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Reconstructing Income Inequality in Italy: New Evidence and Tax Policy Implications from Distributional National Accounts

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Abstract

This work reconstructs novel series on income distribution in Italy combining survey data, tax data and National Accounts both at the national and regional levels, and it analyzes the overall progressivity of the tax system. Our new Distributional National Accounts allow to correct for remarkable misreporting of capital income in surveys, to provide more accurate estimates of consumption, and to better account for the role of informal economy. Our fresh estimates show higher income concentration at the top 10%, 1% and 0.1% with respect to previous studies in order of 2 to 3 percentage points. Moreover, the share of national income of the richest top 10%, top 1% and top 0.1% has been steadily increasing after the 2008 crisis. Our results shed further light on the multifaceted nature of inequality in Italy: youngest individuals, women and inhabitants of Southern regions have been increasingly exposed to growing levels of inequality. Finally, the Italian tax system is only slightly progressive up to the 95th percentile of the income distribution, and *regressive* for the top 5%. Moreover, it is regressive throughout the whole distribution when individuals are ranked with respect to their net wealth. Simulation exercises show that radical measures, such as a wealth tax, are needed to eradicate the regressivity of the Italian tax system.

Keywords: income inequality, tax progressivity, tax, National Accounts, Italy

JEL classification: C63, D31, E01, H2, H5

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1 Introduction

This work contributes to the research on income inequality and taxation by (i) showing new and more precise estimates on the distribution of income in Italy by combining survey data, tax data, and National Accounts (NA) both at the national and regional levels, and (ii) investigating the overall progressivity of the Italian tax system. We do so by first constructing Distributional National Accounts (DINA) for Italy, and then by studying which categories of taxpayers are most affected by the different types of taxes collected at the national level.

In recent years, the literature on country-specific studies on income inequality has flourished (Piketty and Atkinson, 2010). For Italy, several studies report increasing trends since the 1980s up to the 2000s and, subsequently, a stagnating dynamics for several inequality indicators (Alvaredo and Pisano, 2010; Blanchet et al., 2019). The literature has also investigated income inequality at a more fine-grained geographical scale, finding higher inequality in Southern Italy with respect to Central and Northern areas (Güell et al., 2018). However, methodologically, there is room for improvements in the estimates by distributing the national income to individuals as in Blanchet et al. (2019), who correct the EU-SILC surveys using Personal Income Tax returns (PIT[1]) and distribute the imputed rents and undistributed profits to individuals in order to obtain an initial approximation of the national income gross and net of taxes.[2] However, the latter work, wishing to derive a first estimate for all European countries, lacks enough specificity in order to take into account some detailed characteristics of the individual States.

The distribution of income in a country is intimately intertwined with taxation policies. As showed in studies on the determinants of income inequality (Roine et al., 2009; Jaumotte and Osorio Buitron, 2020), the progressivity of the tax system is one of the main factors influencing income inequality, with lower top marginal tax rates being positively associated to more unequal distributions. The studies assessing the overall degree of tax progressivity in France (Bozio et al., 2018) and the United States (Piketty et al., 2018; Saez and Zucman, 2019, 2020) have shown that the tax system boils down to a flat tax over the whole income distribution. In particular, Saez and Zucman (2019) have documented how the degree of progressiveness of the tax system has dramatically decreased starting from the 1950s.[3] In Italy, although several studies have carried out a detailed analysis of the distribution of

[1] In the case of Italy we refer to the Imposta sui Redditi delle Persone Fisiche (IRPEF) as the personal income tax.

[2] A similar work is carried out by Ederer et al. (2020) for a wide set of European countries. However, they mainly utilize EU-SILC and HFCS data. In the next sections we show that by focusing on Italy we can combine a rich ensemble of data sources.

[3] However, there is an open debate on the degree of progressivity of the US system, as results in Saez and Zucman (2019) are in contrast with estimates from other work reviewed in Splinter (2020).

single categories of taxes (Gastaldi et al., 2017; Gastaldi and Liberati, 2018; Di Caro, 2020; Baldini, 2021), the evidence on the degree of the overall progressivity of the tax system is still unsettled as the works (Amoureux et al., 2019; Ederer et al., 2020; Kuypers et al., 2021) either include a limited set of categories of taxes or do not properly account for capital incomes.

For this reason, in this work we aim at reconciling different streams of literature to precisely reconstruct the Italian personal national income distribution and accurately estimate the progressivity of the Italian tax system taking into account several tax categories. More specifically, by combining different types of data and following the distributional national accounts methodology (DINA, cf. Alvaredo et al., 2016), our first contribution consists in distributing to individuals the entire national income reported in the national accounts reconciling for the first time macroeconomic data with microeconomic ones. Furthermore, our study is the first able to correct income for the impressively incomplete reporting of capital income information[4] by combining survey data with new series on wealth distribution in Italy estimated by Acciari et al. (2020), consistent with total wealth reported in macroeconomic aggregates.

With respect to major DINA studies (Piketty et al., 2018; Ederer et al., 2020), we also provide some further novel methodological contributions possibly useful for other countries. First, our estimates are consistent with regional accounts, allowing for a more precise study of evidence at a sub-national level. Second, we combine our main survey of reference (IT-SILC, Istat, a) with more accurate information on consumption (HBS, Istat, b), instead of using the difference between income and savings as commonly done in other studies. In this way, we are able to include only consumption components that are effectively subject to the value-added tax (VAT).[5] We also distribute the whole amount of direct and indirect taxes present in the national accounts at the individual level. In this way, we provide for the first time in Italy four different estimates of national income distribution (i.e. factor income, pre-tax national income, post-tax disposable income and post-tax national income) at both individual and household levels. Relatedly, with respect to most of the studies on Italian inequality (Alvaredo and Pisano, 2010; Blanchet et al., 2019), we account for the relevant role of the informal economy employing the estimates of the Non-Observed Economy (NOE) in the national accounts provided by the Italian official statistical office (Istat),[6] corresponding to 15.5% of Italian national income in 2015.

We find that our novel estimates of income inequality in Italy revise upwards those presented in the literature (Alvaredo and Pisano, 2010; Blanchet et al., 2019): the concentration

[4] In the definition of capital income, we include both income originating from financial assets and from real estate.

[5] In the case of Italy we refer to the Imposta sul Valore Aggiunto (IVA).

[6] The report may be found at the following link: https://www.istat.it/it/archivio/248596.

of income at the top 10%, 1% and 0.1% are higher by by 2 to 3 percentage points. Moreover, since the 2008 crisis, the shares of national income of the richest 10%, 1% and 0.1% have increased and, for the latter, it is still on a growing trend. With our methodology, we are also able to analyze in more detail the multifaceted nature if Italian inequality by looking at the gender and age composition, the geographical dimension, the role of households and zoom into the income composition in each fractile of the income distribution. We find that the youngest Italians (18-35 years old) in the bottom part of the income distribution are those more severely hit by the surge in inequality. Gender income gaps are relevant and follow a J-curved pattern, being high at the bottom, and even higher at the very top of the income distribution. Households have a positive role in reducing inequalities for individuals at the bottom of the income distribution, while the effect vanishes for the highest part providing evidence for assortative mating. Finally, we document high disparities both among and within Italian macro-regions, with the highest top income concentrations in the North.

Our second major contribution is to estimate the effective tax rates paid for each percentile of the income and wealth distribution. To do so, we combine the universe of Italian direct and indirect taxes with all sources of personal income employing a transparent methodology easily replicable in other countries. We find that the tax rate over the income distribution is only moderately progressive up to around the 95th percentile. For the top 5% of income earners, the tax system is *regressive* with a significant drop in the tax rate paid by the richest 1%, who pay a lower tax rate than those in the lower deciles of the income distribution, as found in France and the U.S. When we differentiate tax payers according to their primary source of income, we find that the tax rates are substantially flat oscillating around an average of 53% for employees, 50% for self-employed, 35% for capital-income earners, whereas they are slightly progressive for pensioners, ranging from 28% to 36%.[7] Finally, when we rank individuals with respect to their net wealth, the tax system is regressive throughout the whole distribution.

We also simulate the impact on progressivity of a dual tax system, wherein labor income is taxed progressively while capital one is taxed proportionally, vis-à-vis a comprehensive system, wherein both income sources are subject to progressive tax rates. We find that the latter system has a significant redistributive impact in relative terms, but it does not achieve progressivity at the top of the income distribution. The latter objective can be obtained only by levying a wealth tax on the richest 5% of distribution. Such results should be taken into account in the current debate on the reform of the Italian tax system in order to respect the principle of tax progressivity clearly stated in article 53 of the Italian Constitution.

[7] As discussed in Section 4.3, this peculiarity of the pensioners is due to the absence of social security contributions, which, are empirically found to exert a regressive impact overall.

The remainder of the paper is structured as follows. Section 2 describes our methodology to construct the distributional series. Section 3 presents novel estimated series of income distribution and concentration, providing evidence on several dimensions of inequality. In Section 4, we shows the results on the progressivity of the Italian tax system, and in Section 5 we simulate alternative configurations. Finally, Section 6 concludes.

2 Data and methodology

In this section, we describe the methodology employed to estimate new series of income inequality and tax progressivity consistent with the different income sources and taxes present in the national accounts, compiled by the Italian National Institute of Statistics (Istat). To do so, we combine several data sources, such as national surveys, national accounts, regional accounts, personal income tax returns, and external data on wealth distribution.[8]

We start by using the IT-SILC survey as our database of reference due to an acceptable level of detail on many income sources reporting both net and gross variables. The survey relies on a sample of about 88 thousand individuals of at least 16 years of age, and it is conducted every year since 2004, providing statistics on income, education and personal information. To correct for non-sampling errors affecting the IT-SILC, we recalibrate the survey sample weights using the personal income tax tabulations at the regional level. Thereafter, using data-fusion techniques, namely propensity-score matching, we use the SHIW survey from the Bank of Italy to derive the joint distributions of (i) wealth and income, and (ii) consumption and income at the personal level. The resulting information on the two joint distributions allows us to integrate our dataset with the best available series on consumption and wealth, respectively the HBS survey on consumption, and a novel data source on Italian wealth distribution created by Acciari et al. (2020). Finally, using national and regional accounts to rescale income sources and taxes to match their macroeconomic counterparts, we construct fresh national income distribution series and analyze the tax system's progressivity. The different data sources and a schematic representation of our methodology is presented in Table 1 and in Appendix from A.1 to A.6. Let us now analyze each step in more details.

2.1 Rescaling the sampling weights

Several studies (Dalenius, 1977; Assael and Keon, 1982; Gertner and Köhl, 1992; Verma and Lê, 1996; Taleb and Douady, 2015) show that national surveys typically suffer from sampling

[8]The use of all the data sources involved takes place under the full and sole responsibility of the authors and does not involve the institutions providing the data.

Table 1: Methodological steps

Steps	*Description*	*Data details*	*Methodological details*
1	Start by using the IT-SILC (Istat, a) as our baseline data source	IT-SILC survey is run at personal level with sample size of about 80 thousand individuals per year from 2004 to 2015	
2	Adjust the IT-SILC sample weights using the PIT tax tabulations at regional level (MEF)	PIT tabulations at regional level available from 2000 to 2019 and are divided in 33 brackets	The sample weights are adjusted using the BFMcorrection algorithm developed by Blanchet et al. (2018)
3	Match IT-SILC with SHIW (Bank of Italy) to get the joint distribution between income and wealth and between income and consumption	SHIW is a biannual survey from Bank of Italy, with a sample size of about 20 thousand individuals from 1991 to 2019	The matching procedure is done using propensity score matching at the individual level
4	Match with Acciari et al. (2020) (AAM) distribution on wealth	AAM data is a distribution at the percentile level from 1995 to 2016	The matching procedure is done by adjusting the wealth shares and total wealth, derived in step 3, at the percentile level
5	Match with HBS survey on consumption (Istat, b)	HBS is a survey on consumption run by Istat from 1997 to 2019 at the household level. HBS has a sample size of about 15 thousand households	The matching procedures is done by adjusting the consumption shares and total consumption, derived in step 3, at the percentile level
6	Scaling up with national accounts to get the final distributional national accounts	national accounts are compiled yearly by Istat following the SNA08	The scaling up is performed by proportionally adjusting each income and tax component for each institutional sector

and non-sampling errors. Sampling errors are statistical errors that could potentially be solved with sufficiently large sample size. In particular, due to small sample size, surveys may underestimate the total income owned by a specific group of individuals. This is especially true at the top of the income distribution, where revenues are often under-reported or misreported. To overcome these issues in the IT-SILC, the Italian national statistical institute identifies survey respondents by fiscal code to match their income with external administrative data. In this way, misreporting of several income items can be corrected with remarkable precision for wages, pensions, and other transfers.

