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Redistribution in real-world PIT: Evidence from Italian tax records[*]

by

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Abstract

This paper studies the redistributive capacity of the Italian personal income tax by using individual tax files. We propose and apply a modified version of the decomposition of the Reynolds-Smolensky index. The main findings of the work can be listed as follows. Few tax instruments explain most of the redistributive effects of the Italian PIT. The distributional implications of PIT tax credits and other components show relevant heterogeneity on a regional level. Our results integrate the findings of previous works analysing the Italian case with different datasets and focusing on different years. The advantages and shortcomings of using tax statistics for studying redistribution are also discussed. The summary of the results and future avenues of research are conclusively presented.

Keywords: personal income tax; redistribution; tax statistics; regional effects.
JEL classification: D31, H23, H24.

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1. Introduction

The personal income tax (PIT) has become a mixed blessing for policymakers around the world. On the one side, it counts for a relevant part of public revenues: in 2016, the share of PIT on total public revenues was about 25% and 28% in the European Union and in Italy, respectively (EU Commission, 2017). The PIT continues to represent a crucial pillar of modern tax-benefits systems (Joumard *et al.*, 2012); during the Great Recession, moreover, the countercyclical role of this tax has been advocated from a distributive perspective (Jenkins *et al.*, 2013). On the other side, the redistributive capacity of PIT has been questioned because of its actual configuration, which uncovers most of financial and property income, has difficulties to deal with real-world wealth disparities (Seidl *et al.*, 2013). In addition, the set of preferential tax treatments of particular individuals, groups or economic activities (i.e. tax expenditures) within the PIT structure can produce distortions in terms of efficiency and equity (Burman *et al.*, 2008). Therefore, studying the redistributive effects of personal income taxes is important in order to support the discussion on the possible recalibration of PITs' objectives (Gordon and Kopczuk, 2014).

Tax statistics can be useful for analysing progressivity and redistribution for several reasons (Atkinson *et al.*, 2017). Tax files outperform survey data by providing a better approximation of top income shares (Burkhauser *et al.*, 2016). Tax returns rely upon larger sample sizes than survey collections and reduce survey-specific issues such as measurement errors and attrition (Card *et al.*, 2010). Tax administrative data favour the understanding of the effects of different tax instruments on progressivity and redistribution (Chetty and Hendren, 2013). However, tax files present various shortcomings (Bakker, 2012). Information on individuals with income below the tax threshold (i.e. non-fillers) and households are not taken into consideration by undermining the external validity of the analyses conducted with tax statistics (Atkinson and Brandolini, 2001). Tax returns are influenced by underreporting deriving from avoidance and evasion and the administrative process under which they are collected (Obersky *et al.*, 2017). Yet, tax files are helpful for understanding the redistributive capacity of personal income taxes across and within countries by integrating the findings obtained with different dataset (Jäntti *et al.*, 2016).

The main aim of this paper is to throw further light into the redistributive consequences of the Italian PIT by using novel administrative microdata based on individual tax returns. Specifically, the contributions of the work to the existing literature are threefold. First, from a methodological side, we apply a modified version of the generalized Pfähler-Lambert decomposition method proposed by Onrubia *et al.* (2014) to the tax files in order to evaluate the different impact of the set of PIT's instruments - tax schedules, deductions, and tax credits - on vertical and horizontal redistribution. This decomposition reduces some of the limitations present in the original formulation of the Reynolds-Smolensky (RS) index discussed in Pfähler (1990) and Lambert (1989). In doing this, we also integrate recent studies that look at the implications of tax rates and deductions by using tax statistics for different countries (Miyazaki and Kitamura, 2016).

Second, we investigate the regional-specific redistributive effects of the Italian PIT by applying the decomposition of the RS index to the twenty Italian regions (NUTS-2 level). In particular, we provide evidence on the spatial distribution of the PIT across Italy and the different consequences of the PIT's instruments on a regional level (Golladay and Haveman, 2013). The interest for the regional dimension is motivated by different reasons (Biswas *et al.*, 2017). The PIT can have asymmetric redistributive consequences across places that need to be studied: for instance, using tax files for Spain, Bonhomme and Hospido (2013) documented the presence of spatial variations when looking at the redistributive ability of the Spanish PIT. Income disparities within regions are becoming of particular importance in Europe (Hoffmeister, 2009) and in Italy (Mussida and Parisi, 2016) by motivating further investigations on the role of the tax system for smoothing differences in the initial income conditions among taxpayers living in different areas.

Third, and specific to the Italian case, we integrate and update the findings of the works that have studied redistribution in Italy by relying upon tax records (Morelli, 2016). More precisely, we add to the contribution of Di Nicola *et al.* (2015), which combined tax returns data and survey-based observations for developing a microsimulation model, on two directions: the adoption of different measures of redistribution and the focus on the regional dimension. More directly related to our work is the study of Barbetta *et al.* (2016) - henceforth BPT - that analysed the

distributional implications of the Italian PIT with tax statistics, by using a sample of more than one million of individual tax returns for the fiscal year 2011. Our findings can be read as supplementary to the results of BPT (2016) for the following reasons. In this paper, we look at the fiscal year 2014 and we have a particular interest for the regional dimension. The tax statistics used here are more representative of the Italian population of taxpayers than the work of BPT (2016) where dependent workers and pensioners were over-represented.

The paper is organised as follows. Section 2 provides some background information on the Italian PIT. Section 3 contains the description of the tax files. The empirical analysis is developed in section 4 where the methodology and the results are presented. Section 5 discusses the limits of the analysis and presents some additional results. The concluding section summarises the findings of the work also in the light of future avenues of research.

2. The Italian PIT

In Italy, the personal income tax - *Imposta sul Reddito delle Persone Fisiche* or IRPEF - is one of the main instruments to achieve progressivity and redistribution at least *de jure* and a primary source of public revenues. In the first semester of 2017, IRPEF revenues on accrual basis were equal to about 89 billion Euros representing about 21% of the Italian gross domestic product. Likewise in other countries, labour and pension incomes count for more than two-thirds of the overall taxable income, while incomes generated from financial activities and property remain outside the IRPEF taxation. The exclusion of financial and property incomes is one of the reasons of criticism regarding the actual redistributive role of the Italian PIT (Verbist and Figari, 2014). In addition, the very high number and fragmented nature of tax deductions and credits have claimed for a reconsideration of tax expenditures on efficiency and equity grounds (Baldini *et al.*, 2017).

