number of PIT brackets increased from four to five and the consequent change of the tax rate applied.[6] As a result, what determines the redistribution of PIT has changed remarkably. The role played by marginal tax rates amounted to 18.7% of RS for the 2005 tax-benefit system, obtained as the sum of gross PIT ($S^{S1}_{1,05}$: 21.1%) and the regional surtax ($S^{S1}_{2,05}$: -2.4%). What remains of RE was entirely achieved by deductions with a contribution of 83.7%, where the replaced deductions D_1 and D_2 accounted for 66.7% and 18.7% respectively. Tax credits were found to have a minor regressive effect of -1.1%. This distribution of effects was instead inverted for the 2018 tax-benefit system. Deductions no longer played a dominant role following the legislative changes: their effect may be quantified as 4.2% of the gross redistributive effect. The most important role is now played by tax credits with a contribution of 55.0% consisting of the tax credit which replaced the 'no-tax-area and progressivity' allowance ($C^{S1}_{5,18}$: 40.5%) and the pool of tax credits which replaced tax allowances for dependent family members ($C^{S1}_{6,18}$: 8.4%; $C^{S1}_{7,18}$: 2.9%; $C^{S1}_{9,18}$: 0.2%). Last but not least, in relative terms the impact of PIT tax rates on redistribution doubled to 39.3%, followed by a smaller progressive effect of the regional surtax ($S^{S1}_{2,18}$: 3.2%)[7]. These findings show that tax expenditures by income source either in the form of deductions (D_1) or tax credits (C_5) are still the tools which for the most part determine PIT redistribution, a result which reflects the high ratio of taxpayers mainly with employment or retirement income (83.3% in 2017, the most recent year available at the time of writing).[8] Relative contributions calculated for the year 2018 are in line with previous studies using administrative data (Barbetta et al., 2018; Di Caro, 2018).

Focusing on the results in Scenario 3 (full results reported in Appendix), it may be seen that almost no tax-benefit instrument exercises a regressive effect on income distribution except for the proportional tax on deposits (S_8) for both tax periods. Withholding taxes on capital income and gains, broadly defined as the sum of arrears and severance pay (S_3), government bonds (S_6) and others (S_4), dividends (S_5), private

pensions (S_7) and deposits, contribute positively albeit to a small extent to determining RE, which is equal to 0.4% and 1.9% for the 2005 and 2018 tax years respectively. A growing and significant role is instead played by disability pensions[9] ($D^{S3}_{10,05}$: 2.0% $\rightarrow$ $D^{S3}_{10,18}$: 5.5%) and social pension ($D^{S3}_{8,05}$: 3.3% $\rightarrow$ $D^{S3}_{8,18}$: 4.9%). Family allowances, known in the Italian system as *Assegno per il nucleo familiare*, have a stable positive effect over the period studied ($D^{S3}_{9,05}$: 2.8% $\rightarrow$ $D^{S3}_{9,18}$: 2.9%).

Table 3. RE decomposition in Scenario 3 applying O14 (unit of analysis: equivalent household): brief summary of results

TAX-BENEFIT INSTRUMENT	**2005 %RE**	**2018 %RE**
PIT (S_1)	95.3	77.6
Regional surtax (S_2)	-2.2	2.5
Proportional taxes on capital income (S_3-S_8)	0.4	1.9
Proportional tax on rental income (S_9)	-	2.9
Social pension (D_8)	3.3	4.8
Family allowances (D_9)	2.9	2.9
Disability pensions (D_{10})	2.0	5.5
Housing benefits (D_{11})	0.2	0.2
Minimum Insertion Income (D_{12})	0.2	0.2
Child benefits (D_{13})	0.0	0.2
Maternity payments (D_{14})	0.0	0.2
Scholarships and grants (D_{15})	0.0	0.0
Non-taxable rental income (D_{16})	-0.4	0.0
REI (D_{17})	-	1.3
80 euro bonus (D_{18})	-	1.3
Newborn bonus (D_{19})	-	0.6
Maternity bonus (D_{20})	-	0.0
Reranking (R)	1.6	2.1
Redistributive effect (*RE*)	**100.0**	**100.0**

Note: values are ordered by increasing contributions of the 2005 tax period.

A number of new tax-benefit instruments were introduced over the period 2005-2018. Rental income from residential property is now excluded from the PIT base and taxed at a proportional tax rate of 10% when the underlying contract was stipulated at a controlled rent and 21% for all remaining cases. This optional tax regime,

introduced under the name of *cedolare secca* in 2011, is intended to recover tax revenue and to favour the emersion of undeclared properties. In the first year of its introduction, revenue collected amounted to 0.9 billion euros for a total of nearly half a million taxpayers according to tax returns. The popularity of the alternative measure to progressive taxation increased rapidly in subsequent years, with revenues amounting to 2.6 billion paid by 2.4 million taxpayers for the tax year 2017. It is still not clear whether the exclusion from PIT of this source of income has effectively encouraged property owners to declare unregistered properties, thus increasing tax revenues. This is because of another tax change concerning rental income still subject at the discretion of the taxpayer to progressive marginal tax rates: while taxable income was determined taking into account 85% of the value of the rental income until 2013, the proportion is now 95% (Beraldo and Esposito, 2019). Due to the high concentration in the wealthiest income groups ($C^{18}_{S9,Y}$: 0.56), the effect of *cedolare secca* on income inequality is found to be positive and equal to 2.9%.

During the seventeenth legislature of the Italian Republic – under the Renzi government – four measures were introduced in the broad context of redistributive policies: *a*) the '80 euro' bonus (D_{18})[10], an in-work refundable tax credit of 80 euros per month granted to employees with income from employment ranging from 8,174 to 26,600 euros and positive net PIT, meant to stimulate private consumption of the working class and to boost economic growth (Baldini et al., 2015b; Bazzoli et al., 2017); the total amount was 11.7 billion euros for 9.5 million earners according to administrative data for 2017; *b*) the newborn bonus (D_{19}), a means-tested benefit of 960 euros per year aiming to tackle child poverty and to increase the purchasing power of medium-low income groups, that can be claimed by households for each newborn or adopted child during the tax period in question if the corresponding ISEE (*Indicatore della Situazione Economica Equivalente*, a means-testing criterion also taking account of the overall wealth of the household) is less than 25,000 euros, while the amount of the bonus is doubled if the ISEE household income is less than 7,000 euros; EUROMOD calculations for the 2018 tax-benefit system indicate that roughly 900,000 households benefited from the bonus for a total amount of 1.1 billion euros; *c*) the Italian minimum income benefit for the year 2018, better known as REI – *Reddito di Inclusione* (D_{17}), the first universal tool to fight absolute poverty ever introduced in the history of the Italian welfare state (Baldini et al., 2018), consisted of a cash benefit of a maximum of 6,408 euros per year conditional on the fulfilment of several economic criteria and the activation of a personalised path of social and labour re-inclusion of the family;[10] based