Non-sampling errors, on the other hand, are errors that cannot be solved by increasing the sample size, and that typically arise due to unobserved heterogeneity in non-response rates. The construction of the IT-SILC sample-weights considers the non-response rates of individuals by matching for each non-respondent the equivalent respondent based on several demographic characteristics and occupation. However, non-response rates may increase with higher income (Groves and Couper, 2012). Therefore, not considering the totality of income in the construction of the sample weights leads to biased results by under-representing the richest individuals and over-representing those at the bottom of the income distribution. Recently, the national statistical office has acknowledged this issue (Istat, 2021) and has considered possible ways to account for these types of non-sampling errors using administrative data to fill the reported income of non-respondents. However, the publicly available data have not been adjusted yet. To overcome these problems, we employ a new algorithm developed by Blanchet et al. (2018), which uses tax tabulations to correct the sample weights. The algorithm identifies the merging points between the income distributions derived from survey and tax data and rescales the sample weights at the right of the merging point to match the distribution of the tax data, which is assumed to be more reliable. To compensate for the scaling-up at the top, the algorithm also scales down the weights at the left of the merging point to keep total sample weights constant. Moreover, the algorithm allows preserving the original distribution of several covariates such as age and gender.

This technique has been recently used in Blanchet et al. (2019), also for the case of Italy. However, we made several adjustments: (i) we used a more precise definition of taxable income; (ii) we correct only non-sampling errors since the IT-SILC already corrects for the possible sampling errors, as explained above; (iii) we use regional personal income tax tabulations to correct each region's non-sampling error and keep the original distribution of gender and age at the regional level (full detail in Appendix A.1).

2.2 Merging different data sources

The IT-SILC database provides rich information on income and demographics, but it is almost silent on wealth and consumption behaviour.[9] However, these two elements are fundamental to distribute income and taxes linked to financial assets, real estate, and consumption. To acquire reliable information on the distribution of consumption, we use the Household and Budget Survey (HBS) produced by Istat[10], while we use a novel data source by Acciari et al. (2020) (henceforth AAM), estimated employing national accounts and administrative data on inheritance taxation, to gather information on wealth distribution.

To combine these datasets, we first obtain the joint distribution of wealth and income and of consumption and income from the Survey on Household Income and Wealth (SHIW). The survey is conducted by the Bank of Italy every two years with a sample comprising about 20,000 individuals. The survey includes personal information as well as details on net income, wealth and consumption.[11] As in the SHIW both wealth assets and consumption are recorded at the household level, we first redistribute wealth at the personal level following the methodology of D'Alessio (2018) and allocate consumption among the family members simply in proportion to their net income. Similarly to Albarea et al. (2015), we merge the two surveys SHIW and IT-SILC by propensity score matching using wages, self-employment income, pensions, gender, age and geographical area as covariates for the matching algorithm (full details in Appendix A.2). As a result, we obtain an IT-SILC survey supplemented with additional data on wealth ownership and consumption from SHIW, which identifies the joint distributions between income and wealth and between income and consumption, which is a crucial piece of information to investigate the overall progressivity of a tax system (Kuypers et al., 2021).

To integrate these external data sources on the distribution of wealth and consumption into our main dataset, we proceed as follows. First, we rank each person by percentiles of wealth. We then associate at each percentile the wealth share corresponding to the same percentile of wealth derived from AAM data. Finally, using the total national wealth calculated by AAM and multiplying it by the shares of each percentile, we derive the whole distribution of wealth consistent with AAM. Moreover, we further decompose the total net wealth in six different components using the composition of wealth in SHIW at the percentile level (full detail in Appendix A.2). For the case of consumption, we apply an

[9] More precisely, income from financial assets is present in the IT-SILC, but it is severely under-reported. It represents around 10% of the financial income received by the household sector in NA.

[10] The survey involves around 32,000 households every year. The interviewer annotates the main socio-demographic characteristics and food and non-food spending habits with extreme detail, which is useful for identifying items subject to VAT.

[11] Nevertheless, the IT-SILC survey remains richer in information about the types of income sources, social security contributions, gross income and a larger sample size at the regional level.

analogous procedure. We first sum at the family level the personal consumption and rank it by one thousand fractiles of consumption. We then use the HBS to derive the distribution of consumption at the same fractile level, and we apply to each consumption-fractile in the IT-SILC the level of consumption derived from the HBS.

2.3 Deriving the Distributional National Accounts

We have derived an IT-SILC survey with recalibrated sample weights that is augmented with data on wealth and consumption. Following the DINA guidelines (Alvaredo et al., 2016), we use this database to estimate the distribution of each income component and taxes that constitute the national income in national accounts.

The DINA methodology aims at reconciling micro-data with macro-economic aggregates through the use of NA. Even though national accounts are far from being perfect and income estimates are annually changed and refined, they are still the best available tool for cross-country comparison since they are built upon the same principles of the System of National Accounts. With this methodology, by distributing the whole national income at the personal level, we are thus able to build internationally consistent estimates and to compare income shares, income averages, thresholds, trends and all sorts of inequality statistics across countries similarly to what is currently done with macro-economic aggregates.

Although being constructed following the international "System of National Accounts 2008" (SNA08) and the "European System of Account 2010" (ESA2010), the Italian national accounts has few specificities that we take into account in this work of reconciliation between micro and macro data. First, we include actual rents by adding them to imputed rents.[12] We then decompose the capital income variable in NA, "Profits Distributed by companies", in three different sub-components: (i) dividends, (ii) income withdrawn by members of quasi-corporations, (iii) other profits distributed by companies. Out of these three components only dividends are capital income in the common sense of remuneration of investments. The other two components have a more ambiguous origin since they represent income received as a result of some type of work in the company.[13] Although these types of income are included as capital income in NA, for tax purposes they represent incomes included in the personal income tax base. In our analysis, we will thus consider

[12] We do so by subtracting actual rents from the mixed-income category of the household sector and include them together with the imputed rents under the Operating surplus of the household sector. This is in line with the 22 December 2020 report at the following link: https://www.istat.it/it/archivio/248596.

[13] In particular, the income withdrawn by members of quasi-corporations is the income actually withdrawn by members of individual proprietorships, family businesses and simple and de facto partnerships with more than 5 employees and all partnerships (in Italian "Società di persone") for their own needs out of the profits earned by their quasi-corporations, while other "profits distributed by companies" represent the compensation to the directors and statutory auditors of the joint-stock companies and the profit distributed to the members of the cooperatives.

these income sources as self-employment income. We are also able to differentiate among social security contributions paid by employed workers and self-employed, together with a granular decomposition with 65 sub-variables for "taxes on production and imports", and 34 sub-variables for "taxes on income and wealth" (see Appendix A.3 and A.4 for additional details on the reclassification of taxes in each institutional sector).

Another crucial aspect of Italian national accounts is the role of the Non Observed Economy (NOE). In Italy, the role of the informal economy is highly relevant due to the prevalence of small and medium-sized enterprises. In the last year of our analysis (2015), the NOE accounted for about 15.5% of Italian national income, one of the highest ratios among OECD countries (Blades and Roberts, 2002; UN Economic Commission for Europe, 2008; Gyomai and Van de Ven, 2014). By taking into account this NA adjustment, we substantially increase the robustness of our estimates of income distribution to under-reporting of income in surveys and tax returns.

By considering all these aspects, we identify four income concepts: factor national income, pre-tax national income, post-tax disposable income and post-tax national income. The first concept is the income flow that remunerates the factors of production, namely labor and capital, before taking into account taxes and transfers for pensions and social assistance. It is given by the sum of capital income (i.e. rents and imputed rents, financial income like dividends and interests), wages and salaries, self-employment income, and it includes social security contributions paid by workers and employers. This income concept does not include the transfers for pensions and for this reason inequality statistics will be higher, in comparison with other income definitions, as most of the old-age population earns zero factor income. However, this income definition is especially useful when estimating inequality in the labor market, focusing on the working-age population. The second income concept, often considered in the literature as the baseline definition, is the pre-tax national income, which does not include social security contributions, but it considers transfers for pensions and other transfers due to contributions. Differently from the other concepts, the post-tax disposable income does not sum to the total national income. In the latter, we indeed include all the transfers for social assistance, but we subtract indirect and direct taxes paid. Finally, for the post-tax national income distribution series, we add back indirect and direct taxes paid through the inclusion of public expenditures. The intuition is to include in the definition of income the redistribution that occurs through public spending, concerning e.g. education, healthcare, etc.

In order to construct our income series, we start by identifying the amount of direct taxes paid by individuals that emerges from the IT-SILC.[14] Given our aim of matching national accounts, we allocate, for each direct tax category, the difference between numbers

[14]The direct taxes in the survey are calculated as the difference between gross and net variables.

reported in NAs and in IT-SILC proportionally to the corresponding tax amount recorded in the IT-SILC. In this way, we obtain, for each individual, taxes that are coherent with NAs and we utilize this new variable to derive an updated gross income (by summing taxes to IT-SILC net income) for the different income categories.[15] From the regional national accounts, we identify the income from self-employment, wages, actual and imputed rents, dividends and interests for the institutional sector of households. We distribute them in proportion to their relative provisional gross income keeping the regional totals consistent with regional national accounts, thus obtaining what we call the final gross income. To allot actual and imputed rents, as well as dividends and interests, we use the distribution of real estate, equities and shares. With this approach, we implicitly assume that the rate of return on each asset is constant over the wealth distribution. This is a relatively strong assumption, as recent findings for other countries point out that a higher level of wealth is associated with a higher rate of return (Fagereng et al., 2020; Bach et al., 2020; Iacono and Palagi, 2021). However, it is worth noticing that by keeping this assumption — standard in similar studies in the literature (see Piketty et al., 2018, for the US case) — we are probably underestimating the financial and estate income accruing to the wealthiest individuals and, thus, reducing the overall level of inequality.[16] We estimate the net income variables as the difference between the final gross income variables and the final direct taxes paid. Finally, we distribute indirect taxes on consumption in proportion to personal consumption and distribute other indirect taxes on income or wealth proportionally to the relative income or wealth asset (full detail in Appendix A.3).