Apart from some modifications that are introduced each year, in the last two decades, the main structure of the Italian PIT has remained quite stable. For the fiscal year 2014, which is the focus of our analysis, table 1 provides a description of the key components of IRPEF, namely tax schedules, deductions, and tax credits. Tax schedules include the national progressive tax schedule and the regional and municipal surcharges

that vary across regions/municipalities, where specific deductions and exemptions are possible. We also take into consideration the flat rate '*Cedolare Secca'* applied to particular rental income that since 2011 has been excluded from the IRPEF tax base. The two deductions considered here are the most relevant deductions in terms of number of beneficiaries and average amount. The tax credits for family members and employment conditions are part of the PIT design for achieving redistribution: they take into consideration households' conditions and the occupational status. The remaining tax credits are used for addressing specific economic and social purposes and show differences regarding the number of beneficiaries and the average amount of benefits. The percentage of taxpayers with positive values for the tax credits in question reads as follows: mortgage interest (9.7%); health expenditures (41.3%); home restructuring (18.6%); interventions for energy savings (4.3%)[1].

In mid-2014, the Italian government introduced the '80 euro bonus' as a refundable tax credit of 80 euro per month that is given to dependent workers with a gross income between €8,145 and €26,000. Taxpayers with gross income between €24,000 and €26,000 received a decreasing amount of the tax credit. In 2014, the total attainable amount of the bonus was equal to 640 euro; the bonus has been confirmed in the subsequent years. The bonus produced a symbolic effect against austerity-driven policies and contributed to reducing the tax wedge on labour. Neri *et al.* (2017) provided evidence on the role of the bonus for sustaining the consumption of food and durable goods particularly among low-income households. Yet, the net effects of the bonus are still under investigation. In the tax files, we have information on the exact amount of the bonus net of errors that are important for estimating the effects of the bonus (Baldini and Pellegrino, 2016).

3. Description of tax files

The tax statistics used in the paper derive from a sample of individual tax returns elaborated at the Italian Ministry of Economy and Finance (MEF) for the fiscal year 2014. These data contain different pieces of information on taxpayers' individual characteristics, income categories, tax schedules, deductions and credits covering 80,000 anonymised taxpayers that are equal to 0.2% of the total Italian taxpayers filling

[1] The choice of the specific tax deductions and credits used here is motivated by two main reasons: data availability in the tax files, relevance in terms of number of taxpayers and amount of benefits.

personal income tax returns. A detailed presentation of the tax files, which includes a discussion on the sampling procedure and summary statistics, is provided in Di Caro (2017a). Tax returns can give a more precise description of gross and net income on a regional level than survey data by improving the spatial coverage (Longford *et al.*, 2012). As for Italy, the sample of tax files possibly covers all the 8,000 Italian municipalities, while the EU-SILC dataset that is commonly used for distributional analysis is based on 800 municipalities. From a regional perspective, moreover, tax statistics can reduce the measurement error between estimated income and true income more precisely than surveys (Ceriani *et al.*, 2013)[2].

Table 2 reports some measures used for describing redistribution and progressivity applied to the tax files (Cowell, 2011). The net tax liability includes the national tax schedule and the regional and municipal surcharges, but not the flat rate '*Cedolare Secca*' so as to consider only the overall IRPEF's tax liability. Results are obtained with the inclusion of the '80 euro bonus' among the tax credits (second column) and without it (third column). Some comments are worth underlying. Our results are similar to those obtained for the Italian case by adopting survey-based datasets such as the work of Pellegrino *et al.* (2012) that used the SHIW databank and the contribution of Baldini *et al.* (2015) where the EU-SILC was used. The reduction of the Gini coefficient after the application of PIT is in line with the findings obtained when analysing personal income taxes in other OECD countries (IMF, 2014). As for the '80 euro bonus', which was benefited from more than 11 million taxpayers (about 28% of total taxpayers), it contributed to reduce vertical inequality: the Gini coefficient decreased by about 0.8% and the average tax rate by about 3.6% when the bonus is accounted for. The Kakwani index passed from 0.2009 (without the bonus) to 0.2245 (with the bonus) by confirming that the bonus worked for improving progressivity.

[2] A detailed review of the literature studying redistributive issues in Italy is presented in Di Caro (2017b), where a more precise comparison between tax statistics and survey data is also provided.

Table 2. Italian PIT redistributive indexes

Measure	No bonus 80 euro	Yes bonus 80 Euro	Difference in %
Gini coefficient for the gross income	0.4595	0.4595	0.0
Gini coefficient for the net income	0.4092	0.4059	-0.8
Gini coefficient for the net tax liability	0.6774	0.6784	0.2
Concentration coefficient for the net income	0.4079	0.4045	-0.8
Concentration coefficient for the net tax liability	0.6620	0.6633	0.2
Redistributive effect	0.0516	0.0550	6.6
Reynolds-Smolensky index	0.0503	0.0536	6.6
Kakwani index	0.2009	0.2245	11.7
Atkinson-Plotnik-Kakwani index	0.0013	0.0018	33.5
Suits progressivity index	0.2558	0.2859	11.7
Musgrave-Thin redistributive effect	1.0931	1.0991	0.5
Average tax rate (%)	20.43	19.69	-3.6

Note: The results in the second (third) column are obtained with the exclusion (inclusion) of the '80 euro bonus' from (to) the category tax credits. Table reports: the Kakwani index of tax progressivity; the Musgrave-Thin index of redistributive effect; the Reynolds-Smolensky index of redistributive effect; the Vertical Equity measure; the Atkinson-Plotnick index of horizontal inequity; the Suits' index if progressivity.