on EUROMOD, its aggregate value amounted to 1.1 billion euros for a total of 800,000 households; last, *d*) the maternity bonus (D_{20}), a lump sum benefit of 800 euros paid for the birth or adoption of a child regardless of the economic condition of the applicant; nearly half a million households received this benefit in 2018 for an aggregate value of 485 million euros. These redistributive policies amounted to 14.4 billion euros in total, equal to 0.8% of GDP at market prices in 2018. The adoption of O14 makes it possible to quantify the gross redistributive effect of all four measures as 3.2%, showing a progressive effect for each policy except for the maternity bonus which has a neutral effect on inequality (D_{20}^{S3}: 0%). One particularly interesting case is that of the '80 euro' bonus once compared to REI: both measures positively affected income redistribution with the same value of 1.3%. It may be argued that an 11.7-billion-euro macroeconomic shock should lead to higher redistributive effects than an 1.1-billion-euro policy such as REI, even if it is intended for the poorest income groups. The difference in cost is remarkable, and the quantification of the effects may be interpreted as the incapacity of the '80 euro' policy to achieve an adequate level of redistribution. The picture is then completed by the newborn bonus, the redistributive effect of which amounts to 0.6%.

So far the discussion has been centred on the contribution of tax-benefit instruments to the gross redistributive effect. In fact, O14 presents the characteristic of being an incomplete decomposition method focusing on vertical effects, which means that it does not provide a single value representing horizontal movements along the income distribution for each instrument analysed. The results of the application of D93 are therefore presented in the following (see Appendix). It is interesting to note the different magnitudes in the relative effect of net tax liabilities (R^T) and income sources exempt from progressive taxation (R^{Ben}) when moving from Scenario 3 to 4. The reranking of households in Scenario 3 after subtracting the total amount of net taxes from gross income minus tax-free income sources ($Y - Ben$, following the notation in Section 2), has a positive effect on income inequality, but its magnitude varies substantially according to the tax-benefit system chosen ($R_{05}^{T,S3}$: -5.1% $\rightarrow$ $R_{18}^{T,S3}$: -4.8%). However, this equalising effect is not confirmed when including SICs for the 2005 tax-benefit system, where net tax liabilities contribute to reducing income redistribution ($R_{05}^{T,S4}$: 7.2%). The subsequent step consists of calculating the reranking of households after adding tax-free income sources to gross income after tax minus tax-free income sources, resulting in disposable income, $Y - T$. Results show that R^{Ben} plays an offsetting role, as it tends to be positive and always higher than R^T except

for the 2005 tax-benefit system in Scenario 4, where it contributes to a lesser extent to the reduction of the net redistributive effect ($R_{05}^{Ben,S4}$: 4.9%).

3.2 The relative contribution of tax-benefit instruments applying Urban (2014)

To complete our investigation into the role of tax-benefit instruments in determining income redistribution, the results of the application of U14 will be discussed in this section (see Appendix for full results). The peculiarity of this simulation is twofold. First, the breakdown of RE was carried out taking account of SICs (Scenario 4). Second, the decomposition approach employed differs from O14 by calculating contributions to marginal changes in RE through small proportional increases in the overall value of taxes, benefits and pre-tax/benefit income for all units, thus making it possible to isolate not just vertical but also horizontal effects of taxes and benefits.

The comparison of results among tax-benefit systems in Scenario 4 is given in Table 3. The contribution of overall SICs amounts to 28.3% and 22.8% for the 2005 and 2018 tax year respectively. This means that SICs contributed up to half of the amount resulting from progressive taxation in shaping redistribution, even if its influence decreased over the time period[10]. Much of the effect is achieved through employer contributions ($S_{10,05}$: 17.8% → $S_{10,18}$: 15.1%), followed in order of magnitude by employee ($S_{11,05}$: 6.0% → $S_{11,18}$: 5.9%) and self-employed contributions ($S_{12,05}$: 4.5% → $S_{12,18}$: 1.8%). The only significant difference over the period studied is therefore recorded for self-employed contributions. Despite the general increase in SICs, their aggregate value is lower by 3.6 billion euros in 2018 than in the base tax period (as is their incidence on total SICs) and no significant change was recorded in their concentration along the income distribution ($C_{S12,Y}^{05}$: 0.50 → $C_{S12,Y}^{18}$: 0.53). It is also worth noting that the horizontal effects of employer and employee SICs are such as to halve their contributions to the net redistributive effect for both tax periods.

The role of SICs in exercising an equalising effect on income redistribution can also be seen in Figure 3, where the percentage ratio of households where at least one member pays SICs by decile of gross equivalised household income is plotted. The incidence of SICs increasing with income is more evident for employer/employee contributions rather than self-employed contributions. Generally speaking, this 'natural' feature of proportional taxes levied on income sources highly concentrated on wealthy groups – such as capital income and gains and rental income from residential property – is

playing a role in sharpening the loss of vertical equity associated with the exclusion of these income components from progressive taxation as in the Italian context (Boscolo, 2019).

Table 4. Relative contribution of tax-benefit instruments in Scenario 4 applying U14: brief summary of results