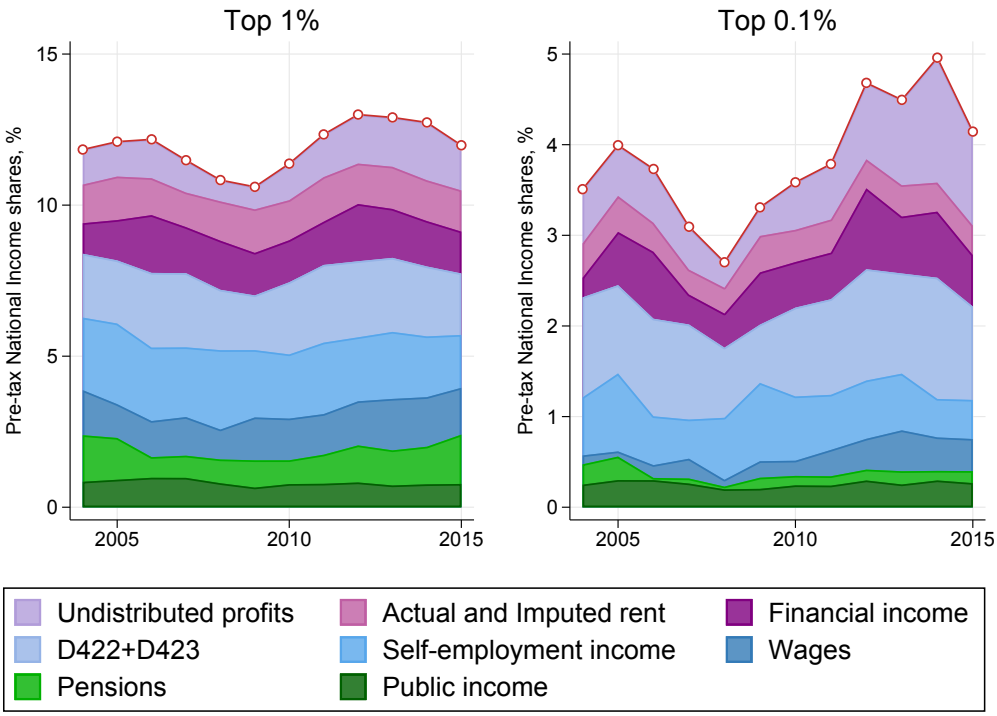
To match the national income of the whole economy, we need to include also the income accruing to the public and business sectors of the national accounts. Following the literature (Piketty et al., 2018), we consider the corporate tax and retained earnings of the business sector as income earned by those who own the shares of the businesses. Therefore, we distribute the latter categories in proportion to the financial assets of equities and shares. Regarding the income from the public sector, we distribute it in proportion to the personal distribution of all other income sources. This distributional choice operates as a level-shifter of individual income but it will not change the relative distribution among individuals. In addition, to construct the post-tax national income series, we distribute the public spending according to the actual expenditure across regions.

Finally, we obtain a new dataset that is consistent with national and regional accounts and that distributes at the personal level all gross income variables, social security contri-

[15] For example, in order to get gross capital incomes we add capital income taxes to net capital incomes.

[16] We choose to keep the assumption of constant returns in order to obtain results that are comparable to previous studies for other countries (Piketty et al., 2018) and due to the lack of estimates on heterogeneous rates of return specific for Italy. As such, our results should be read as conservative, and the true underlying inequality levels might be even more dramatic.

Figure 1: Dynamics of Pre-tax Income concentration



Notes: D422 is income withdrawn from quasi-corporations. D423 is remuneration to directors of companies. Note that D422 and D423 are ambiguous concepts and it is not straigthforward to define whether it is income deriving from capital or labor.

butions, direct and indirect taxes. We will employ the new data series to first shed further light on the concentration of income in Italy and, then, to estimate the tax progressivity of the Italian system.

3 The multifaceted Italian inequality

Our newly constructed series can be employed to provide fresh estimates for Italian key inequality indicators which can update the evidence of previous studies (cf. Section 3.1). We will then provide an international comparison (see Section 3.2). Finally, we will discuss trends related to income growth focusing on age groups (Section 3.3), as well as evidence on gender inequality and regional disparities (Section 3.4).

3.1 New estimates of income concentration

Our data show that several measures of income inequality have been oscillating in the period 2004-2015. Figure 1 shows indeed that top 1% shares of pre-tax income have been quite stable at relatively high levels, around 12%, with an increase in the aftermath of the

Table 2: Factor National Income thresholds, averages and shares in 2015, 18 years or older.

Income group	*Population*	*Income threshold*	*Average income*	*Income share*
Full population	50,699,447		26,357	100.0%
P 0-25	12,674,862		384	0.4%
P 25-50	12,674,862	1,640	6,244	6.3%
P 50-60	5,069,945	12,813	16,570	6.3%
P 60-70	5,069,945	21,015	26,502	10.1%
P 70-80	5,069,945	32,214	38,241	14.5%
P 80-90	5,069,945	44,842	53,247	20.2%
Top 10%	5,069,945	64,030	112,437	42.7%
Top 5%	2,534,972	83,924	152,476	28.9%
Top 1%	506,994	166,648	326,619	12.4%
Top 0.1%	50,699	508,801	1,140,799	4.3%

Great Recession. Similar trends emerge for top 10% shares, being just slightly below 40%, and for Gini coefficients, oscillating around a value of 0.55. However, concentration at the very top of the income distribution has risen more markedly, as shown by the top 0.1% share. This appears to be mainly due to a surge in undistributed profits and capital income from quasi-corporations and remunerations to directors (see Figure 1).[17]

Let us draw a comparison between our results and previous comparable estimates on Italy. Although we build on work by Blanchet et al. (2019) (BCG), we follow Piketty et al. (2018) in that we specifically focus on one country (Italy) and distribute all the national accounts components of national income, as thoroughly outlined in the previous section. This approach has two main advantages. First, we are able to account for all income categories, while Blanchet et al. (2019) distributed only imputed rents and retained earnings of corporations to match NA. Second, we retrieve a more realistic distribution of capital incomes, by using information on real and financial assets presented by Acciari et al. (2020).[18] As a result, for our baseline definition of income, i.e. pre-tax and transfers income, our estimates of income concentration for the period 2004-2015 appear to be significantly higher with respect to those of previous literature (see Figure A.1 in Appendix A.7). Furthermore, while earlier studies documented stagnating concentration at the top in the last years (Alvaredo and Pisano, 2010; Blanchet et al., 2019), in our newly constructed data, inequality trends appear to be increasing in the post Great Recession period. To sum up, our methodology, by more correctly imputing capital incomes and by constructing real DINA, improves upon previous estimates and finds that inequality levels are *higher* than previously thought and *increasing*, instead of stagnating.

[17]Note that remuneration of directors are business profits distributed to the administrator and directors as form of compensation to their work in the company.

[18]The reader can refer to Appendix A.7 for more details.

Table 3: Pre-tax National Income thresholds, averages and shares in 2015, 18 years or older.

Income group	*Population*	*Income threshold*	*Average income*	*Income share*
Full population	50,699,447		26,357	100.0%
P 0-25	12,674,862		1,046	1.0%
P 25-50	12,674,862	5,819	13,276	13.6%
P 50-60	5,069,945	19,632	22,113	8.4%
P 60-70	5,069,945	24,641	27,442	10.4%
P 70-80	5,069,945	30,524	34,224	13.0%
P 80-90	5,069,945	38,313	44,264	16.8%
Top 10%	5,069,945	51,810	99,717	37.8%
Top 5%	2,534,972	69,378	140,394	26.6%
Top 1%	506,994	159,898	315,911	12.0%
Top 0.1%	50,699	517,628	1,096,958	4.2%

We now provide evidence for the whole distribution of income. Note that, as in Italy taxes are paid by individuals and, given our aim of ultimately estimating tax progressivity, we will consider individuals as our unit of analysis. We start considering factor national income, i.e. the income that finances the factors of production, namely labor and capital, including social security contributions and excluding taxes, transfers and pensions. Note that this means that we allocate almost 0 labor income to the oldest individuals, mechanically increasing the overall inequality in the country. According to our estimates in Table 2, the top 10%, i.e. the richest individuals, earn at least €64,000, almost 43% of the total factor national income, while people in the bottom 50% of the income distribution roughly earn 7% of the total national income with an upper-income threshold of only €12,800.

In order to correctly account for the position of pensioners in the income distribution, we then consider the pre-tax national income distribution (Table 3). In this case, the social security contributions are excluded from the calculations. Instead, transfers due to contributions, namely old-age pensions, unemployment benefits, sickness benefits, etc., are included. While the global picture does not dramatically change for top income earners, who keep similar thresholds and averages, the situation of people at the bottom of the income ladder is considerably affected. Indeed, income for the poorest 50% of individuals more than doubles from an average of €3,300 to around €7,160, meaning that the pensions and transfer system particularly sustain those at the bottom of the factor-income distribution rather than those at the top.

3.2 International comparison

In this section, we compare our new estimates for Italy with those for the United States and France (Piketty et al., 2018; Garbinti et al., 2018), which are also obtained using DINA

guidelines,[19] for the period 2004-2015, the years for which data of the IT-SILC survey are available.

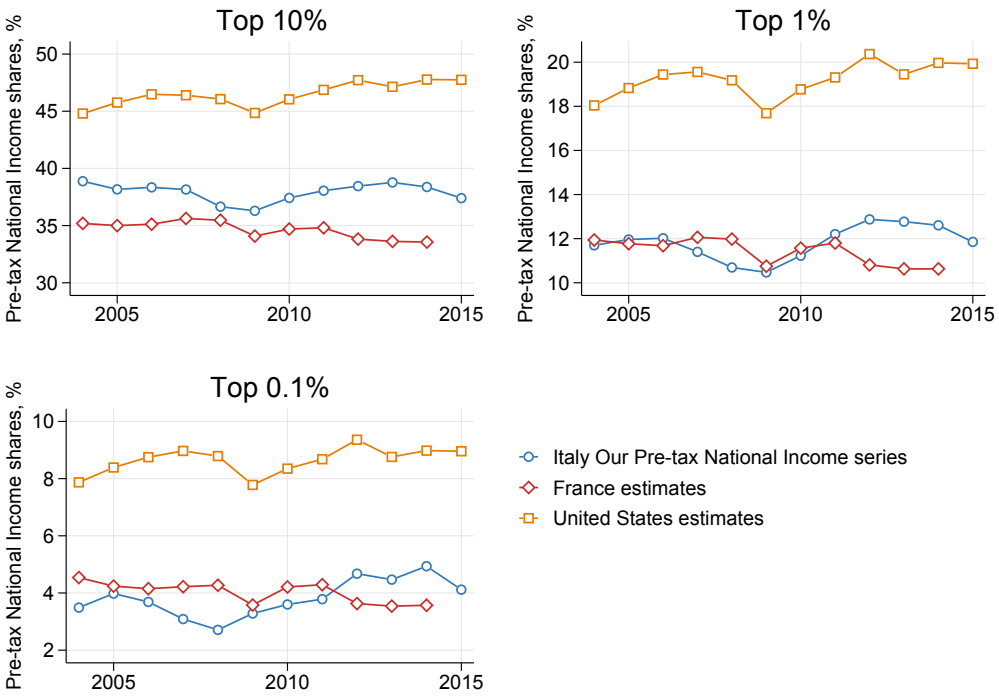
Exploiting the international comparability of DINA estimates, which are constructed using uniform income concepts (see Section 2.3 for further details), we are able to consistently contrast the distribution and the concentration of income among countries.

In the period 2004-2015, we find striking differences between European countries and the United States (Figure 2). While France and Italy have similar levels of national income shares earned by the richest individuals, the United States are characterized by income shares that are 4 percentage points higher throughout the whole period. However, differently from France, Italy seems to be projected towards the same trends of increasing inequality as those observed in the United States, as shown by the surge of the pre-tax national income shares for the richest Italians after the global financial crisis. Middle 40% shares of national income instead rise faster in Italy than in France, while in the US the middle income group is losing income shares (see Figure 3). We also find that in Italy the rise of income shares for the top and middle income groups comes at the expense of the bottom 50%, which, among the three countries, is the one that has lost most of its share of pre-tax national income. Indeed, the incomes of the poorest Italians appear to be reducing at a faster speed than in the US, losing about 2 percentage points of national income vis-à-vis 1 percentage point during the considered period for the US (Figure 3). According to these results, pre-tax income inequality in Italy appears to be rising especially by leaving behind the poorest individuals while the shares of the very rich steadily rise.