The results obtained with the tax files have to be carefully interpreted by noting that tax statistics present weaknesses that can partly reduce their informative content (Atkinson *et al.*, 2011). Individuals at the bottom of the income distribution that do not fill tax returns because their income is below the tax threshold are not taken into account. We are not able to check for the influence of tax evasion and avoidance that can produce consequences on the distribution of income among individuals and the actual consequences of PIT (Marino and Zizza, 2012). Information on households and transfer payments, which are relevant when studying redistributive aspects (Coulter *et al.*, 1992), is not present in tax files where the unit of analysis is the individual taxpayer and non-taxable components are not included. Despite the presence of these limits, the fact that the tax files produce findings that are similar to those obtained with richer datasets acts in favour of using the sample of tax records for studying the redistributive capacity of the Italian PIT. In section 5, we provide some additional results for checking the robustness of the empirical analysis.

Table 3. Comparison of gross and net income, Italian regions

REGION	Tax Files		MEF Microsimulation	
	Gross Inc.	Net Inc.	Gross Inc.	Net Inc.
Valle d'Aosta	21,519.93	17,840.81	29,787.12	23,229.90
Piedmont	21,626.05	17,403.81	25,019.01	19,364.31
Lombardy	23,812.80	18,828.49	30,329.59	22,851.44
Liguria	21,376.80	17,245.68	30,297.21	22,692.93
Trentino AA	21,199.62	17,347.50	30,725.20	23,846.24
Friuli VG	20,943.59	16,993.12	26,788.40	20,961.37
Veneto	20,989.45	17,068.18	26,642.69	20,454.74
Emilia Romagna	21,990.87	17,693.93	28,668.22	21,744.81
Toscana	20,541.99	16,750.45	27,115.91	21,341.93
Marche	18,647.90	15,437.46	24,293.20	19,005.84
Umbria	18,757.00	15,480.18	21,644.29	17,037.27
Lazio	22,085.75	17,410.40	27,713.44	20,829.68
Abruzzo	17,056.89	14,178.18	18,707.57	15,057.71
Molise	14,981.51	12,591.64	16,928.15	13,630.34
Campania	16,564.74	13,816.25	17,260.21	13,871.75
Puglia	15,588.78	13,206.03	20,400.54	16,095.35
Basilicata	15,090.76	12,810.96	18,217.25	14,497.28
Calabria	14,345.29	12,165.94	17,731.35	14,237.28
Sicily	15,740.80	13,189.09	17,730.00	14,151.85
Sardinia	17,185.86	14,277.59	23,116.21	18,282.65
Italy	20,075.87	16.542,74	25,040.02	19,323.64
St.dev	2,938.07	2,111.33	4,996.60	3,553.57

Note: Data in the third and fourth columns are obtained from MEF tax-benefit microsimulation model.

Table 3 reports the average gross and net income in the twenty Italian regions obtained from the sample of tax files used in this paper (first and second columns) and the MEF tax-benefit microsimulation model (third and fourth columns)[3]. The variables deriving from the tax-benefit model provide a much richer description of gross and net individual and family wealth conditions than those present in the tax files. In the MEF tax-benefit microsimulation dataset, for instance, the gross income takes into full consideration property income and the net income includes a large set of tax deductions and credits and many categories of transfers (Di Nicola *et al.*, 2017). Yet, it is interesting to note that the tax statistics used here are able to provide a good approximation of pre- and post-tax income differences across Italian regions, which is one of the objectives of our analysis. The regional series of gross and net income obtained from the tax files show a high and significant correlation (> 0.90), with the counterparts deriving from the tax-benefit model.

[3] We are particularly grateful to Fernando Di Nicola and Giorgio Mongelli for providing the data used in table 2 that are obtained from the MEF tax-benefit microsimulation model.

4. Decomposing the redistributive effects of the Italian PIT

4.1 Methodology

To evaluate the redistributive effects of each tax instrument within the PIT structure we use a decomposition of the Reynolds-Smolensky index, which is a measure of absolute redistribution capturing the action of the overall redistributive system present in one country or that of a specific tax/transfer (Reynolds and Smolensky, 1977). In particular, different decompositions' methods of the RS index have been proposed in the literature for describing the consequences of the tax instruments on progressivity and redistribution particularly when using tax microdata (Jenkins, 1988). We apply a modified version of the generalised Pfähler-Lambert decomposition method recently proposed by Onrubia *at al.* (2014) to the tax files elaborated for the Italian case. This approach has the following merits. It allows for the solution of some issues present in the original Pfähler-Lambert method such as the role of the sequential order adopted when separating the single elements of PIT. It makes possible to study the impact of different tax schedules with respect to the same benchmark by adopting a sort of comprehensive-income perspective. Moreover, this decomposition method provides a flexible formula for analysing the impact of each tax instrument in terms of redistribution[4].

More precisely, the following decomposition of the RS index has been applied to the Italian tax files for the year 2014:

$$\Pi^{\mathrm{RS}} = \frac{\bar{B}}{\overline{Y-S}} \sum_{i=1}^{l} \frac{\bar{S}_i}{\bar{B}} \Pi^{K}_{B,B-S_i} - \frac{\bar{Y}}{\overline{Y-T}} \sum_{i=1}^{m} \frac{\bar{C}_i}{\bar{Y}} \Pi^{K}_{Y-S,Y-S+C_i} - \frac{\bar{Y}\bar{S}}{\overline{\bar{B}(Y-S)}} \sum_{i=1}^{n} \frac{\bar{D}_i}{\bar{Y}} \Pi^{K}_{Y,Y-D_i} - R \qquad (1)$$

where Y denotes the gross income, B the taxable income (i.e. $B = Y - D$) , S the gross tax liability obtained as the sum of l tax schedules, T the net tax liability (i.e. $T = S - C$), C the sum of the m tax credits, and D the sum of the n deductions. The presence of an upper bar indicates the average of a variable; $\Pi^{K}_{X,Z}$ is the Kakwani Index between the generic variables X and Z. The first three components on the right-hand side of (1) are used for decomposing the vertical effects of each component (tax schedules, deductions and credits) of the Italian PIT (Urban, 2016). The reranking term R describes the effects

[4] Wherever possible, we follow the notation used in Onrubia *at al.* (2014), where additional details are discussed.

of PIT on horizontal equity, that is, how the IRPEF influences the ranks of income units in the transition from pre- to post-tax income (Urban, 2014)[5].