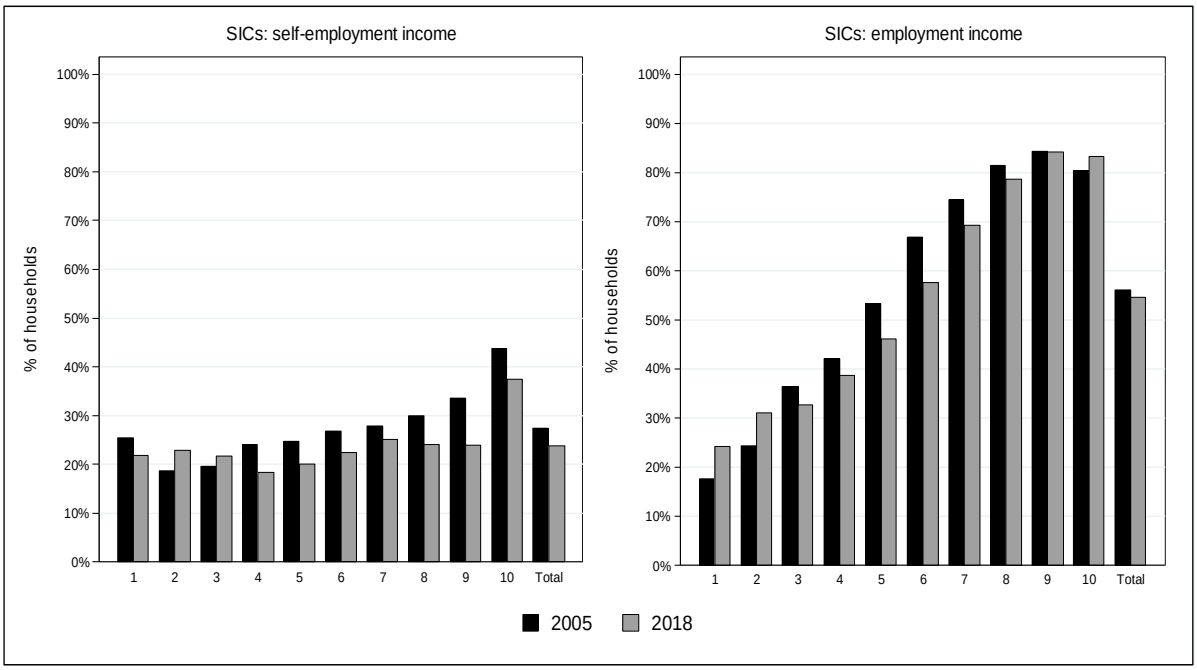
TAX-BENEFIT INSTRUMENT	**2005 %RE**	**2018 %RE**
PIT (S_1)	55.4	50.2
SICs: employer (S_{10})	17.8	15.1
SICs: employee (S_{11})	6.0	5.9
SICs: self-employed (S_{12})	4.5	1.8
Proportional taxes on capital income (S_3-S_8)	3.1	1.5
Regional surtax (S_2)	1.3	2.0
Proportional tax on rental income (S_9)	-	2.0
Social pension (D_8)	5.7	7.0
Family allowances (D_9)	5.0	4.2
Disability pension (D_{10})	2.1	5.2
Minimum Insertion Income (D_{12})	0.2	0.2
Housing benefits (D_{11})	0.2	0.3
Child benefit (D_{13})	0.1	0.3
Maternity payment (D_{14})	-0.1	0.3
Scholarships and grants (D_{15})	-0.2	-0.3
Non-taxable rental income (D_{16})	-1.1	0.0
REI (D_{17})	-	1.9
80 euro bonus (D_{18})	-	1.4
Newborn bonus (D_{19})	-	0.8
Maternity bonus (D_{20})	-	0.1
Redistributive effect (δRE)	**100.0**	**100.0**

Note: values are ordered by increasing contributions of the 2005 tax period.

The application of U14 leads to results in line with O14 in terms of sign, magnitude and dynamics over time of redistributive effects. Most of the instruments analysed are found to have small horizontal effects, leaving to vertical effects the determination of the net redistributive effect achieved. Disability pensions are the only tax-free cash benefits with significant horizontal effects: in the absence of other benefits, their effect on redistribution would be almost doubled ($D_{10,05}$: 2.1% $\rightarrow$ $D_{10,18}$: 5.2%). Family

allowances and social pension are confirmed to be among the cash benefits with the highest contribution to the net redistributive effect ($D_{8,05}$: 5.7% → $D_{8,05}$: 7.0%; $D_{9,05}$: 5.0% →$D_{9,05}$: 4.2%). This is followed by various cash benefits with minor effects such as maternity payments (D_{14}), child benefits (D_{11}), housing benefits (D_{13}) and the minimum insertion income (D_{12}), called *Reddito minimo di inserimento*, whose aim is to tackle poverty and social exclusion. The sum of the effects of these residual cash benefits amounts to 0.4% of δRE in 2005 and reaches 1.1% in 2018. The 'bonuses policy' is quantified in 4.2% of δRE, but unlike the previous applications, REI has an even greater progressive effect than the '80 euro' bonus ($D_{17,05}$: 1.9%; $D_{18,05}$: 1.4%). Withholding taxes on capital income are found to have a more limited progressive effect also when employing U14, equal to 3.1% and 1.5% for the 2005 and 2018 tax-benefit system respectively. The proportional tax on rental income from residential property presents a positive effect in line with the previous applications ($S_{9,05}$: 2.0%). To complete our analysis, scholarships and grants negatively determine redistribution for both tax periods ($D_{15,05}$: -0.2% → $D_{15,18}$: -0.3%).

Figure 3. Households with at least one member paying SICs by decile of gross equivalised household income



4. Conclusions

This article provides initial evidence about the contribution of proportional taxes and tax-free cash benefits to income redistribution in Italy over the period 2005-2018. In order to answer the questions posed above, two alternative methods for decomposing the redistributive effect of the tax-benefit system were adopted (Onrubia et al., 2014; Urban, 2014). The calculation of the effect of taxes and benefits was repeated for various scenarios which diverge from each other as they represent different degrees of extension of the tax-benefit system under examination. The main results of the study can be summarised as follows. The contribution of PIT components varied substantially over time. Marginal tax rates, deductions and tax credits determine PIT redistribution amounting to 42.4%, 55.0% and 4.2% respectively, while the 2005 tax period presented an opposite distribution of effects (18.7%, -1.1% and 83.7%). In a more comprehensive scenario, including gross income subject to proportional taxes and tax-free income sources such as cash benefits but excluding SICs, the contribution of PIT and regional surtax jointly considered to income redistribution amounts to 80.1% for the 2018 tax period when employing Onrubia et al. (2014) – O14 for simplicity. Moving on to the contribution of the remaining tax-benefit instruments, withholding taxes on capital income are found to have a small progressive effect on income redistribution ranging from 0.4% to 1.9% over the period 2005-2018. Social pension, family allowances and disability pensions are the tax-free cash benefits which contributed most to determining redistribution in 2018 (2005), amounting to 4.8%, 2.9% and 5.5% (3.3%, 2.9%, and 2.0%) of the net redistributive effect respectively. To complete the picture in 2018, the flat tax levied on rental income from residential properties, the *cedolare secca*, made a contribution of 2.9% as calculated with O14, followed by the minimum income benefit in force until March 2019 – known as REI – with an effect of 1.3% and by the '80 euro' bonus, also equal to 1.3%.