By looking at the differences in average income for different income groups (Table 4), we can deepen our analysis on the comparison across countries. Even after adjusting the average income of income groups by purchasing power parity, significant differences among countries remain for all income groups. More specifically, the average income in France for the bottom 50% is almost twice as large with respect to the Italian one. US bottom 50% average income is also higher than the Italian counterpart, although with reduced differences. Concerning other income groups, France is characterized by higher incomes than Italy throughout the distribution, except for the top 0.1%, whose average income is larger for Italians. When instead comparing Italy to the US, income gaps are largest at the top of the income distribution. We indeed find that, while the top 10% in the US earns about 1.5 times the average income of the top 10% in Italy, the US top 0.1% receives, on average, more than three times the Italian top 0.1% income. These results show how marked the differences in income and inequality between the United States and European countries are. Strikingly, while in the US, the top 1%, which is composed by about 2 million individuals, earns more than a million a year, in Italy and France only 0.1%

[19]The estimates for the U.S. and France are freely available on the WID.world website.

Figure 2: International comparison of Top Income shares of Pre-tax National Income



Notes: All series are calculated among adults from 20 years old. All income is divided at the personal level. Series for US and France are from WID.world.

of individuals, which account for about 50 thousand people, reach similar income levels.

3.3 Who bears the cost of the decline of real income?

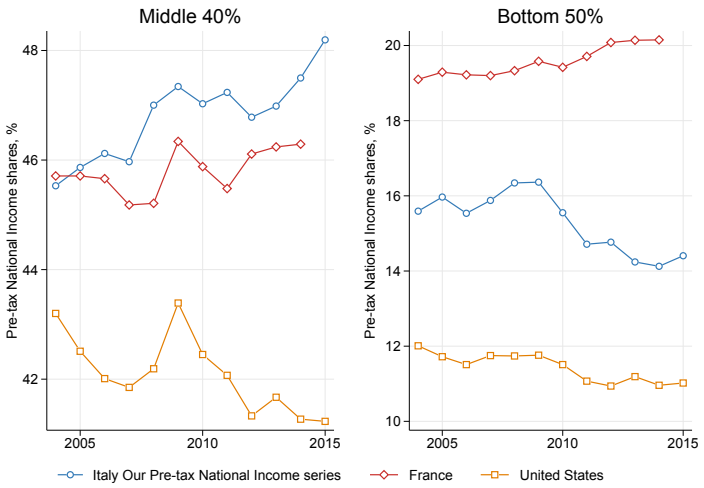
When analyzing the aggregate components of net national income, one should consider that Italy, contrary to the US, France, Germany, and other European countries, has experienced an overall macro-economic loss in the first decades of the 21st century. Indeed, in the period from 2004 to 2015, Italy has witnessed a reduction of per capita national income in real terms of 13% according to World Bank estimates.[20]

Focusing on aggregate data, we find that the macroeconomic loss of real per-capita income has characterized all components of Italian national income. More specifically, undistributed profits is the category which has reduced the most, by almost 40%, followed by self-employment income[21] and capital income, with a reduction of 27% and 20% respectively, while employed income has declined by about 5% with respect to 2004. However, standard macroeconomic data alone do not allow to understand whether national trends

[20]Data can be found at World Bank dashboard.

[21]Self-employed income includes mixed-income, income withdrawn by members of quasi-corporations and other profits distributed by companies as a form of compensations.

Figure 3: International comparison of bottom and middle income shares of pre-tax national income



Notes: All series are calculated among adults from 20 years old. All income is divided at the personal level. Series for US and France are from WID.world.

are equally shared by the entire population. Instead, using our data on distributional national accounts we are capable of bridging this gap and deriving which mechanics at the micro level determine the macro aggregates at the national level.

We find that this reduction in real terms has hit everyone throughout the whole income distribution, but some categories have suffered more than others. By looking at the factor national income for people in working-age (i.e., between 18 and 65 years old), we focus only on the components of market-driven income, without taking into account the redistribution made by the government with the pensions system. In this scenario, we find that the poorest individuals are those who suffered the greatest loss in terms of real average income (see Figure 4). This income group, i.e. the bottom 50%, went from a mean income of almost €8,000 per year to just €5,500, which implies a loss of about 30% of income. The middle 40%, i.e. people earning between €21,000 and €70,000, appears to be the less severely hit by the income loss, with an average reduction of real income of about 10% from an average of €47,000 to €42,500 in 2015. On the other hand, the top 10% and the top 1% went from an average of €142,000 to €120,000 and from €404,000 to €326,000 respectively, which translate into an overall loss of real income closer to the macro-economic average.

For the bottom 50% of the population, this impressive drop in total income is due to a general reduction of all income components: employed income and self-employment income fell by about 10% and 40% respectively from 2004 to 2015. Due to a constant reduction of the amount of net wealth held by this income group, also capital income has accordingly reduced by around 37%. With regard to the middle 40%, the main source

Table 4: Pre-tax National Income averages in 2014 PPP US$, 20 years or older[a].

	Population			Average Income		
Income group	*United States*	*France*	*Italy*	*United States*	*France*	*Italy*
Bottom 50%	117,587,416	25,654,434	24,736,004	15,745$	19,170$	10,222$
Middle 40%	94,069,933	20,523,547	19,788,803	74,131$	55,033$	42,967$
Top 10%	23,517,483	5,130,887	4,947,201	343,173$	159,594$	138,864$
Top 5%	11,758,742	2,565,443	2,473,600	521,035$	222,776$	197,078$
Top 1%	2,351,748	513,089	494,720	1,434,777$	505,599$	456,138$
Top 0.1%	235,175	51,309	49,472	6,454,379$	1,697,334$	1,786,062$

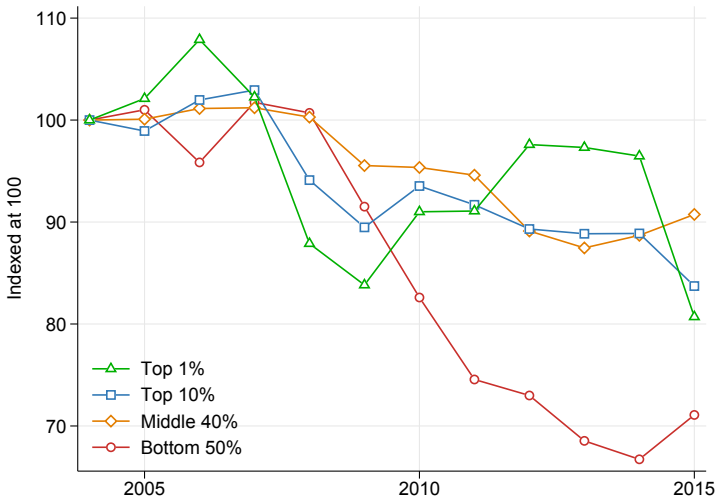
[a]Note: Average income is in 2014 PPP US dollars. The reference year is 2014 since it is the last available year for France.

of income in this group is employed income, which represents more than 60% of their income and has declined only by 5% keeping the overall loss more modest compared to the other income groups. However, self-employed income, which accounts for 20% of the total income of this group, recorded the largest drop, of around 30%, compared to 2004. Contrary to the bottom 90%, the top income groups did not experience any drop of employed or self-employed income. The top 1% indeed experienced only in recent years a slight reduction of capital income which, in 2015, accounts for 20% of their total income (more details on income composition are provided in Section 4.1).

Great disparities emerge also within each income group once we consider the age of its members. We decompose the bottom 50% of income earners between two age groups: the young adults from 18 to 35 years old and the rest of the working-age population from 36 to 65. Our findings suggest that, independently from the national income distribution concepts we use, the youngest individuals at the bottom of the income distribution are always those who experienced the highest drop in real income (see Figure 5), which went from €8,000 in 2004 to €4,500 per year in 2015. The average real income of the age group 36-65 has fallen from €8,000 in 2004 to €6,450 in 2015.[22] The resulting average loss of the youngest individuals amount to 42%, while that of the older group is limited to 19%. This is in line with the evidence provided by Bartels and Morelli (2021), and it confirms that Italy is no country for young (wo)men.

[22]The data reported in the text refer to the factor income distribution. Note also that averages for the bottom 50% are dragged down by near-zero income for the bottom 25%, similarly to what is shown in Table 2.

Figure 4: Growth of real Factor National Income in working age population



Notes: Income is divided at the personal level for the working age population 18-65.

3.4 Gender, households and geographical inequalities

In this section, we provide insights on further dimensions of inequality that can be studied starting from our distributional national accounts. We first show how income is distributed between genders in Section 3.4.1. We then consider how estimates change if we aggregate income at the household level in Section 3.4.2. Finally, in Section 3.4.3 we provide information on the distribution of national income within and between Italian regions.

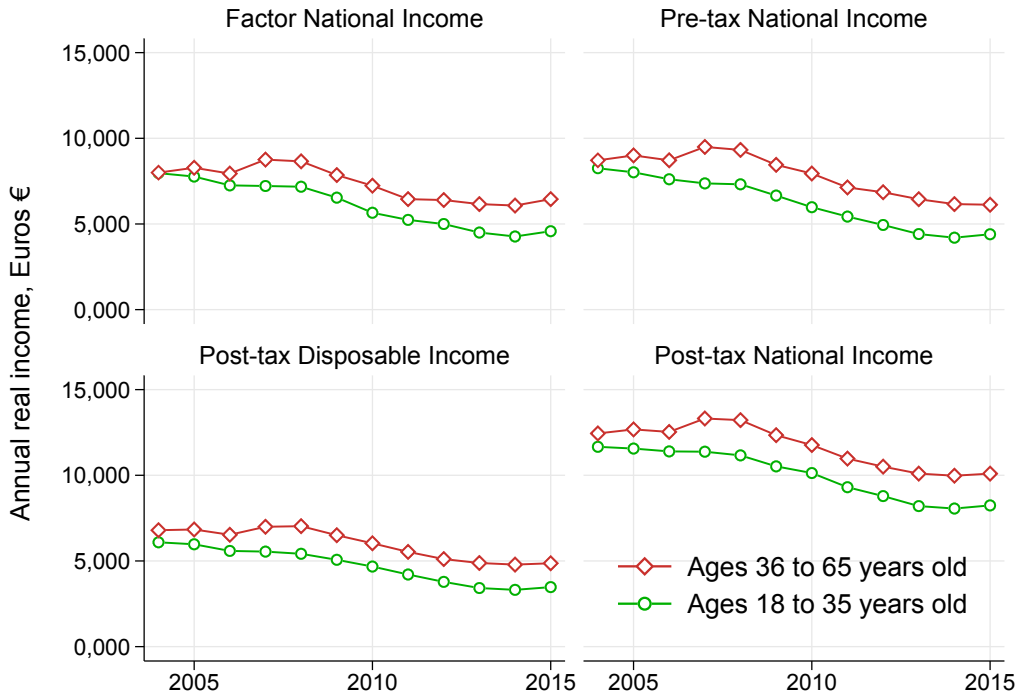
3.4.1 Gender inequality

In the previous section, we have showed how the bottom half of the distribution has been heavily hit by income losses in the 2004-2015 decade and within that group, young adults have experienced the highest income drop in real terms. The picture is even more dramatic when one focuses on the gender composition of the bottom 50%. Women ageing from 36 to 65 are subject to a huge loss in real income which is similar to the youngest women, and this brings their average income closer to the young adults' group. On the other hand, men ageing from 36 to 65 enjoy an average income of around €8,400 in 2015[23], which is 55% higher than women's income in the same age group.[24] These results suggest that the gender income gap has increased after the Great Recession, in line with findings of Piazzalunga and Di Tommaso (2019).

[23] Amounts are expressed in 2018 prices.

[24] The gap is calculated as $(Y^W - Y^M)/Y^W$, which equals $1 - Y^M/Y^W$, with Y^M being the income of men and Y^W the income of women.