In the original formulation proposed by Onrubia *at al.* (2014), the reranking term was equal to $R = Gini_{Y-T} - Conc_{Y-T,Y}$ and no specific distinctions on the different effects of each category of tax instruments on reranking were present. In our case, we are also interested in looking at the consequences of PIT instruments on reranking. Therefore, we extend the formula in (1) by introducing a decomposition of the reranking term that is based on the geometric approach discussed in Duclos (1993). This approach, which employs the sum of the reranking deriving from each tax instrument for building the Concentration index, is able to describe the extent to which separate PIT components are individually responsible for the reranking of units (Duclos, 1997). In our decomposition of the RS index the reranking effect takes the following form:

$$R = R^S + R^C = \left(Conc_{Y-T,Y-T-C} - Conc_{Y-T,Y}\right) + \left(Gini_{Y-T} - Conc_{Y-T,Y-T-C}\right), \quad (2)$$

where R^S and R^C are the parts of the reranking effect due to gross tax liabilities and tax credits, respectively. The term $Conc_{Y-T,Y-T-C}$ is the concentration coefficient of net income ordered on the basis of net income minus tax credits. It is important to note that the adoption of the relation in (2) allows for the identification of the different weights of gross tax liabilities and the set of tax credits with regard to the violation of the no-reranking principle[6]. Observe that, moreover, the contribution of tax credits to the overall reranking effect is expected to be higher than that of tax schedules given the more relevant interferences on income rankings of the former category of tax instruments.

4.2 Results

The results obtained from the decomposition of the RS index applied to the tax files are reported in table 4. Values are expressed as percentage of the total RS index.

[5] The reranking term represents one of the different ways of describing horizontal equity. Dardanoni and Lambert (2002) provided a detailed discussion on alternative measures of horizontal equity.

[6] The re-ranking term has been decomposed by assuming that gross taxes come first than tax credits. In our case, the presence of aggregate categories (i.e. tax schedules and credits) limits the occurrence of problems related to the specific sequence or transition. Different decomposition methodologies are discussed in Monti *et al.* (2012) and Urban (2014).

The '80 euro bonus' is included in specifications C and D; specifications B and D include the flat rate *'Cedolare secca'* among the tax schedules. Some observations are worth commenting upon. The original architecture of the Italian PIT, which is made up of the national tax schedule (S_1) plus the two tax credits for family members (C_1) and occupational status (C_2), represents the backbone of redistribution counting for about 98% of the RS index. This means that the tax instruments traditionally used for achieving progressivity and redistribution still characterise the actual configuration of IRPEF and its impact on income distribution. These results support the evidence presented in BPT (2016), where a larger set of tax credits was considered, that found a very limited impact on redistribution associated to the set of deductions and tax credits within the Italian PIT.

Table 4. RS index decomposition, Italian PIT

PIT components	No '80 euro bonus'		Yes '80 euro bonus'	
	(A)	(B)	(C)	(D)
Tax Schedules (S):	**0.4250**	**0.4238**	**0.4027**	**0.4016**
Progressive tax schedule (S_1)	0.3847	0.3850	0.3646	0.3649
Regional Surcharge (S_2)	0.0271	0.0271	0.0256	0.0257
Municipal Surcharge (S_3)	0.0132	0.0132	0.0125	0.0125
Flat Rate (S_4)	-	-0.0015	-	-0.0015
Tax Credits (C):	**0.5825**	**0.5826**	**0.6118**	**0.6123**
Dependent family members (C_1)	0.0804	0.0801	0.0770	0.0768
Employment, retirem., others (C_2)	0.5185	0.5185	0.4970	0.4970
Mortgage interest (C_3)	0.0007	0.0006	0.0006	0.0006
Health expenditures (C_4)	0.0026	0.0026	0.0024	0.0025
Home restructuring (C_5)	-0.0132	-0.0128	-0.0127	-0.0122
Interventions for energy savings (C_6)	-0.0065	-0.0064	-0.0062	-0.0061
80 euro bonus (C_7)	-	-	0.0537	0.0537
Deductions (D):	**0.0133**	**0.0126**	**0.0128**	**0.0125**
Main residence (D_1)	0.0095	0.0090	0.0091	0.0090
Pension contributions (D_2)	0.0038	0.0036	0.0037	0.0035
Re-ranking (R):	**-0.0208**	**-0.0193**	**-0.0273**	**-0.0264**
Tax Schedules (R^S)	-0.0016	-0.0016	-0.0015	-0.0022
Tax Credits (R^C)	-0.0192	-0.0177	-0.0252	-0.0242
TOTAL RS INDEX	**1.0000**	**1.0000**	**1.0000**	**1.0000**

Note: Values expressed as percentage of the total RS index. Results in A-B (C-D) are obtained with the exclusion (inclusion) of the '80 euro bonus' from (to) the category tax credits. Results in B and D include the flat rate *'Cedolare secca'* among the tax schedules.

As for the remaining tax schedules, it can be noted that the regional (S_2) and municipal (S_3) surcharges slightly produce positive effects in terms of redistribution by confirming previous findings obtained for the Italian case (Monteduro and Zanardi,

2005). The flat rate *'Cedolare Secca'* negatively contributes to the redistributive capacity of IRPEF. This effect can be due to the high concentration of the *'Cedolare Secca'* among taxpayers with high declared income, which mostly benefited from the tax reduction deriving from the exclusion of the associated property income from the progressive tax rate. Indeed, the average amount of the flat rate declared by taxpayers in the 9^{th} and 10^{th} deciles of gross income is about six times higher than in the rest of the population. Yet, the influence of the taxation of property income on progressivity and redistribution is not completely covered in our analysis that uses tax files. Simulation exercises based on detailed datasets are needed for understanding the redistributive consequences of property taxation (Figari *et al.*, 2012).