Finally, to overcome the lack of compliance with the mutual exclusion property and to take account of SICs in the analysis, the empirical strategy proposed here is to turn our attention to the contribution of taxes and benefits to marginal changes in vertical and horizontal effects, that is the application of the methodology proposed by Urban (2014). With this approach, the contribution of progressive taxation in 2018 amounted to 52.2% (63.7%) when including (excluding) SICs. In other words, progressive taxation contributed to a lower extent to marginal changes in the net redistributive capacity of the tax-benefit system than its actual contribution to income redistribution as discussed

above. As far as proportional taxes and benefits are concerned, their contribution was found to be generally in line with the results of O14. It is worth mentioning that SICs had a strong positive effect on income redistribution amounting to 22.8% (28.3%) in 2018 (2005), driven mainly by SICs paid on employment income with a contribution of 21.0% (23.8%).

Appendix

RE decomposition applying O14 for the 2005 tax year (unit of analysis: equivalent household): full results

TAX-BENEFIT INSTRUMENT	Scenario 1			Scenario 2			Scenario 3		
	RE	%	$C_{X,Y}$	**RE**	%	$C_{X,Y}$	**RE**	%	$C_{X,Y}$
Tax schedules (S)	**.0086**	**18.7**	**.5619**	**.0080**	**18.2**	**.5561**	**.0078**	**17.3**	**.5539**
PIT (S_1)	.0097	**21.1**	.5685	.0088	**20.0**	.5634	.0086	**19.1**	.5610
Regional surtax (S_2)	-.0011	**-2.4**	.4317	-.0011	**-2.5**	.4280	-.0010	**-2.2**	.4251
Arrears and severance pay (S_3)				.0003	**0.7**	.5635	.0003	**0.7**	.5618
Other bonds (S_4)				.0001	**0.2**	.7119	.0001	**0.2**	.7119
Dividends (S_5)				.0001	**0.2**	.7317	.0001	**0.2**	.7297
Government bonds (S_6)				.0000	**0.0**	.6403	.0000	**0.0**	.6392
Private pensions (S_7)				.0000	**0.0**	.8708	.0000	**0.0**	.8672
Deposits (S_8)				-.0003	**-0.7**	.4317	-.0003	**-0.7**	.4333
Tax credits (C)	**-.0005**	**-1.1**	**.3733**	**-.0004**	**-0.9**	**.3698**	**-.0005**	**-1.1**	**.3660**
Minimum limits for PIT (C_1)	.0000	**0.0**	-.5789	.0000	**0.0**	-.5793	.0000	**0.0**	-.5731
Mortgage interest payments (C_2)	.0000	**0.0**	.3484	.0000	**0.0**	.3446	.0000	**0.0**	.3357
Building and refurbishing costs (C_3)	-.0001	**-0.2**	.3491	.0000	**0.0**	.3483	-.0001	**-0.2**	.3464
Other expenses (C_4)	-.0004	**-0.9**	.3880	-.0004	**-0.9**	.3838	-.0004	**-0.9**	.3807
Deductions and exemptions (D)	.0385	**83.7**	-.0351	**.0370**	**84.1**	**-.0345**	**.0385**	**85.4**	**-.0416**
PIT: income source (D_1)	.0307	**66.7**	-.0835	.0294	**66.8**	-.0826	.0277	**61.4**	-.0820
PIT: dependent family members (D_2)	.0086	**18.7**	-.2483	.0082	**18.6**	-.2412	.0078	**17.3**	-.2417
PIT: main residence (D_3)	.0004	**0.9**	.2421	.0004	**0.9**	.2408	.0004	**0.9**	.2383
PIT: other expenses (D_4)	.0000	**0.0**	.4220	.0000	**0.0**	.4183	.0000	**0.0**	.4159
PIT: private pension contribution (D_5)	-.0001	**-0.2**	.5786	-.0001	**-0.2**	.5739	-.0001	**-0.2**	.5692
PIT: maintenance payments (D_6)	-.0002	**-0.4**	.6108	-.0001	**-0.2**	.6108	-.0001	**-0.2**	.6031
PIT: self-employed SICs (D_7)	-.0009	**-2.0**	.4711	-.0007	**-1.6**	.4610	-.0008	**-1.8**	.4521
Social pension (D_8)							.0015	**3.3**	-.6624
Family allowances (D_9)							.0013	**2.9**	-.5073
Disability pension (D_{10})							.0009	**2.0**	.0533
Housing benefits (D_{11})							.0001	**0.2**	-.0836
Minimum Insertion Income (D_{12})							.0001	**0.2**	-.0142
Child benefit (D_{13})							.0000	**0.0**	-.6095
Maternity payment (D_{14})							.0000	**0.0**	.3154
Scholarships and grants (D_{15})							.0000	**0.0**	.3928
Non-taxable rental income (D_{16})							-.0002	**-0.4**	.6539
Reranking (R)	**.0005**	**1.1**		**.0005**	**1.1**		**.0007**	**1.6**	
Redistributive effect (RE)	**.0460**	**100.0**		**.0440**	**100.0**		**.0451**	**100.0**	
Pre-tax Gini index (G_Y)	.3673			.3725			.3594		
Post-tax Gini index (G_{Y-T})	.3214			.3285			.3143		

Reranking decomposition applying D13

2005 tax-benefit system	**Scenario 1**		**Scenario 2**		**Scenario 3**		**Scenario 4**	
	RE	**%**	**RE**	**%**	**RE**	**%**	**RE**	**%**
Taxes (R^T)	.0005	**1.1**	.0005	**1.1**	-.0023	**-5.1**	.0045	**7.2**
Benefits (R^{Ben})					.0030	**6.7**	.0030	**4.9**
Reranking (*R*)	**.0005**	**1.1**	**.0005**	**1.1**	**.0007**	**1.6**	**.0075**	**12.1**
2018 tax-benefit system	**Scenario 1**		**Scenario 2**		**Scenario 3**		**Scenario 4**	
	RE	**%**	**RE**	**%**	**RE**	**%**	**RE**	**%**
Taxes (R^T)	.0007	**1.5**	.0007	**1.6**	-.0048	**-4.8**	-.0019	**-1.9**
Benefits (R^{Ben})					.0058	**5.8**	.0103	**10.3**
Reranking (*R*)	**.0007**	**1.5**	**.0007**	**1.6**	**.0010**	**2.1**	**.0084**	**8.4**

RE decomposition applying O14 for the 2018 tax period (unit of analysis: equivalent household): full results