Figure 5: Growth of real National Income for the bottom 50% of the working-age population

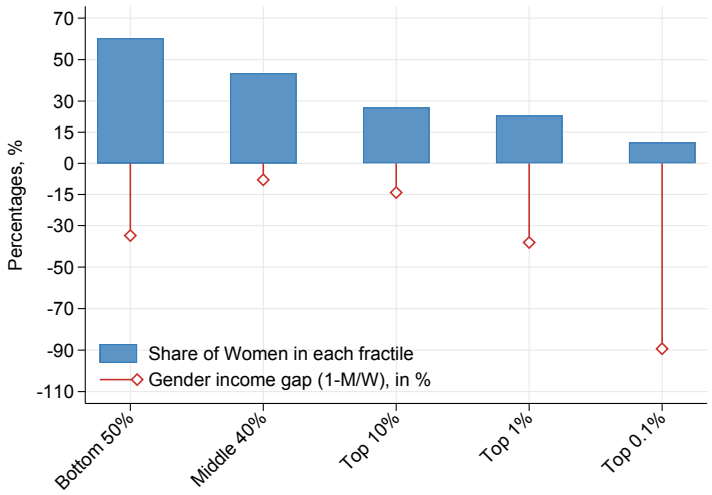


Notes: Real income is calculated using NIC 2018 price-index from Istat. Income is divided at the individual level for the bottom 50% of the working age population 18-65.

Our estimates on market-driven income allow us to provide a broader picture of gender inequality in Italy. Focusing on the working-age population of the factor national income distribution, net of public-sector income to factor out redistributional policies, we find that the ratio of the number of women over the number of men is relatively constant over time in every quantile of the income distribution. However, in 2015, women were the majority only in the bottom 50%, representing 60% of individuals in that income group. In other income groups, the higher up we climb the income distribution, the lower is women's participation in the group. Indeed, in the middle 40% (composed by people earning between €19,000 and €61,000) the share of women represents about 43% of the population, while this share falls to 27% in the top 10%, 23% in the top 1% and down to 10% in the top 0.1% (see Figure 6).

Gender inequality does not only affect women participation to the various income classes, but also their earnings within each group. We find indeed a persistent gender gap throughout the whole income distribution (cf. Figure 6). In the lowest income group, women earn almost 35% less than men, suggesting the presence of a sticky floor, while in the middle-income group this gap is lower and on average equal to 8%. Income disparities

Figure 6: Gender gaps and gender composition for selected quantiles, 2015



Notes: Shares and income gaps are calculated on working age population of factor income net of the income of the public sector.

sharply increase with higher income groups, with women earning on average almost 40% less than the average income earned by men in the top 1%. If we move to the top 0.1%, the few women (3,537 in total) earn on average 90% less than men in the same income group (i.e. women's top income is approximately half the one men are earning), indicating a thick glass ceiling. Previous literature (i.e, Mussida and Picchio, 2014; Piazzalunga and Di Tommaso, 2019) has provided evidence for the coexistence of a sticky floor and a glass ceiling for the gender wage gap in Italy. To the best of our knowledge, we are the first at confirming this stylized fact for Italy also for broader definitions of income, with even higher gaps at the top of the distribution (relative to the bottom) with respect to previous studies. Although there might be several determinants behind income gaps, both supply-side ones, such as unequal job search due to social norms (Del Bono and Vuri, 2011; Cutillo and Centra, 2017), and demand-side ones, such as discrimination (Zizza, 2013), a detailed explanation of the mechanisms at play is beyond the scope of this study.[25]

3.4.2 Household inequality

Looking at the distribution of individual income is certainly useful to understand the level of inequality of a country. One might also be interested in how the income is distributed at the household level, especially if the country at study relies heavily on the income earned by

[25]Given that the literature has focused on gender wage gaps, and some preliminary investigations have been carried out for wealth gaps (D'Alessio, 2018), a deeper understanding of the mechanisms at play for total income is a much needed and promising future direction of research.

Table 5: Pre-tax National Income thresholds, averages and shares in 2015, Households.

Income group	*Number of Households*	*Number of Individuals*	*Income threshold*	*Average income*	*Income share*
All Household	25,763,010	50,699,447		52,165	100.0%
P 0-25	6,440,752	9,758,080		13,537	6.5%
P 25-50	6,440,752	11,209,263	22,728	30,350	20.8%
P 50-60	2,576,301	5,191,668	38,627	42,658	8.2%
P 60-70	2,576,301	5,452,614	46,990	51,442	9.9%
P 70-80	2,576,301	5,943,172	56,594	63,047	12.1%
P 80-90	2,576,301	6,375,219	70,370	81,732	15.7%
Top 10%	2,576,301	6,769,431	96,842	173,052	33.2%
Top 5%	1,288,150	3,307,558	129,563	235,177	22.5%
Top 1%	257,630	611,706	260,787	493,475	9.5%
Top 0.1%	25,763	56,085	713,077	1,590,468	3.0%

all the the members of the family or if there is a large share of women that exits or does not even enter the labor market. In such cases, we would observe higher disparities in income concentration when looking at the individual distribution of national income than those found at the household level. At the same time, if individuals tend to form households with others who are in the same range of income, inequality might even increase by looking at the distribution at the household level.

Our estimates show that the top income shares calculated at the household levels are lower with respect to those computed at the individual level. This implies that Italian households have a relevant redistributive role. We find that the top 10% of households earn about 33% of pre-tax national income[26] (compare Tables 5 and 3). Moreover, we find that the bottom 50% of the household income distribution earns about 26% of total pre-tax national income, while this income share was only 14% in the individual distribution. On average, we find that individuals who are in the bottom 30% of the individual income distribution, when considered in their relative household, tend to be around the 40th percentile of the household distribution (see Appendix A.8). However, our results show that the equalizing effect is more evident only in the bottom half of the income distribution, while individuals in the upper half of the distribution tend to live in households with a similar income rank. This is in line with evidence on assortative mating pointed out by Milanovic (2019). All in all, considering households instead of individuals entails an equalizing effect only at the bottom of the distribution. On the contrary, top households reinforce inequality trends.[27] For evidence on how households influence personal income also across generations in Italy see Acciari et al. (2022).

[26]Here we use our baseline definition of pre-tax national income in order to account for the income received by all households components, namely also pensions for older individuals.

[27]Results are robust if one instead looks at household income adjusted by the OECD equivalence scale.

Table 6: Macro-regional average income in 2015, 18 years or older.

Income group	*North*	*Center*	*South*
Full population	31,431	27,282	19,021
P 0-25	3,126	1,830	121
P 25-50	17,757	14,681	6,823
P 50-60	26,011	23,174	15,608
P 60-70	31,449	28,344	20,740
P 70-80	38,287	35,053	27,105
P 80-90	48,941	45,707	36,119
Top 10%	117,412	99,262	73,281
Top 5%	169,043	136,363	98,665
Top 1%	401,586	264,290	211,241
Top 0.1%	1,579,170	561,218	656,949

3.4.3 The Italian regional divide

Being our distributional national income series consistent with the regional national accounts for the household sector produced by Istat, we can focus on the regional distribution of pre-tax national income to shed further light on disparities between and within regions for any income group. First, in Table 6 we look at disparities in average income *between* Italian macro-regions, i.e. the North, the Center and the South. Thereafter, in Table 7, we investigate income concentration *within* macro-regions.

Table 6 clearly shows that large disparities exist among the three macro regions for any income group. In particular, the North attains a higher income level with respect to other territories throughout the income distribution. This is particularly true at the two tails of the regional distributions, where the gaps are even larger. For instance, at the bottom 25% of the income distributions the North is characterized by income levels that are more than 25 times larger than the South.[28] Also at the top income gaps are quite high. The top 0.1% in the North indeed earns an average income which is 2.8 times higher than the one in the Center, and 2.4 than Southern income. Furthermore, numbers for the top 1% in the North are 1.5 times higher than income at the Center and 1.9 times higher than figures in the South. Notably, except for the top 0.1%, in which income is higher for the South than for the Center, the ranking of regions is always such that Northern average income is greater than the Central one, which is in turn higher than the Southern one.

Turning to within-region inequality, Table 7 shows that, although the bottom earns really low shares in every macroregion, numbers are particularly small for the South. Indeed, only 0.2% of Southern income accrues to the bottom 25% of the Southern income

[28]Of course, this large number is due to high unemployment rates among the young and high female inactivity rates in the South. Looking at households, instead of individuals, would render a less dramatic picture. Still, high disparities persist.

Table 7: Macro-regional income shares in 2015, 18 years or older.

Income group	*North*	*Center*	*South*
P 0-25	2.5%	1.7%	0.2%
P 25-50	16.6%	15.1%	9.1%
P 50-60	8.3%	8.5%	8.2%
P 60-70	10.0%	10.4%	10.9%
P 70-80	12.2%	12.8%	14.2%
P 80-90	15.6%	16.8%	19.0%
Top 10%	37.4%	36.4%	38.5%
Top 5%	26.9%	25.0%	25.9%
Top 1%	12.8%	9.7%	11.1%
Top 0.1%	5.0%	2.1%	3.5%

distribution (for the North the corresponding share is 2.5%). While at the middle of the distributions, shares are more similar in magnitude across regions, the top reveals some interesting insights. By looking at top 10% shares, it would seem that concentration is higher in the South with respect to other regions. However, climbing further up the income ladder reveals a different pattern: top income shares are higher in the North, with top 0.1% grabbing 5% of total Northern income (which is 50 times more than what this group would earn in the hypothetical case of perfect equality). Instead, the Center is the region that appears to have the lowest concentration at the top.

All in all, this macro-regional analysis confirms the well-known fact that huge disparities across Italian geographical areas exist, with the North being the richest region. We also show that the gaps are especially high at the two tails of the income distribution. In addition, we provide evidence for income concentration within macro-areas, showing that, by looking at the very top of the distribution, the North is the most unequal region. Interestingly, the use of top income shares provides evidence that is contrasting with what was previously found in Güell et al. (2018), who instead show larger disparities in the South, by utilizing the standard deviation of log incomes as inequality indicator.

4 The (lack of) progressivity of the Italian tax system

In this section, we will present our main findings related to the progressivity of the Italian tax system. In order to do so, we employ the pre-tax national income[29] in line with previous studies (Bozio et al., 2018; Saez and Zucman, 2019). However, since social security contributions (SSCs) paid by households represent a large fraction of total income, especially for the poorest individuals, we add also SSCs paid both by workers and employers to the

[29]It is useful to recall that pre-tax national income series are constructed including pensions in the distribution of income while all social security contributions paid by workers and employers are excluded.

total pre-tax income. This means that we add SSCs as a source of income for individuals, obtaining a new variable that we call SSCs-adjusted national income, which is higher than the total national income in NA.[30] We think that adopting SSCs-adjusted national income makes the comparison with macro economic aggregates easier and improve improves the understanding of the effective tax rate from an individual perspective, where social security contributions are deducted from gross income. However, the measurements of tax rate progressivity reported below are not significantly different from those obtained by excluding SSC (see Appendix A.10 for further details).

The remainder of the section is structured as follows. We will first discuss the composition of individual incomes which is instrumental to the investigation of the incidence of different tax categories (Section 4.1). We will then estimate tax progressivity over the income distribution (Section 4.2) and for different types of earners identified by their main income source (Section 4.3). Finally, in Section 4.4, we will investigate tax incidence over the wealth distribution. Throughout the analysis, in order to avoid biases related to changes in fiscal legislation and reforms, for simplicity, we will focus on the latest year available, 2015.