The two tax credits related to home restructuring and energy savings (C_5 and C_6) negatively influence the redistributive capacity of the Italian PIT, though they have limited effects on the total RS index. This can be explained by the high concentration of such tax credits among taxpayers with high income: taxpayers in the top decile register an average amount of tax credits C_5 and C_6 five times higher than other taxpayers do. In other words, taxpayers at the top of the income distribution made the majority of expenditures for home restructuring and interventions for energy savings in 2014. If we compare the results obtained with the inclusion of the '80 euro bonus' (C_7) among the category of tax credits, two comments can be made. The bonus exerted a positive role in terms of redistributive capacity by explaining about 5.4% of the total RS index. The introduction of the bonus, however, created negative effects on horizontal equity: the total reranking effect was about one-third higher in the presence of the bonus. This result is a direct derivation of the specific design of the bonus (i.e. only dependent workers benefited from it) that, in some cases, produced an unequal tax treatment of equals (Morini and Pellegrino, 2016).

Looking at the reranking term we can observe that the set of tax credits influence more relevantly the reranking term than tax schedules do. In other words, tax credits show higher distortive effects in the transition from pre- to post-tax income than the rest of tax instruments. This is also confirmed when comparing the Gini and Concentration coefficients of the different tax instruments. As for Italy, Monti *et al.* (2015) noted the importance of investigating the consequences of tax credits on the reranking effect in

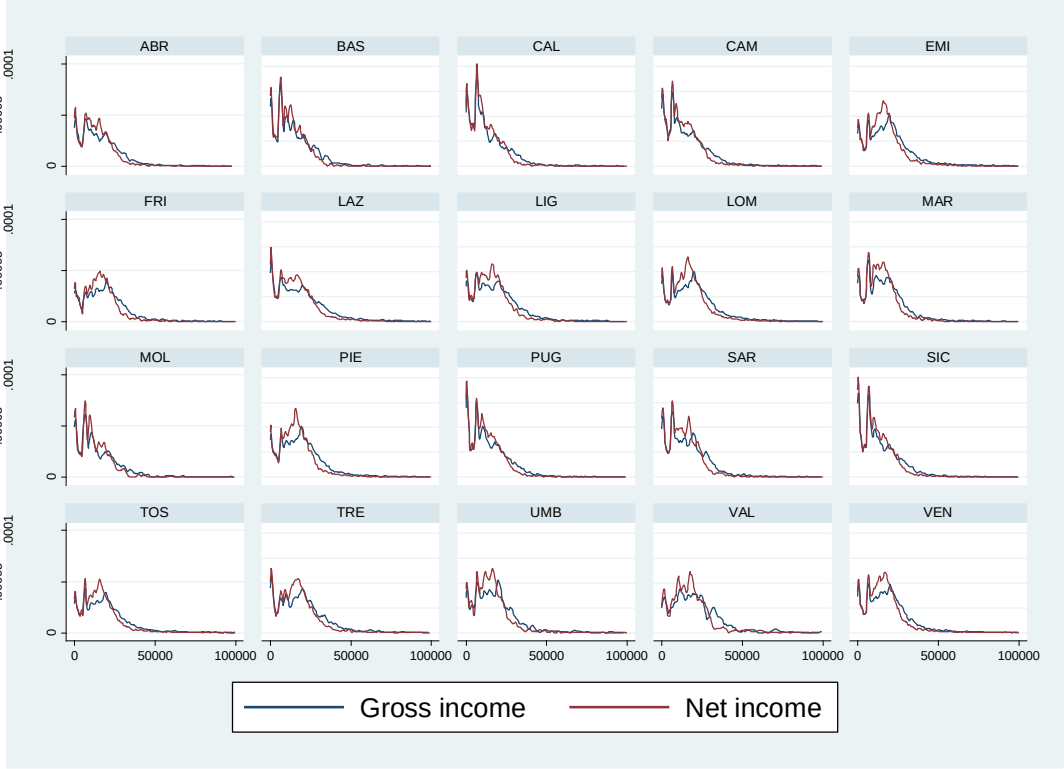
order to understand the overall redistributive impact of the Italian PIT for different categories of taxpayers.

4.3 Regional decompositions

Regional income disparities are relevant both across and within the twenty Italian regions (Jesuit, 2008). The historical economic and social differences between the North and the South of the country continue to shape spatial inequalities on a regional level, with most of the regions located in the *Mezzogiorno* lagging behind the rest of the country (Daniele and Malanima, 2014). In 2014, the standard deviation of the Gini coefficient for the net income was equal to about 2.6%, with the highest values registered in the Southern regions. Income differences show important spatial patterns also when looking at the within-region distribution of wealth (Cerqueti and Ausloos, 2015). During the same year, we found that the highest values of the Gini coefficient for the gross individual income were registered in Lazio (0.4953) and Sicily (0.4834), while the lowest values were recorded in Friuli VG (0.4146) and Veneto (0.4205). Figure 1 reports the kernel density of gross and net income for the Italian regions.

The investigation of the place-specific redistributive capacity of PIT becomes important for understanding how this tax contributes to reduce spatial differences in the distribution of income between and within regions (Bönke and Schröder, 2015). The Italian PIT works for smoothing the spatial distribution of post-tax net income; on a regional level, the Gini coefficient for the net income is about 12% lower than that of gross income. To throw further light in this study area we apply the decomposition of the RS index obtained from the combination of (1) and (2) to the twenty Italian regions. Table 5 reports the results of the RS index decomposition for each Italian region: information are grouped for categories of tax instrument. Results are obtained with the inclusion of the ‘80 euro bonus’ among the tax credits and the flat rate *‘Cedolare secca’* among tax schedules.

Figure 1. Kernel density gross and net income, Italian regions



Note: ABR: Abruzzo, BAS: Basilicata, CAL: Calabria, CAM: Campania, EMI: Emilia-Romagna, FRI: Friuli VG, LAZ: Lazio, LIG: Liguria, LOM: Lombardia, MAR: Marche, MOL: Molise, PIE: Piemonte, PUG: Puglia, SAR: Sardegna, SIC: Sicilia, TOS: Toscana, TRE: Trentino AA, UMB: Umbria, VAL: Valle d'Aosta; VEN: Veneto.