TAX-BENEFIT INSTRUMENT	Scenario 1			Scenario 2			Scenario 3		
	RE	%	$C_{X,Y}$	RE	%	$C_{X,Y}$	RE	%	$C_{X,Y}$
Tax schedules (*S*)	**.0204**	**42.4**	**.4743**	**.0183**	**41.0**	**.4683**	**.0173**	**36.4**	**.4652**
PIT (S_1)	.0189	**39.3**	.4730	.0147	**32.8**	.4630	.0138	**29.1**	.4600
Regional surtax (S_2)	.0015	**3.2**	.4981	.0012	**2.7**	.4867	.0012	**2.5**	.4839
Proportional tax on rental income (S_9)				.0015	**3.4**	.5709	.0014	**2.9**	.5640
Arrears and severance pay (S_3)				.0010	**2.3**	.5445	.0010	**2.1**	.5447
Private pensions (S_7)				.0000	**0.0**	.2268	.0000	**0.0**	.1918
Government bonds (S_6)				.0000	**0.0**	.4377	.0000	**0.0**	.4334
Dividends (S_5)				.0000	**0.0**	.4484	.0000	**0.0**	.4411
Other bonds (S_4)				.0000	**0.0**	.4906	.0000	**0.0**	.4848
Deposits (S_8)				-.0001	**-0.2**	.3342	-.0001	**-0.2**	.3322
Tax credits (*C*)	**.0264**	**55.0**	**.0873**	**.0253**	**56.6**	**.0822**	**.0214**	**45.1**	**.0805**
Income source (C_5)	.0195	**40.5**	.0488	.0185	**41.4**	.0459	.0158	**33.3**	.0461
Dependent children (C_6)	.0041	**8.6**	-.0552	.0039	**8.8**	-.0610	.0035	**7.4**	-.0641
Dependent spouse (C_7)	.0014	**2.9**	-.2126	.0013	**2.9**	-.2237	.0012	**2.5**	-.2349
Rents (C_8)	.0009	**1.9**	-.2697	.0008	**1.8**	-.2849	.0007	**1.5**	-.2893
Other expenses (C_4)	.0003	**0.6**	.4325	.0003	**0.7**	.4218	.0002	**0.4**	.4172
Dependent parents (C_9)	.0001	**0.2**	-.4364	.0001	**0.2**	-.4545	.0001	**0.2**	-.3895
Mortgage interest payments (C_2)	.0001	**0.2**	.3277	.0001	**0.2**	.3119	.0001	**0.2**	.3048
Lone parents (C_{10})	.0000	**0.0**	-.4534	.0000	**0.0**	-.4999	.0000	**0.0**	-.5544
Minimum limits for PIT (C_1)	.0000	**0.0**	-.1602	.0000	**0.0**	-.1020	.0000	**0.0**	-.1220
Education expenses (C_{11})	.0000	**0.0**	.2621	.0000	**0.0**	.2595	.0000	**0.0**	.2506
Insurance premiums (C_{12})	.0000	**0.0**	.4684	.0000	**0.0**	.4589	.0000	**0.0**	.4528
Building and refurbishing costs (C_3)	.0001	**0.2**	.3802	.0002	**0.5**	.3722	-.0001	**-0.2**	.3672
Health-related expenses (C_{13})	-.0001	**-0.2**	.4104	.0000	**0.0**	.3981	-.0001	**-0.2**	.3932
Deductions and exemptions (*D*)	**.0020**	**4.2**	**.3192**	**.0018**	**4.1**	**.2973**	**.0098**	**20.6**	**-.0264**
PIT: main residence (D_3)	.0019	**4.0**	.1191	.0017	**3.8**	.1265	.0016	**3.4**	.1221
PIT: self-employed SICs (D_7)	.0002	**0.4**	.3993	.0002	**0.5**	.3975	.0001	**0.2**	.3774
PIT: other expenses (D_4)	.0000	**0.0**	.4110	.0000	**0.0**	.4021	.0000	**0.0**	.4009
PIT: maintenance payments (D_6)	.0000	**0.0**	.4648	.0000	**0.0**	.4654	.0000	**0.0**	.4511
PIT: private pension contribution (D_5)	-.0001	**-0.2**	.4453	.0000	**0.0**	.4303	-.0001	**-0.2**	.4291
Disability pensions (D_{10})							.0026	**5.5**	.0295
Social pension (D_8)							.0023	**4.8**	-.6162
Family allowances (D_9)							.0014	**2.9**	-.3436
REI (D_{17})							.0006	**1.3**	-.9148
80 euro bonus (D_{18})							.0006	**1.3**	.1619
Newborn bonus (D_{19})							.0003	**0.6**	-.3536
Child benefits (D_{13})							.0001	**0.2**	-.5230
Maternity payments (D_{14})							.0001	**0.2**	-.2842
Minimum Insertion Income (D_{12})							.0001	**0.2**	-.2794
Housing benefits (D_{11})							.0001	**0.2**	-.2238
Mother bonus (D_{20})							.0000	**0.0**	.0100
Non-taxable rental income (D_{16})							.0000	**0.0**	.4255
Scholarships and grants (D_{15})							.0000	**0.0**	.4390
Reranking (*R*)	**.0007**	**1.5**		**.0007**	**1.6**		**.0010**	**2.1**	
Redistributive effect (*RE*)	**.0481**	**100.0**		**.0447**	**100.0**		**.0475**	**100.0**	
Pre-tax Gini index (G_Y)	.4141			.4135			.3875		
Post-tax Gini index (G_{Y-T})	.3661			.3689			.3401		

Relative contributions of taxes and benefits applying U14 for the 2005 tax period (unit of analysis: equivalent household): full results