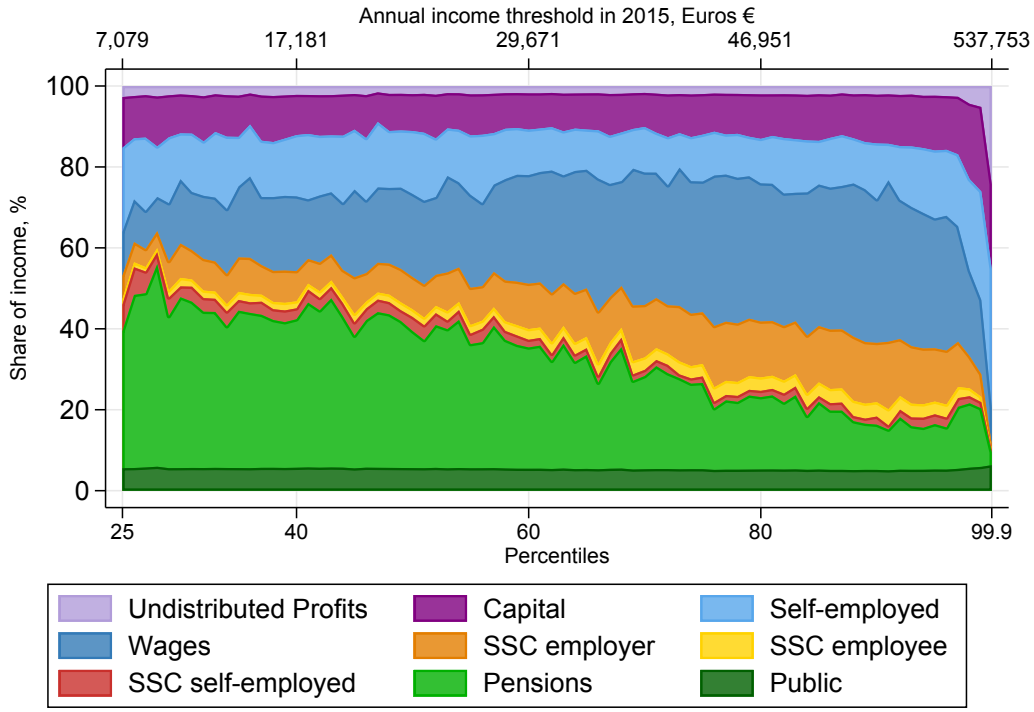
4.1 Income composition

Let us first discuss the composition of individual incomes over the income distribution, as this represents crucial information for understanding tax incidence. We find that, while pensions are more present in the left tail of the income distribution, middle-high income earners are on average composed by individuals earning a large part of their income from dependent work (see Figure 7).

Capital income appears to be relatively flat over most of the income distribution. However, the sum of capital income and undistributed profits becomes a major component of incomes at the very top of the distribution. The constancy of capital income over most of the income distribution is partially explained by two factors. First, in line with the literature (e.g. Piketty et al., 2018), we assume constant rates of returns (cf. Section 2.3), implying that earnings from capital are non-zero also for those with relatively low levels of wealth. Second, our definition of capital income includes imputed rents, which are particularly

[30] Think of a simple situation in which half of the people are earning 100 units of income from labor, of which 50 units are deducted as SSCs in period 1 to pay pensions to the other half of the individuals. Then, both types of individuals have an income of 50 units, which is assumed to be taxed at 50%. In this case, by distributing the amount of taxes paid and considering SSCs only as a source of income tax, we will end up in an unrealistic situation in which taxes for the employed workers would be equal to 75 while their income would be recorded at 50 units. On the other hand, taxes for the pensioners would be equal to 25 units while having an income of 50 units. To properly distribute SSCs as income tax, we need to include both pension income and SSCs as sources of income in the denominator. In this case, the employed workers would pay 75 units as taxes out of a total income of 100 units, and the pensioner will pay 25 units out of a total income of 50 units.

Figure 7: Pre-tax National Income composition including Social Security Contributions, 2015



Notes: Capital income is composed by the sum of actual and imputed rents and financial income

relevant in Italy, wherein over 70% of the households are home owners.[31] Nonetheless, this constancy in composition for a wide part of the distribution masks great heterogeneity in capital income levels. Furthermore, we find that people at the very top of the income distribution, namely the top 0.1%, heavily rely on capital income, as well as on undistributed profits, which are allocated in proportion to equity, shares and business assets.

To have a better understanding of the overall composition of income, we divide people into four different groups according to their primary source of income: (i) income and salaries from dependent work, (ii) income from self-employment, (iii) pensions and (iv) capital income (see Figure 8). As expected, the first two groups are mutually self-exclusive; those who are categorized as employees have very low income from self-employment activities and, in the same way, those who are considered self-employed workers have very low dependent income. For both groups, the relevance of social security contributions declines toward the top of the income distribution due to the contributions ceiling imposed on income above €100,000.[32] For both employees and self-employed workers, the relevance

[31] See https://www.oecd.org/housing/data/affordable-housing-database/.

[32] The threshold is reduced to €76,000 for some specific categories of self-employed workers Circolare INPS n2026.

of capital income tends to be higher at the top of the income distribution, accounting for about 25% of total income for the top 0.1%. More specifically, in the case of employees, financial income is the most prevalent type of capital income at the top, while, for self-employed workers, rents and undistributed profits are more relevant. In the group where pensions is the main source of income, capital income increases steadily throughout the income distribution, especially for actual and imputed rents. Finally, when we look at people whose main source is capital income, things get much more heterogeneous. First, pensions, employed and self-employed income jointly account for about 50% of their total income. Moreover, undistributed profits are also relevant, especially for those at the top of the income distribution where they account for around 25% of their total income.

Let us focus now on the top of the income distribution where the prevalence of the different categories of income vary substantially. In the top 10%, almost 60% of the people are earning income mainly from employed activities, 16% of the people are self-employed workers, and only 8% prevalently live off the returns of their capital investments. However, as one climbs the ladder of the top income distribution, such shares are completely reversed. At the top 1%, composed of around 500,000 individuals, only 36% of the group earn mainly employed income, while 31% get primarily self-employment income, and people earning mainly capital income increases to almost 18%. Capital income earners become the most represented among the top 0.1%. Indeed, individuals earning prevalently capital income represent around 60% of the top 0.1%, while employees are just 11% and self-employed workers 28%.

After having analyzed in detail income composition, we can now move on towards our final objective of estimating overall tax incidence along the income distribution.

4.2 Actual tax rates over income percentiles

As explained in previous sections, our income series are built by redistributing to each individual all income and taxes that are present in national accounts. Therefore, by comparing the amount of income received with the amount of taxes paid, we are able to estimate the actual tax rate for each individual and the overall progressivity of the Italian tax system across income percentiles. More specifically, we first sum the income and taxes for each percentile of the distribution of pre-tax national income plus social security contributions. We then calculate the average tax rate at the percentile level by dividing total taxes paid by total income received.

We find that the tax rate is only *slightly progressive* up to the 95th percentile: the average rate increases from about 40% for individuals with lowest incomes (below €15,000 per year) to approximately 50% at around the 90th percentile of the income distribution (see

Figure 8: Income composition by prevalent income, 2015.

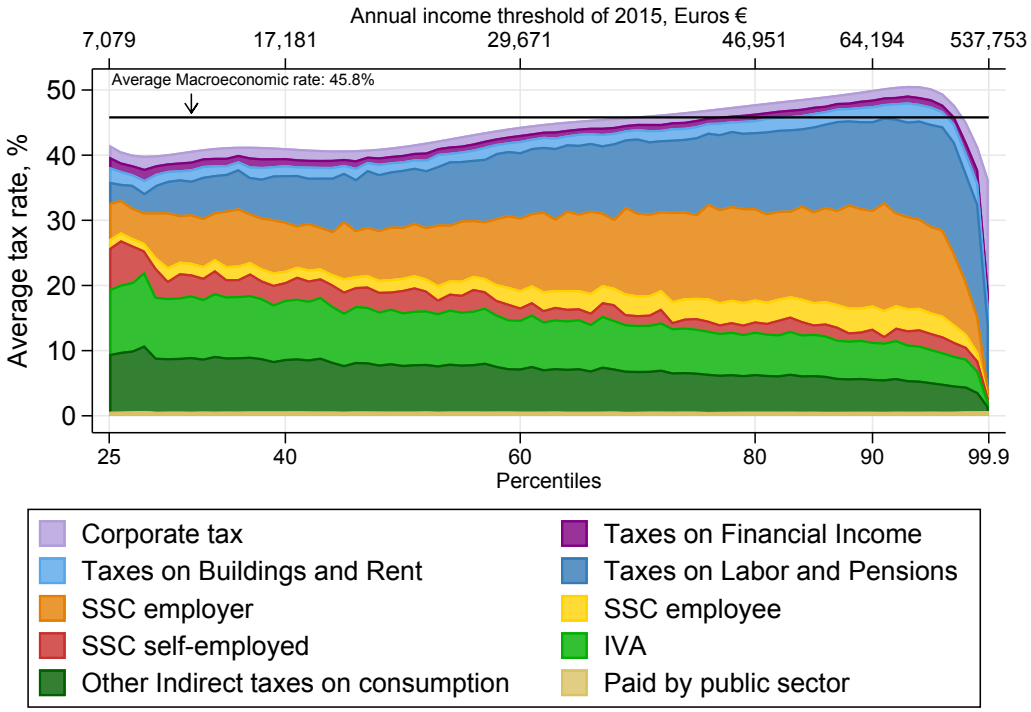


Figure 9). The low degree of overall progressivity shown in Figure 9 can be explained by the combination of the following factors. First, effective average tax rates on labor and pensions are increasing with income throughout the whole distribution. Second, although SSCs are theoretically proportional with respect to labor income, the increasing role of wages and self-employed income (instead of pensions) for the middle 40% of the distribution (see Figure 7) turns out to progressively impact on the overall tax incidence up to the 90th percentile. Finally, although, theoretically, consumption taxes are designed in order to avoid regressivity, this is not the case empirically, as they drag the whole system towards lower progressivity. Coherently, the regressivity of the consumption tax is confirmed also in studies that take into account consumption sub-categories in a finer way (see e.g. Gastaldi et al., 2017).

The Italian tax system turns *regressive* for those earning more than €78,000, corresponding to tax payers in the top 5% of the income distribution. This income group is composed by individuals deriving up to 45% of their income from ownership of financial and business assets. As such, they enjoy favorable flat-tax rates and are not subject to compulsory social security contributions. The result is that the highest income group enjoys the lowest estimated tax rates, which appear to be around 37% (see Figure 9).

In the discussion above we have intentionally left out the very bottom of the income

Figure 9: Tax rate by income percentiles, 2015.



Notes: The reported macro-economic tax rate is equal to about 46% of the SSCs-adjusted national income, where SSCs are included in both numerator and denominator. This tax-rate is lower than the usual rate reported from official international institutions (see e.g. OECD, World Bank, Eurostat), where the denominator is the GDP, rather then the national income, and social security contributions are included only in the numerator as a source of taxation.

distribution, in a cautionary spirit. Estimations of tax rates for the bottom 25% are indeed characterized by high uncertainty levels due to the majority of individuals earning very low income levels, i.e. less than €6,000. Nevertheless, we find that they are subject to an average tax rate of about 52% (see Figure A.6 in Appendix A.10), which is higher than the average tax rate paid by the majority of the population and, particularly by the richest individuals. This is due to the fact that even if a smaller part of their income is actually subject to direct taxes, they still have to allocate a higher fraction of their income to pay indirect taxes, which considerably increase the overall tax rate for this group.

4.3 Actual tax rates by types of income

To obtain a more granular assessment of the overall tax rate paid by each individual, we divide the population of interest into four different groups according to their primary source of income: (i) income and salaries from dependent work, (ii) income from self-employment, (iii) pensions and (iv) capital income. We find that the average tax rate

strongly depends on the main source of earned income, shedding light on the actual tax rates paid by individuals according to the relative position in the total income distribution (cf. Figure 9). More precisely, the average tax rate for each type of income is substantially flat with a small increase at the top, around the 90th percentile, that nevertheless becomes regressive for the top 5% (see Figure 10).

We will first describe the differences in levels and trends of the tax rates across the different types of income earners and, then, we will proceed by explaining their determinants.