Table 5. RS index decomposition, Italian regions

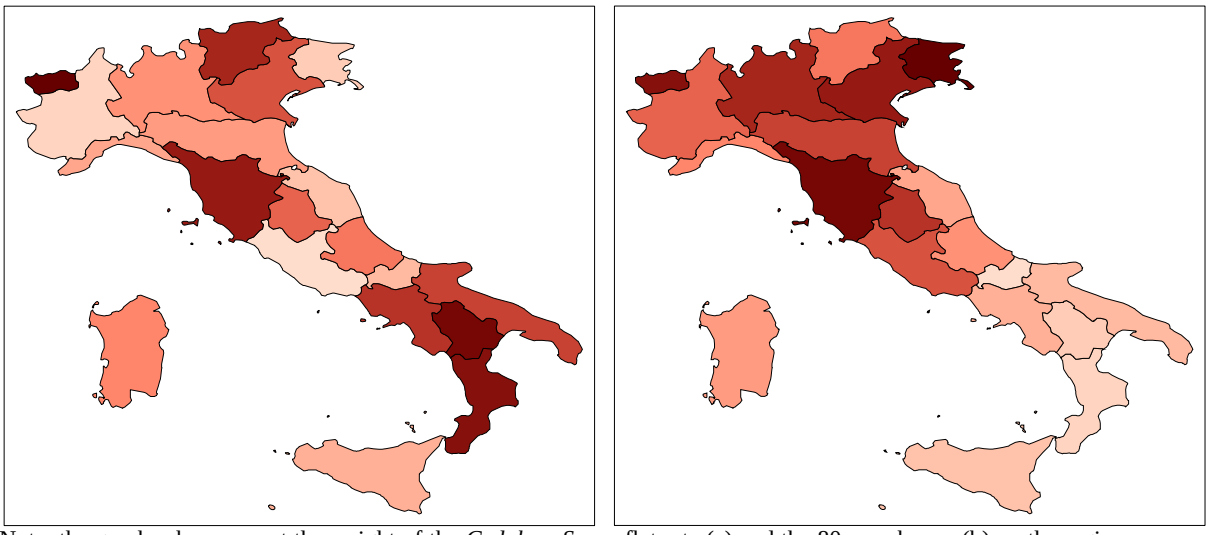
REGION	PIT components				
	Tax Schedules	Tax Credits	Deductions	Re-ranking	RS Index
Valle d'Aosta	0.4270	0.5595	0.0366	-0.0231	1.0000
Piedmont	0.4512	0.5627	0.0076	-0.0215	1.0000
Lombardy	0.4769	0.5377	0.0035	-0.0181	1.0000
Liguria	0.4150	0.5686	0.0337	-0.0173	1.0000
Trentino AA	0.4169	0.6104	-0.0040	-0.0233	1.0000
Friuli VG	0.4224	0.5959	0.0029	-0.0212	1.0000
Veneto	0.4197	0.5928	0.0098	-0.0224	1.0000
Emilia Romagna	0.4293	0.5739	0.0178	-0.0210	1.0000
Toscana	0.4094	0.5966	0.0117	-0.0177	1.0000
Marche	0.3836	0.6127	0.0242	-0.0205	1.0000
Umbria	0.3813	0.6246	0.0152	-0.0211	1.0000
Lazio	0.4243	0.5706	0.0198	-0.0147	1.0000
Abruzzo	0.3607	0.6380	0.0180	-0.0167	1.0000
Molise	0.3037	0.6904	0.0211	-0.0152	1.0000
Campania	0.3424	0.6633	0.0129	-0.0186	1.0000
Puglia	0.3172	0.6774	0.0236	-0.0182	1.0000
Basilicata	0.3559	0.6407	0.0215	-0.0181	1.0000
Calabria	0.2854	0.7137	0.0145	-0.0136	1.0000
Sicilia	0.3180	0.6820	0.0155	-0.0155	1.0000
Sardinia	0.3403	0.6589	0.0168	-0.0160	1.0000
Italy	0.4016	0.6123	0.0125	-0.0264	1.0000
St.dev.	0.0533	0.0502	0.0097	0.0029	-

Note: Values expressed as percentage of the total RS index. Results obtained with the inclusion of the '80 euro bonus' among the category tax credits and the flat rate *'Cedolare secca'* among the tax schedules.

The effects of the tax schedules on the redistributive capacity of the Italian PIT are higher in the Centre-North of the country than in the South. In Central and Northern regions, tax schedules explain about 42% of the total RS index, whereas in the regions located in the *Mezzogiorno* they count for less than 33% of the total RS index. This finding is a direct derivation of the progressive structure of IRPEF: in the regions where individuals with high income are more present, marginal tax rates contribute to achieve redistribution more than in other areas where high-income taxpayers are less present. Conversely, the contribution of tax credits in terms of RS index is more pronounced in the South (about 67%) than in the rest of the country (about 58%). This can be due to different factors such as the low income levels registered in the South, which influence the calculation of tax credits depending on income.

Figures 2a,b. Region-specific contribution, *Cedolare Secca* and 80 euro bonus

(a) Cedolare Secca **(b) 80 euro bonus**



Note: the graphs above report the weight of the *Cedolare Secca* flat rate (a) and the 80 euro bonus (b) on the region-specific RS index. Dark (light) colours indicate high (low) values of the variables.

The graphs in figure 2 illustrate the regional-specific redistributive consequences of two tax instruments, the *Cedolare Secca* flat rate (figure 2a) and the '80 euro bonus' (figure 2b): values are expressed as percentage of the total regional RS index. As for the *Cedolare Secca*, we can observe that this tax instrument negatively influences redistribution in 11 out of 20 regions. In the remaining regions, the flat rate contributed to improve the overall PIT redistributive capacity by reporting a positive value in terms of total RS index. One of the reasons for explaining such asymmetries can be related to the fact that in the regions where taxpayers with high income mostly benefited from the

flat rate, the tax reduction with respect to the ordinary tax rate was more relevant and, as a consequence, a negative impact on redistribution was registered. This was the situation observed, for instance, in regions like Lazio and Piedmont.