TAX-BENEFIT INSTRUMENT	**Scenario 3**						**Scenario 4**					
	H	**%**	**V**	**%**	**T**	**%**	**H**	**%**	**V**	**%**	**T**	**%**
PIT (S_1)	-.0028	**31.8**	-.0535	**71.6**	-.0508	**77.2**	.0022	**6.5**	.0529	**42.2**	.0508	**55.4**
Arrears and severance pay (S_3)	-.0000	**0.0**	-.0021	**2.8**	-.0021	**3.2**	.0001	**0.3**	.0022	**1.8**	.0021	**2.3**
Regional surtax (S_2)	-.0001	**1.1**	-.0013	**1.7**	-.0012	**1.8**	.0001	**0.3**	.0013	**1.0**	.0012	**1.3**
Deposits (S_8)	.0000	**0.0**	-.0004	**0.5**	-.0004	**0.6**	-.0001	**-0.3**	.0003	**0.2**	.0004	**0.4**
Other bonds (S_4)	.0000	**0.0**	-.0002	**0.3**	-.0002	**0.3**	.0000	**0.0**	.0002	**0.2**	.0002	**0.2**
Dividends (S_5)	.0000	**0.0**	-.0001	**0.1**	-.0001	**0.2**	.0000	**0.0**	.0001	**0.1**	.0001	**0.1**
Government bonds (S_6)	.0000	**0.0**	-.0001	**0.1**	-.0001	**0.2**	.0000	**0.0**	.0001	**0.1**	.0001	**0.1**
Private pensions (S_7)	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**
SICs: employer (S_{10})							.0196	**57.8**	.0358	**28.5**	.0163	**17.8**
SICs: employee (S_{11})							.0059	**17.4**	.0114	**9.1**	.0055	**6.0**
SICs: self-employed (S_{12})							-.0004	**-1.2**	.0037	**3.0**	.0041	**4.5**
Social pension (D_8)	-.0007	**8.0**	-.0059	**7.9**	-.0052	**7.9**	.0007	**2.1**	.0059	**4.7**	.0052	**5.7**
Family allowances (D_9)	-.0002	**2.3**	-.0048	**6.4**	-.0046	**7.0**	-.0004	**-1.2**	.0042	**3.3**	.0046	**5.0**
Disability pension (D_{10})	-.0039	**44.3**	-.0058	**7.8**	-.0019	**2.9**	.0049	**14.5**	.0067	**5.3**	.0019	**2.1**
Minimum Insertion Income (D_{12})	-.0004	**4.5**	-.0006	**0.8**	-.0002	**0.3**	.0004	**1.2**	.0006	**0.5**	.0002	**0.2**
Housing benefits (D_{11})	-.0001	**1.1**	-.0004	**0.5**	-.0002	**0.3**	.0001	**0.3**	.0003	**0.2**	.0002	**0.2**
Child benefit (D_{13})	-.0000	**0.0**	-.0001	**0.1**	-.0001	**0.2**	.0000	**0.0**	.0001	**0.1**	.0001	**0.1**
Maternity payment (D_{14})	-.0001	**1.1**	-.0001	**0.2**	.0001	**-0.1**	.0002	**0.6**	.0001	**0.1**	-.0001	**-0.1**
Scholarships and grants (D_{15})	-.0004	**4.5**	-.0002	**0.3**	.0002	**-0.3**	.0004	**1.2**	.0002	**0.2**	-.0002	**-0.2**
Non-taxable rental income (D_{16})	-.0001	**1.1**	.0009	**-1.2**	.0010	**-1.5**	.0003	**0.9**	-.0007	**-0.6**	-.0010	**-1.1**
Total effect (*E*)	**-.0088**	**100.0**	**-.0747**	**100.0**	**-.0658**	**100.0**	**-.0339**	**100.0**	**-.1254**	**100.0**	**-.0917**	**100.0**

Relative contributions of taxes and benefits applying U14 for the 2018 tax period (unit of analysis: equivalent household): full results

TAX-BENEFIT INSTRUMENT	Scenario 3						Scenario 4					
	H	**%**	**V**	**%**	**T**	**%**	**H**	**%**	**V**	**%**	**T**	**%**
PIT (S_1)	-.0045	**28.5**	-.0566	**59.0**	-.0521	**65.1**	-.0045	**10.5**	-.0566	**38.6**	-.0521	**50.2**
Proportional tax on rental income (S_9)	.0000	**0.0**	-.0021	**2.2**	-.0021	**2.6**	.0006	**-1.4**	-.0015	**1.0**	-.0021	**2.0**
Regional surtax (S_2)	-.0003	**1.9**	-.0024	**2.5**	-.0021	**2.6**	-.0003	**0.7**	-.0024	**1.6**	-.0021	**2.0**
Arrears and severance pay (S_3)	.0000	**0.0**	-.0015	**1.6**	-.0015	**1.9**	.0000	**0.0**	-.0015	**1.0**	-.0015	**1.4**
Dividends (S_5)	.0000	**0.0**	-.0001	**0.1**	-.0001	**0.1**	.0000	**0.0**	-.0001	**0.1**	-.0001	**0.1**
Government bonds (S_6)	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**
Other bonds (S_4)	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**
Private pensions (S_7)	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**
Deposits (S_8)	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**
SICs: employer (S_{10})							-.0205	**47.9**	-.0362	**24.7**	-.0157	**15.1**
SICs: employee (S_{11})							-.0070	**16.4**	-.0131	**8.9**	-.0061	**5.9**
SICs: self-employed (S_{12})							-.0005	**1.2**	-.0024	**1.6**	-.0019	**1.8**
Social pension (D_8)	-.0013	**8.2**	-.0086	**9.0**	-.0073	**9.1**	-.0013	**3.0**	-.0086	**5.9**	-.0073	**7.0**
Disability pensions (D_{10})	-.0083	**52.5**	-.0136	**14.2**	-.0054	**6.8**	-.0099	**23.1**	-.0153	**10.4**	-.0054	**5.2**
Family allowances (D_9)	-.0001	**0.6**	-.0046	**4.8**	-.0044	**5.5**	.0005	**-1.2**	-.0040	**2.7**	-.0044	**4.2**
REI (D_{17})	.0000	**0.0**	-.0020	**2.1**	-.0020	**2.5**	.0000	**0.0**	-.0020	**1.4**	-.0020	**1.9**
80 euro bonus (D_{18})	-.0002	**1.3**	-.0016	**1.7**	-.0014	**1.8**	.0008	**-1.9**	-.0006	**0.4**	-.0014	**1.4**
Newborn bonus (D_{19})	-.0001	**0.6**	-.0008	**0.8**	-.0008	**1.0**	.0001	**-0.2**	-.0007	**0.5**	-.0008	**0.8**
Child benefits (D_{13})	.0000	**0.0**	-.0003	**0.3**	-.0003	**0.4**	.0000	**0.0**	-.0003	**0.2**	-.0003	**0.3**
Housing benefits (D_{11})	-.0002	**1.3**	-.0005	**0.5**	-.0003	**0.4**	-.0001	**0.2**	-.0005	**0.3**	-.0003	**0.3**
Maternity payments (D_{14})	.0000	**0.0**	-.0003	**0.3**	-.0003	**0.4**	.0000	**0.0**	-.0002	**0.1**	-.0003	**0.3**
Minimum Insertion Income (D_{12})	-.0001	**0.6**	-.0003	**0.3**	-.0002	**0.3**	-.0001	**0.2**	-.0003	**0.2**	-.0002	**0.2**
Mother bonus (D_{20})	.0000	**0.0**	-.0002	**0.2**	-.0001	**0.1**	.0000	**0.0**	-.0001	**0.1**	-.0001	**0.1**
Non-taxable rental income (D_{16})	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**	.0000	**0.0**
Scholarships and grants (D_{15})	-.0006	**3.8**	-.0003	**0.3**	.0003	**-0.4**	-.0005	**1.2**	-.0002	**0.1**	.0003	**-0.3**
Total effect (*E*)	**-.0158**	**100.0**	**-.0959**	**100.0**	**-.0800**	**100.0**	**-.0428**	**100.0**	**-.1465**	**100.0**	**-.1037**	**100.0**