First, dependent workers, whose income is primarily derived from wages and salaries, are those who experience the highest tax rates throughout the whole income distribution (cf. Figure 10). Furthermore, while this category is subject to a very limited progressivity in the income range between €17,000 and €29,500, the tax rate remains substantially flat till the 90th percentile, with a tax rate that is just below 55%. However, also for employees, taxation becomes regressive at the very top.

A similar picture characterizes self-employed (see Figure 10). Their tax rate is slightly lower than that of employees, but it is regressive at the bottom half of the distribution, due to higher effective tax rates on consumption and mandatory minimum non-proportional SSCs.[33] It becomes progressive only for the 90-95th percentiles. However, the tax rate is again decreasing for the top 5% with the top 0.1% being subject to a final tax rate that is lower than the one paid by the poorest individuals in this category.

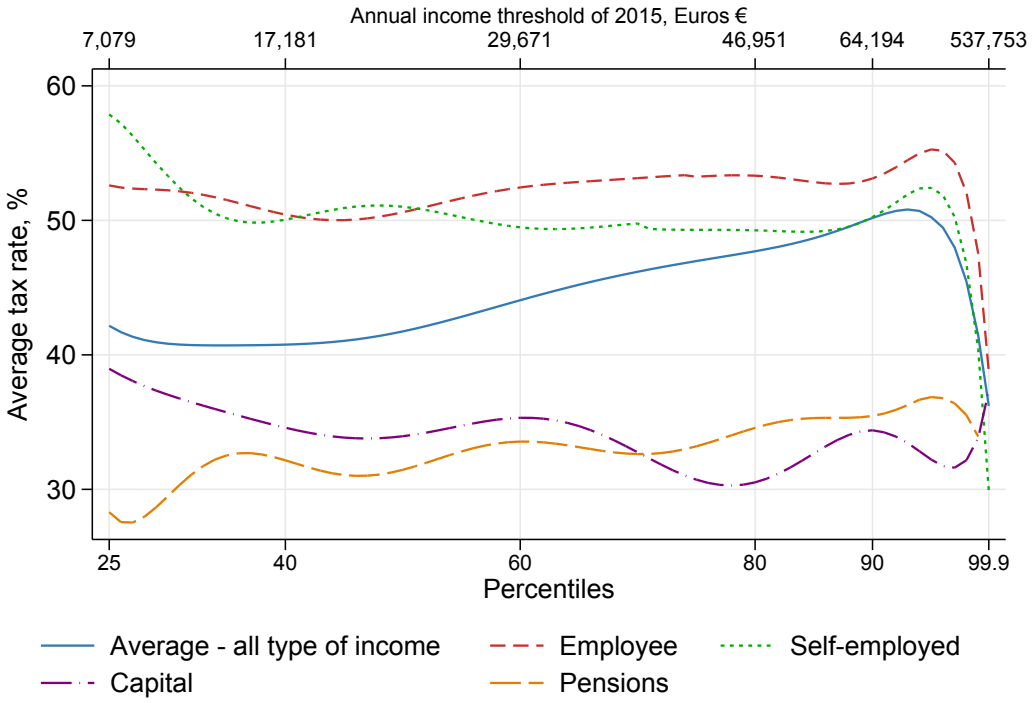
Capital income earners are subject to a tax rate that is regressive at the bottom and flat for the rest of the distribution (see Figure 10), as only a limited portion of these types of income is taxed progressively via the personal income tax. This group is characterized by low tax rates with respect to other ones. This is true also for pensioners,[34] who are nevertheless taxed progressively (see Figure 10). Tax rates referring to this earner type, ranging from around 30% to 40%, are, thus, increasing with income and turn out to be more progressive than for other categories of individuals. Nonetheless, also for pensioners, we find a regressive tax system for the top 5%, the portion of the distribution where income from financial and real assets becomes more relevant, as described in the previous section.

We will now turn to the determinants that shape tax incidence for each income group. To do so, in Figure 11, we show the composition of taxes paid by each category. We find that social security contributions impact the most on employees and self-employed individuals. Moreover, for both categories, effective social security contributions rates appear to be slightly regressive, as the incidence of the contributions falls with higher income. The latter result is due to the increasing relevance of the sum of capital incomes and undistributed

[33]The minimum contribution is set for artisan and traders with income below €15,500 See Circolare INPS n2026.

[34]This is partly due to the fact that no social security contributions are associated with these two types of income.

Figure 10: Tax rate by different types of primary income sources, 2015.

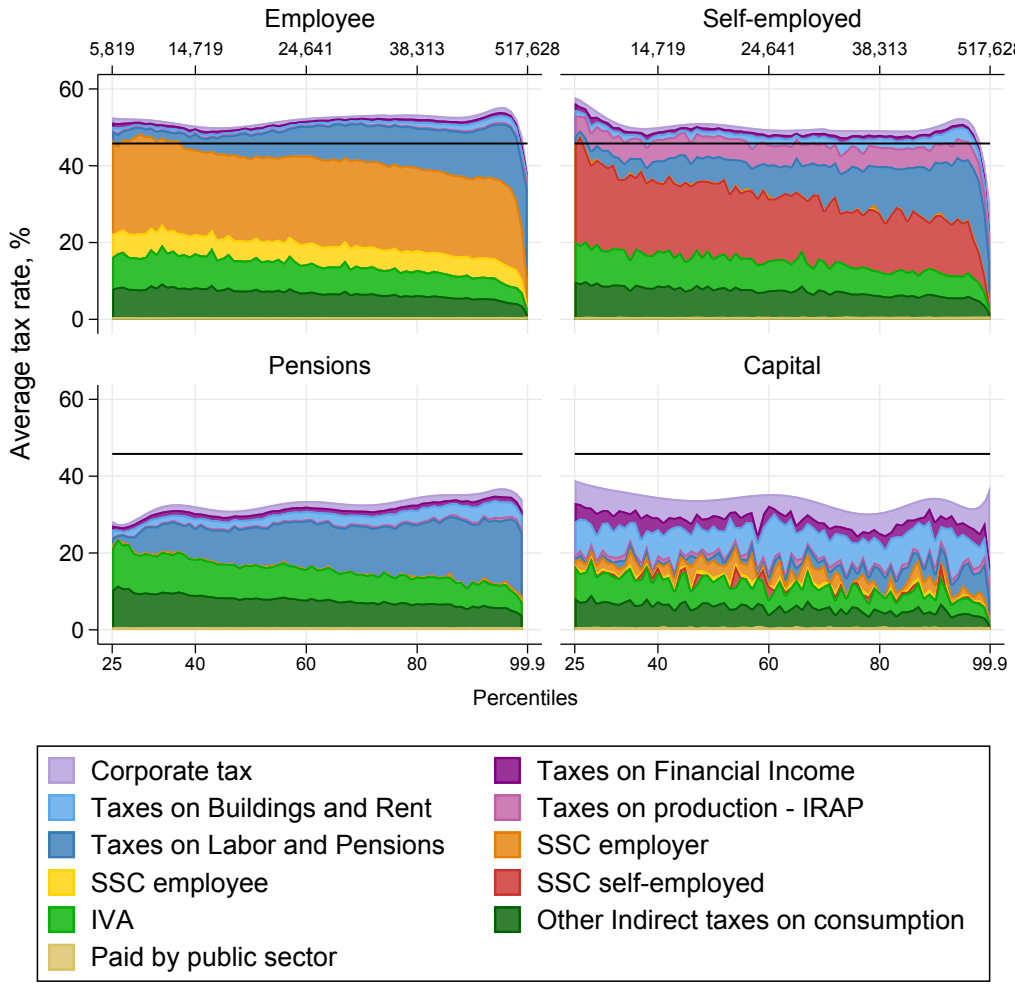


profits at the top of the respective distributions. Since the SSCs are proportional only to labor income, the increase in the relative importance of other sources of income, towards the top of the income distribution, determines the empirical regressivity of SSCs.[35] In this framework, the progressivity of taxes on labor income and pensions only partly compensate for the regressivity of social security contributions and of indirect taxes on consumption, leading to an overall flat-tax for these types of income. The IRAP, a particular tax on productive activities which is paid by companies and self-employed, impacts considerably on the tax rates of the latter by increasing their total tax rates and driving them closer to those of the employees. Finally, for both employee and self-employed workers, the drop of effective tax-rates at the top of the income distribution is explained by the higher incidence of capital income, taxed at a low flat tax rate, by the reduction in SSCs, due to contribution ceilings, jointly with the decline of the incidence of consumption taxes.

Individuals mainly earning capital income are also subject to an overall slightly regressive tax rate (see Figure 11). Only a fraction of this category's income is actually taxed progressively, while the rest of their income is instead subject to a flat-tax rate of 12% or 26% depending on the asset type. As individuals in this income group earn also other

[35] From a policy perspective, one could argue that social security contributions should be compulsory based on the level of income rather than the type of income earned.

Figure 11: Tax rate composition by different types of primary income sources, 2015.



types of income, in addition to capital income, social security also marginally contribute to the overall rate. Furthermore, the progressive personal income tax (taxes on labor income and pensions) is so low that it does not compensate for the other flat and regressive taxes (e.g. VAT), implying an overall slightly decreasing tax rate.

Finally, pensioners represent the only category that does pay an overall progressive tax (see Figure 11). Indeed, as pensioners are not subject to social security contributions,[36] the most progressive component of personal income tax (taxes on labor income and pensions) is enough to compensate for the regressivity of the indirect taxes on consumption.

[36]Recall that, as social security contributions are proportional with respect to labor income, and as top income earners are characterized by an income composition in which capital income is relatively more relevant with the respect to the rest of the distribution, effective SSC rates appear to be empirically regressive over the distributions of income, of employee income and self-employed income.

4.4 Wealth distribution and tax regressivity

What is the degree of progressivity of the tax system if we order individuals based on their net wealth instead of their income? Figure 12 shows that when individuals are compared along the net wealth distribution, the Italian tax system appears to be regressive throughout the whole distribution.

The tax decomposition shows that all tax components are either flat or regressive. This is not surprising: as capital incomes are proportional to wealth, the larger is wealth, the higher is the flow of capital incomes taxed in a proportional way. In turn, this leads to the *overall regressivity* of the system when net wealth distribution is considered. Notice that the estimates of level of regressivity of the system is conservative, as we imputed homogeneous rates of return to individuals (following Piketty et al., 2018) instead of increasing returns to wealth in line with the recent evidence (i.e., Fagereng et al., 2020; Bach et al., 2020; Iacono and Palagi, 2021). We also excluded taxes in the category of "Current transfers", which include inheritance and gift taxes, as they cannot be allocated in a straightforward way. As Italy has one of the lowest inheritance and gift taxes among OECD countries, their inclusion would not substantially change the results.

Overall, the evidence of a regressive tax system when wealth distribution is considered provides further support for the introduction of a top wealth tax, in line with work by Saez and Zucman (2019).