Turning our attention to the '80 euro bonus' (figure 2b), we can note that the major redistributive effects were recorded in the regions located in the Centre and the North of Italy, where the average impact on the RS index was equal to about 5.7%. In the *Mezzogiorno*, the bonus contributed to the RS index for less than 3.9%. The relatively high redistributive role of the bonus in the Centre-North can be explained by the relevance of dependent occupations in this area and the higher number of taxpayers filling tax returns registered in Central and Northern regions with respect to the rest of the country. The consequences of the bonus on the reranking term also show regional differences. The highest impact on reranking was registered in Calabria (South), where in the presence of the bonus the reranking term increased by about 30%; the lowest one in Valle d'Aosta (North) where the reranking increased by about 7%. These results confirm the view that tax policies undertaken during the Great Recession had different distributional effects in different places (Bargain *et al.*, 2016).

From table 5, it is worth observing that the reranking term is quite homogeneous across Italy, with the standard deviation being about 0.29%, by indicating an even spatial impact on reranking produced by IRPEF. In other words, the Italian PIT seems to influence the ranks of income units in the transition from pre- to post-tax income quite similarly across the different regions. The set of results presented in this sub-section supports the view that the personal income tax instruments can have heterogeneous regional impacts on income distribution across places (Zidar, 2015). Further investigations, however, are needed in order to understand the complex role of PIT for influencing the place-specific patterns of redistribution (Hoynes and Luttmer, 2011). In this direction, in Italy, some recent efforts have been made in order to improve the policy relevance of regional tax-benefit microsimulation models that are able to disentangle the spatial effects of taxes and transfers (Maitino *et al.*, 2017).

5. Robustness analysis

Some of the limitations affecting the robustness of our results like the focus on individual taxpayers as unit of analysis, which does not allow for the inclusion of information on households, have been already discussed[7]. Tax files do not contain information on noncompliance that can be important in a country like Italy, where tax evasion is relevant and shows spatial features that can have implications on the actual distribution of income on a regional level (Fiorio, 2011). Despite the study of tax evasion and noncompliance by using tax files merged with survey data represents a promising prospective area of research (Paulus, 2015), in our case, the lack of matched data and the presence of unsettled issues related to measurement errors are obstacles for a concrete application at this time. Moreover, the results heretofore presented have been obtained by using the IRPEF's definition of gross income that does not include most of property and financial incomes: the tax files are mute about relevant components of personal wealth that can influence the pre- and post-tax distribution of income. This is to say that our evidence is able to describe income inequalities in Italy and the redistributive effects of the Italian PIT only for a limited part (Auten and Splinter, 2017)[8].

One additional weakness of using individual tax returns is that they are a byproduct of the particular administrative process and tax legislation under which they have been collected: the analyses based on tax data can be influenced by the specific administrative context and procedures that were present in a given fiscal year. To check for these effects, we have applied the national and regional decompositions of the RS index to a different sample of tax statistics covering the fiscal year 2011[9]. This dataset contains detailed information on 47,360 individual taxpayers corresponding to about 0.1% of the total number of taxpayers filling IRPEF tax returns in that year. It is important to note that, in 2011, the Italian PIT registered the following main differences with respect to the year 2014: the reduced rate of the flat tax *'Cedolare Secca'* was 19%

[7] To check in part for the influence of household conditions in the tax files, following BPT (2016), we have applied the national and regional decompositions of the RS index to different sub-samples: taxpayers with dependent spouse and/or children and single taxpayers. No significant modifications of the main findings of the paper are registered.

[8] Additional information on property income contained in the tax files has been included by using a different definition of gross income that takes into account the property income related to the residential home. No significant modifications of the results are observed.

[9] The sample was created for the tax-benefit model at the MEF and does not contain information on the same individual taxpayers. The sample design and sampling weights are not directly comparable with the tax files for the year 2014.

instead of 10%; the tax credit for home restructuring had only two rates (36% and 41%); the '80 euro bonus' was not present. Regional differences were of some importance in 2011: the standard deviation of the Gini coefficient for the net income was equal to about 2.9%.

Table 6. National and regional RS decomposition, fiscal year 2011

REGION	PIT components				
	Tax Schedules	Tax Credits	Deductions	Re-ranking	RS Index
Valle d'Aosta	0.5739	0.4376	0.0016	-0.0131	1.0000
Piedmont	0.6308	0.3863	-0.0061	-0.0110	1.0000
Lombardy	0.6189	0.4045	-0.0112	-0.0122	1.0000
Liguria	0.6370	0.3654	0.0100	-0.0124	1.0000
Trentino AA	0.5981	0.4021	0.0139	-0.0141	1.0000
Friuli VG	0.4527	0.5585	-0.0007	-0.0105	1.0000
Veneto	0.5325	0.4930	-0.0081	-0.0174	1.0000
Emilia Romagna	0.6138	0.4100	-0.0078	-0.0160	1.0000
Toscana	0.5482	0.4643	0.0002	-0.0127	1.0000
Marche	0.5780	0.4360	-0.0007	-0.0133	1.0000
Umbria	0.5376	0.4729	0.0029	-0.0134	1.0000
Lazio	0.5567	0.4402	0.0137	-0.0106	1.0000
Abruzzo	05265	0.4738	0.0147	-0.0151	1.0000
Molise	0.5020	0.4867	0.0224	-0.0111	1.0000
Campania	0.5575	0.4429	0.0127	-0.0131	1.0000
Puglia	0.5332	0.4601	0.0172	-0.0105	1.0000
Basilicata	0.5492	0.4559	0.0034	-0.0085	1.0000
Calabria	0.5547	0.4462	0.0076	-0.0085	1.0000
Sicilia	0.5409	0.4498	0.0191	-0.0098	1.0000
Sardinia	0.5107	0.4746	0.0255	-0.0108	1.0000
Italy	0.6807	0.3293	0.0050	-0.0150	1.0000
St.dev.	0.0460	0.0108	0.0427	0.0023	-