Notes

1. In the case of Italy, the most up-to-date non-behavioural models and their primary characteristics are as follows: SM2 (Betti et al., 2011), whose peculiar trait is the employment of its net-to-gross algorithm in order to obtain IT-SILC's gross income variables (Istat, 2011); BETAMOD (Albarea et al., 2015), known for its accuracy in estimating individual tax evasion rates; Di Nicola et al. (2015), the static model of the Italian Department of Finance based on an exact match between sample survey data and individual tax returns; TREMOD (Azzolini et al., 2017), one of the few examples in the Italian context of regional microsimulation modelling; BIMic (Curci et al., 2017), the Bank of Italy's model whose estimations of immovable and movable property values are generally more precise than other models employing non-administrative data; MicroReg (Maitino et al., 2017), focused on indirect taxes and in-kind transfers; finally, MAPP© (Baldini et al., 2015a; Boscolo, 2019), whose strength relies above all on the simulation of in-cash and in-kind transfers as well as proportional taxes and income sources exempt from progressive taxation.
2. Italian politics is particularly dynamic. At the time of writing, the ruling coalition made up by the Five Star Movement and the League fell apart, along with the proposal for a flat tax scheme on personal income.
3. Unlike the approach just discussed, the so-called *natural* decomposition rule as defined in Kristjánsson (2013) computes the effect of each tax-benefit instrument on their corresponding tax bases. This opposite method has been introduced as a technique for analysing the redistributive effect of a dual income tax system, where labour income is subject to progressive marginal tax rates, and capital income to alternative proportional tax regimes.
4. The sum of changes in post-tax/benefit Gini indices in response to proportional increases (β) in pre-tax/benefit income Y – Ben, taxes (T) and benefits (Ben), is equal to zero, precisely $\left[G_{Y-T}^{(Y-Ben)(1-\beta)} - G_{Y-T}\right] + \left[G_{Y-T}^{T(1-\beta)} - G_{Y-T}\right] + \left[G_{Y-T}^{Ben(1-\beta)} - G_{Y-T}\right] = 0$. Mention should be made of the fact that the magnitude of the proportional increase does not affect the calculation of single contributions.
5. To simplify matters, in the following we will often make use of a restricted notation. A first superscript containing the term *Si* indicates the *i-th* scenario to which each redistributive index refers. A further superscript precedes the latter when differentianting for decomposition approach. To indicate the tax-benefit system under examination, a subscript equal to '05' or '18' is added, which is in turn preceded by a numerical subscript when referring to specific tax-benefit instruments. This is not applied to concentration indices, where the superscript stands for the tax period chosen and the subscript is made up of two terms, the first indicating the variable whose concentration index is calculated, while the second represents the variable used for ordering households.

6. PIT brackets and tax rates in 2005 (values in euros): 1) up to 26,000: 23%; 2) 26,001-33,500: 33%; 3) 33,501-100,000: 39%; 4) over 100,000: 43%. PIT brackets and tax rates in 2018 (values in euros): 1) up to 15,000: 23%; 2) 15,001-28,000: 27%; 3) 28,001-55,000: 38%; 4) 55,001-75,000: 41%; 5) over 75,000: 43%.
7. Several regions have modulated additional tax rates and introduced exemptions in such a way as to achieve progressivity over the period 2005-2018. Just five regions out of twenty-one applied graduated tax rates in 2005, a number that increased to 12 in 2018.
8. https://www1.finanze.gov.it/finanze3/pagina_dichiarazioni/dichiarazioni.php: statistics on tax returns released by the Italian Department of Finance – MEF.
9. The following non-taxable income components are included within the category of disability pensions: Civil Infirmity Allowance (*Prestazione di invalidità civile*); Monthly Assistance Allowance (*Assegno mensile di assistenza*); Carer's Allowance (*Indennità di accompagnamento*); Frequency Benefit (*Indennità di frequenza*); Visual Impairment Pension (*Pensione di cecità);* Special Benefit (Indennità speciale); Deaf-Dumb Pension (*Pensione ai sordomuti*); Communication Benefit (*Indennità di comunicazione*); Personal Long-term Assistance Allowance (*Assegno per assistenza personale continuativa*).
10. Despite being commonly defined as a tax credit, this measure is not embedded within the structure of PIT and so it is considered here. The contribution to the overall redistributive effect was computed considering the bonus as an income source exempt from taxation for all decomposition approaches employed.
11. The measure has recently been replaced by *Reddito di Cittadinanza* (RdC), an enhanced minimum income scheme in effect since March 2019; the difference between the two benefits consists in a more generous sum granted by the new scheme in place, which is still conditional on the willingness of the individual to make the transition to employment, and in compliance with further patrimonial requirements. For a detailed examination of the measures, see Monticelli (2019).
12. The proportion of SIC contributions to progressive taxation considered as a whole is equal to 49.9% and 56.0% for the 2005 and 2018 tax-benefit system respectively. It should be noted that SICs amounted to 214 billion euros in 2005,1.63 times higher than PIT and regional surtax jointly considered. As far as the 2018 year is concerned, taking the 2016 administrative data (the most recent available), SICs amounted to 228.4 billion euros with a ratio of 1.36.

References

Albarea A., Bernasconi M., Di Novi C., Marenzi A., Rizzi D. and Zantomio F. (2015). Accounting for tax evasion profiles and tax expenditures in microsimulation modelling. The BETAMOD model for personal income taxes in Italy. *International Journal of Microsimulation*, 8(3): 99-136.

Azzolini D., Bazzoli M., De Poli S., Fiorio C. and Poy S. (2017). Developing and Validating Regional Microsimulation Models. TREMOD: The Tax-Benefit Model of the Italian Province of Trento. *Economia Pubblica*, 1: 5-33.

Baldini M., Giarda E. and Olivieri A. (2015a). A Tax-Benefit Microsimulation Model for Italy: A Partial Evaluation of Fiscal Consolidation in the Period 2011-2014. *Prometeia Nota di Lavoro* 1.

Baldini M., Giarda E., Olivieri A., Pellegrino S. and Zanardi A. (2015b). Il "Bonus" degli 80 euro: caratteristiche ed effetti redistributivi. *Rivista di Diritto Finanziario e Scienza delle Finanze*, LXXIV(I): 3-22.

Baldini M., Casabianca E.J., Giarda E. and Lusignoli L. (2018). The impact of REI on Italian households' income: a micro and macro evaluation. *Prometeia Nota di Lavoro* 1.