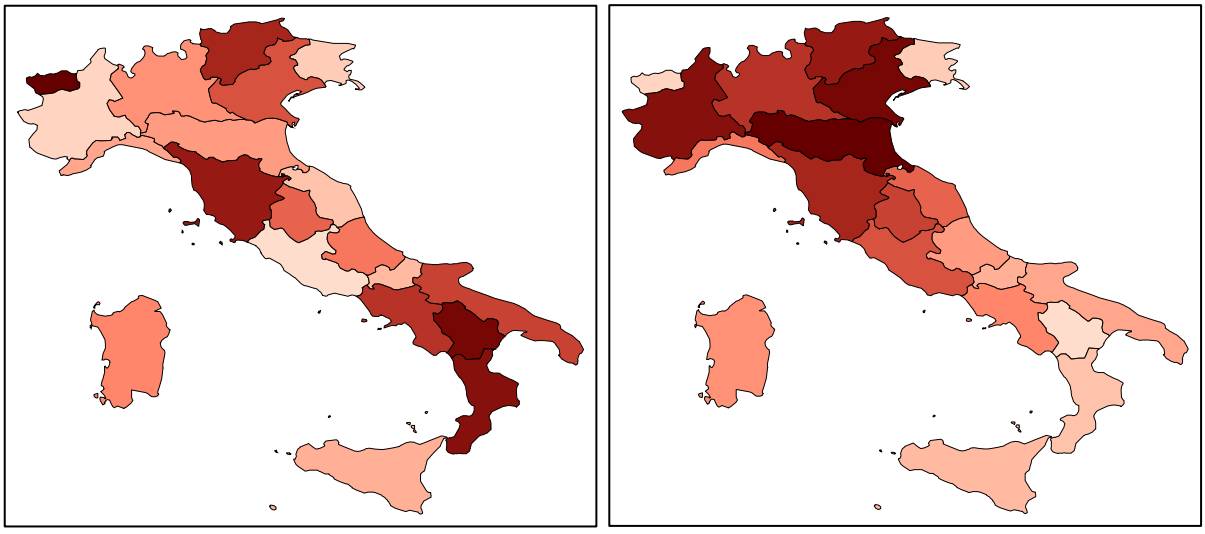
Note: Values expressed as percentage of the total RS index. Results obtained with the inclusion of the flat rate *'Cedolare secca'* among the tax schedules.

Table 6 reports the decomposition of the RS index for Italy as a whole and the twenty Italian regions. The set of IRPEF's tax instruments is similar to that used for the year 2014 including the flat rate *'Cedolare secca'* among tax schedules; the only exception is the '80 euro bonus' that was not present. The main difference with respect to the findings discussed in the previous section is that the redistributive role of tax schedules (tax credits) was relatively higher (lower) in 2011 than in 2014. This can be explained by two main reasons. In 2011, the total gross tax liability resulted higher than in 2014, when more taxpayers declared negative income due to the fact that three years more were passed since the start of the Great Recession. The local tax burden of regional and municipal surcharges decreased following the introduction of numerous exemptions by regions and municipalities. In general, however, the findings obtained for the year 2014 found confirmation also when looking at the year 2011.

The redistributive capacity of the Italian PIT was almost completely due to the combination of the national tax schedule and the two tax credits for family members and occupational status by supporting the results obtained by BPT (2016) for the same year. Tax credits play a major role in terms of RS index in the South than in the Centre-North. Figure 3a reports the redistributive consequences of the *Cedolare Secca* flat rate on a regional level. Note that, differently from the year 2014, the flat rate positively contributed to improve redistribution in all the Italian regions. This was probably due to the limited number of high-income taxpayers opting for the flat rate in the first years of its introduction. The graph in figure 3b shows the regional distribution of the average impact of the two tax credits for home restricting and interventions for energy savings. In all the Italian regions, these tax credits negatively contributed to the RS index, that is, they did not work for improving redistribution. The highest consequences were registered in the regions located in the Centre and in the North, where taxpayers with high income that mostly benefited from the tax credits in question are more present.

Figures 3a,b. Region-specific contribution in 2011, *Cedolare Secca* and home interventions

(a) Cedolare Secca **(b) Home interventions**



Note: the graphs above report the weight of the *Cedolare Secca* flat rate (a) and (the average of) the two tax credits for home restructuring and interventions for energy savings (b) on the region-specific RS index. Dark (light) colours indicate high (low) values of the variables.

6. Conclusion

The progressive rise of wealth inequalities across and between countries and the growing availability of detailed and different data sources have renewed the attention

towards the study of the distribution and the redistribution of income in different places and periods (Cowell and Van Kerm, 2015). This is a broad research area within the economic inequality literature to which the usage of tax statistics added new emphasis and empirical challenges (Lindert, 2017). In this paper, we made a contribution to the analysis of the redistributive capacity of the Italian PIT by using novel individual tax statistics. Our main findings can be listed as follows. First, we presented and applied a decomposition method of the RS index to the tax files by providing evidence on the fact that few tax instruments are able to explain most of the redistributive effects of the Italian PIT. Second, we documented that the personal income tax instruments can have heterogeneous effects on a regional level by supporting the view that the spatial dimension is important when assessing the distributional implications of tax credits (Diamond and Saez, 2011). Third, our results provided novel and updated evidence on specific aspects of the Italian PIT that attracted recent interest such as the redistributive effects of the '80 euro bonus', the consequences of the tax credits for home interventions, and the '*Cedolare secca*' flat rate.

The spectrum and the policy relevance of the analysis conducted in this paper can be improved along the following directions. The integration of the sample of tax files with other administrative and survey-based datasets is crucial for conducting more robust evaluations regarding the distribution and redistribution of income in Italy. In addition, the extension of the time-coverage of the tax statistics becomes important for building longitudinal datasets that can be used for assessing the overall consequences of PIT components on the behaviour of taxpayers with more precision (Feldman *et al.*, 2016). Understanding the factors that contribute to explain why the personal income tax instruments show spatial asymmetries in different places is interesting for improving our knowledge about the actual place-specific consequences of real-world PIT (Checchi and Peragine, 2010). These and other extensions are left for future research.

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