Baldini M. and Rizzo L. (2019a). *Flat tax. Parti uguali tra disuguali?* Bologna: Il Mulino.

Baldini M. and Rizzo L. (2019b). *Però la flat tax di Salvini piatta non è*. lavoce.info, 29.03.2019.

Barbetta G.P., Pellegrino S. and Turati G. (2018). What Explains the Redistribution Achieved by the Italian Personal Income Tax? Evidence from Administrative Data. *Public Finance Review*, 46(1): 7-28.

Bargain O. and Callan T. (2010). Analysing the effects of tax-benefit reforms on income distribution: a decomposition approach. *The Journal of Economic Inequality*, 8: 1-21.

Bazzoli M., De Poli S. and Fiorio C. (2017). The impacts of the Renzi government's economic policies on income distribution. In S. Ginebri (Ed.), *Italian Fiscal Policy Review 2015*. Rome: RomaTrE-Press.

Beraldo S. and Esposito G. (2019). *Cedolare secca: una flat tax che ha ridotto il gettito*. lavoce.info, 19.04.19.

Betti G., Donatiello G. and Verma V. (2011). The Siena microsimulation model (SM2) for net-gross conversion of EU-SILC income variables. *International Journal of Microsimulation*, 4(1): 35-53.

Boscolo S. (2019). Quantifying the Redistributive Effect of the Erosion of the Italian Personal Income Tax Base: A Microsimulation Exercise. *Economia Pubblica*: forthcoming.

Ceriani L. and Gigliarano C. (2010). *EUROMOD Country Report. ITALY (IT) 2005-2008*. https://www.euromod.ac.uk/using-euromod/country-reports/f3-g4.

Creedy J. and Van de Ven J. (2002). Decomposing redistributive effects of taxes and transfers in Australia: annual and lifetime measures. *Australian Economic Papers*, 40(2): 185-198.

Curci N., Savegnago M. and Cioffi M. (2017). BIMic: The Bank of Italy microsimulation model for the Italian tax and benefit system. *Bank of Italy Occasional Papers* no. 394.

Di Caro P. (2018). Redistribution in real-world PIT: Evidence from Italian tax records. *Department of Finance Working Paper* No. 2.

Duclos J.Y. (1993). Progressivity, redistribution, and equity, with application to the British tax and benefit system. *Public Finance*, 48(3): 350-365.

Fuest C., Niehues J. and Peichl A. (2010). The Redistributive Effects of Tax Benefit Systems in the Enlarged EU. *Public Finance Review*, 38(4): 473-500.

Gastaldi F., Liberati P., Pisano E. and Tedeschi S. (2017). Regressivity-Reducing VAT Reforms. *International Journal of Microsimulation*, 10(1): 39-72.

Guillaud E., Matthiew O. and Michaêl Z. (2019). Four levers of redistribution: the impact of tax and transfer systems on inequality reduction. *Review of Income and Wealth*: Early View.

Hümbelin O. and Farys R. (2018). Income redistribution through taxation – how deductions undermine the effect of taxes. *Journal of Income Distribution*, 25(1): 1-35.

Immervoll H., Levy H., Lietz C., Mantovani D., O'Donoughe C., Sutherland H. and Verbist G. (2005). Household Incomes and Redistribution in the European Union: Quantifying the Equalising Properties of Taxes and Benefits. *IZA Discussion Papers* No. 1824.

Kakwani N.C. (1984). On the Measurement of Tax Progressivity and Redistribution Effect of Taxes with Applications to Horizontal and Vertical Equity. *Advances in Econometrics*, 3: 149-168.

Kristjánsson A.S. (2011). Income redistribution in Iceland: development and European comparisons. *European Journal of Social Security*, 13(4): 392-423.

Kristjánsson A.S. (2013). Redistributive effects in a Dual Income Tax System. *FinanzArchiv: Public Finance Analysis*, 69(2): 148-166.

Lerman R.I. and Yitzhaki S. (1985). Income Inequality Effects by Income Source: A New Approach and Applications to the United States. *The Review of Economics and Statistics*, 67(1): 151-156.

Maitino M.L., Ravagli L. and Sciclone N. (2017). MicroReg: a Traditional Tax-Benefit Microsimulation Model Extended to Indirect Taxes and In-Kind Transfers. *International Journal of Microsimulation*, 10(1): 5-38.

MEF (Ministry of Economy and Finance). 2019. *Documento di Economia e Finanza 2019. Sezione III: Programma Nazionale di Riforma.* Rome.

Monticelli E. (2019). *Il nuovo Reddito di cittadinanza ed il Rei: analogie e differenze.* Menabò di Etica ed Economia, 31.01.2019.

Morger M. and Schaltegger C.A. (2018). Income tax schedule and redistribution in direct democracies – the Swiss case. *The Journal of Economic Inequality*, 16(3): 413-438.

O'Donoghue C. (2014). *Handbook of Microsimulation Modelling.* Bingley: Emerald.

Onrubia J., Picos-Sánchez F. and del Carmen Rodado M. (2014). Rethinking the Pfähler-Lambert decomposition analyse real world personal income taxes. *International Tax and Public Finance*, 21(4): 796-812.

Orcutt G.H. (1957). A New Type of Socio-Economic System. *The Review of Economics and Statistics*, 39(2): 116-123.

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

Rossi N. (2018). *Flat tax. Aliquota unica e minimo vitale per un fisco semplice ed equo*. Venice: Marsilio.

Shorrocks A.F. (1980). The Class of Additively Decomposable Inequality Measures. *Econometrica*, 48(3): 613-625.

Stevanato D. (2016). *Dalla crisi dell'Irpef alla flat tax: prospettive per una riforma dell'imposta sul reddito*. Bologna: Il Mulino.

Sutherland H. and Figari F. (2013). EUROMOD: the European Union tax-benefit microsimulation model. *International Journal of Microsimulation*, 6(1): 4-26.

Urban I. (2008). Income redistribution in Croatia: the role of individual taxes and social transfers. *Financial Theory and Practice*, 3(2): 387-403.

Urban I. (2014). Contributions of taxes and benefits to vertical and horizontal effects. *Social Choice and Welfare*, 42(3): 619-645.

Verbist G. and Figari F. (2013). The redistributive effect and progressivity of taxes revisited: An International Comparison across the European Union. *Gini Discussion Paper* 88.

Wagstaff A. and Van Doorslaer E. (2001). What Makes the Personal Income Tax Progressive? A Comparative Analysis for Fifteen OECD Countries. *International* Tax *and Public Finance*, 8: 299-315.