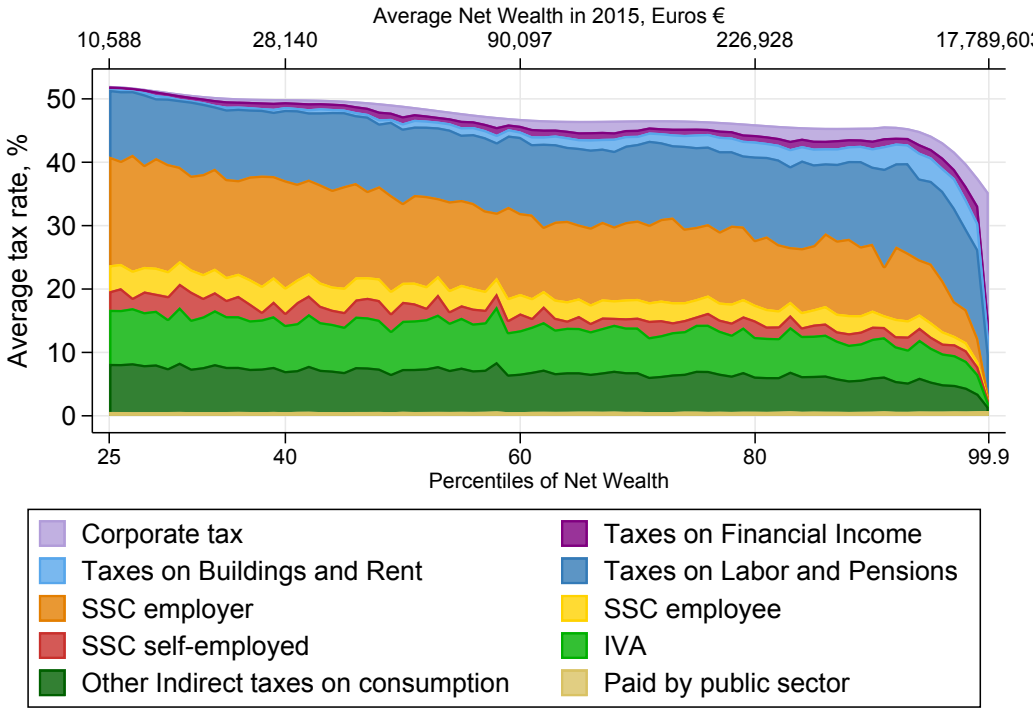
5 The impact on tax progressivity of alternative personal tax regimes

The literature on personal tax regimes (Sørensen, 1994; Saez and Stantcheva, 2018) usually distinguishes between two main approaches, *comprehensive* taxation versus *dual income* taxation. Under a comprehensive personal income tax, all types of income accruing to the same individual are generally subject to progressive tax rates. On the contrary, under a dual taxation regime, labor income is taxed at progressive rates, while all capital incomes are taxed at the same flat rate. While a comprehensive base combined with a progressive schedule tends to be more equitable, dual tax systems are justified on efficiency grounds (see the seminal contribution of Atkinson and Stiglitz, 1976).

Clearly, the comparison between the distributional impact of these two regimes has to be made referring to a given structure of the personal income tax schedule. In Italy, the natural reference is the structure of the personal income tax, which is a piecewise-linear progressive tax, based on 5 brackets, with legal marginal rates increasing from 23% to 43% and decreasing-in-income tax allowances.[37] This complex array of features is well

[37]Note that recent personal income tax reforms of 2022 reduced the number of tax brackets to a total of 4, by merging together the last two brackets.

Figure 12: Progressivity by percentiles of Net Wealth, 2015.



summarized by the average tax rate on labor income that we observed before.

In order to investigate what are the effects of different systems on redistribution and inequality, we simulate alternative taxation regimes. In particular, we are interested in exploring the differential impact on tax progressivity of the comprehensive and dual regimes for the actual structure of PIT (Personal Income Tax).[38] For this purpose, we first limit the analysis to capital and labor income taxation,[39] and then we include also consumption taxes and social security contributions.

We will consider a progressive and a dual scenario. In progressive scenario A, we assume that all capital income components are included in the personal income tax base, meaning that the sum of capital and labor incomes is taxed at the same progressive rate as labor income[40] in the actual system. This is equivalent to including capital income in the progressive base (the one subject to PIT) and it represents the most progressive scenario.

[38] In Italy a reform aiming at rendering the tax system increasingly *dual* is currently under debate. See Comunicato stampa del Consiglio dei Ministri n.39, 5 Ottobre 2021.

[39] In this case our definition of total individual income is $Y = Y^L + Y^K$, where Y^L is the sum of pensions, employee income net of SSC paid by workers and employers, mixed-income net of SSCs paid by self-employers, income withdrawn by members of quasi-corporations, other profits distributed by companies as a form of compensations, and Y^K is the sum of dividends, interests, rents and undistributed profits. The list of taxes considered is the totality of direct and indirect excluding VAT and other taxes on consumption.

[40] Labor income tax rates range from 0% in the first percentile to 36% in the top percentile (and slightly above when total income exceeds the highest labor income bracket in the baseline).

Table 8: Simulation results [a]

	Real R-S	Simulated R-S	R-S difference	Extra income (mill. €)
Scenario A (progressive)	2.80%	3.21%	0.41%	5,294.44
Scenario B (dual)	2.80%	2.81%	0.01%	918.84
Scenario A.2 (prog. with SSC)	1.82%	2.54%	0.72%	
Scenario C (prog. with wealth tax)	1.82%	*4.24%*	*2.42%*	*27,510.80*

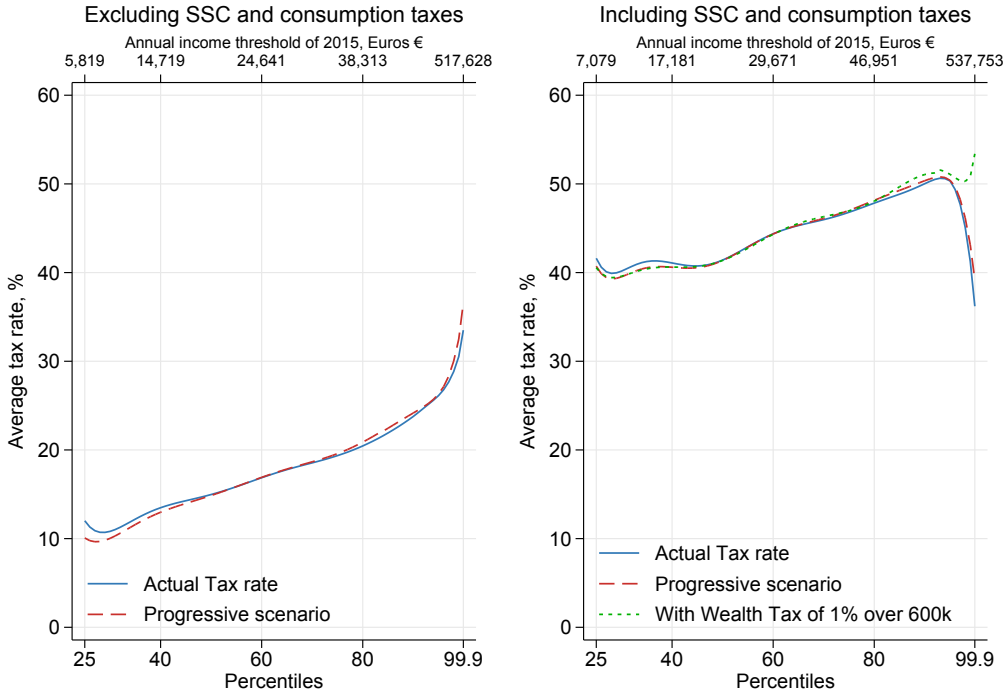
[a] *Notes:* Real and simulated Reynolds-Smolensky indicator (R-S) for different scenarios; difference of the simulated R-S index with respect to the real one; extra income generated in the simulated scenario with respect to real income generated; extra income in millions of euros.

In the dual-income scenario B, we assume a regime wherein labor income is taxed progressively while capital income is taxed at a homogeneous low rate. Note that the current Italian personal income tax might be classified as a quasi-dual one: labor income is taxed progressively,[41] while capital income is taxed proportionally with different tax rates (ranging from 0% to 26%) applied to various capital income categories. Moreover, the tax rates on capital are generally lower than the minimum marginal PIT tax rate on labor income, which is equal to 23%. Therefore, in order to simulate a pure dual income taxation scenario, while keeping labor income taxed at progressive rates, we tax all forms of capital income at the common rate of 23%. We choose this rate because, in pure dual tax, capital income is taxed at the lowest marginal rate applicable to labor in order to limit incentives to transform labor income into capital income. The two scenarios are compared against the benchmark of the real personal income taxation regime, by measuring the Reynolds-Smolensky (RS) index (Reynolds and Smolensky, 1977), which just equals the difference between the Gini coefficient on pre-tax income and the Gini coefficient on post-tax income.

The results that emerge from the simulation exercise are presented in Table 8. First, as expected, the progressivity of the personal income tax is larger with a comprehensive regime than with a pure dual one. However, the difference is quite small in absolute terms, amounting to 0.4 percentage points, albeit more relevant in relative terms, given that 12.5% of the RS index is lost when switching from a comprehensive to a pure dual personal income tax. This difference is due to the fact that, in the progressive scenario, tax rates are lowered at the bottom, while they are increased by few percentage points at the top (see Figure 13, left panel). Second, when social security contributions and indirect taxes are factored in (see Table 8 Scenarios A.2 and B), the impact on progressivity of a switch

[41] More precisely, labor income is taxed progressively with the exception of self-employment income. In fact, the latter type of income may be subject to a flat rate of 15% (the so-called "forfettario"), when below the given threshold of 65 thousand euros. Nevertheless, this is not applicable to the year we are focusing on, 2015, as the flat rate was not yet introduced, so it does not represent a limitation in our analysis.

Figure 13: Actual and simulated tax rates, excluding SSC and consumption taxes (left panel) and including SSC and consumption taxes (right panel)



from a comprehensive to a pure dual tax regime is almost doubled in both absolute (0.7 percentage points) and relative terms (27,6% of the RS index is lost).[42] Third, the present personal income tax is, under a distributional viewpoint, virtually equivalent to a pure dual income tax, and this result is robust to alternative specifications of the flat tax rates on capital incomes.[43]

To sum up, simulation results show that a personal tax reform can have a relevant *relative* impact on progressivity only if it is a radical one, which switches from a dual taxation system to a comprehensive one, entailing a relative increase in progressivity by taxing all income sources progressively. To put it alternatively, mild reforms, such as those increasing some capital income rates while preserving the dual nature of the personal income tax, do not have any impact on progressivity. However, even the introduction of a personal comprehensive income tax base would not considerably reduce the regressivity

[42]Indeed, Scenario B with the inclusion of SSCs and consumption taxes would imply a difference in Reynolds-Smolensky indicators of 0.02% with respect to the actual system.

[43]For example, we also simulated a reform proposal which is currently under discussion in Italy. In particular, the tax rate on interests and dividends from private shares are decreased from 26% to 23%. Moreover, we increase tax rates on interests from public bonds from 12% to 18%. For what concerns "cedolare secca", a particular tax on rents, as it is currently taxed for one third at 10% and for two thirds at 21%, with an overall rate of 17-18%, we increase its tax rate to 23%. The resulting RS index is exactly equal to that obtained under Scenario B, which, in turn, is very close to the real one, so we do not report them.

of the Italian tax system at the top of the income distribution when both social security contribution and consumption taxes are factored in (see Figure 13, right panel).

For this reason, in order to achieve at least a proportional tax system for top incomes, we simulate an additional scenario entailing a comprehensive personal income tax and a *wealth tax* levied only on the top 5% of the wealth distribution (See Table 8 Scenario C). Specifically, we refer to a 1% tax on personal net worth exceeding 600,000 euros. In terms of income distribution, simulation results show that the wealth tax would hit the top 10%. However, the incidence of the wealth tax is significant only for the richest 5% of the income distribution, whose main income source is capital income. Simulation results show that a comprehensive system supplemented by the wealth tax would remove the regressivity from the Italian tax system allowing for some mild progressivity throughout the whole income distribution as shown in Figure 13 (right panel).[44]

6 Conclusions

In this work, we have reconstructed the Italian income distribution following the distributional national accounts approach (DINA, cf. Alvaredo et al., 2016; Piketty et al., 2018) for the period 2004-2015 combining different data sources. With this approach, we were able to correct for remarkable misreporting of capital income in surveys, attributing the missing component to individuals following wealth distributions provided by Acciari et al. (2020). Morevoer, we combined our main survey of reference (IT-SILC, Istat, a) with more accurate information on consumption (HBS, Istat, b), in order to include in the analysis only consumption components that are effectively subject to the value-added tax. We also accounted for the role of tax evasion employing the Non-Observed Economy estimates provided by Istat. Finally, we methodologically contributed to the literature by building DINA that are consistent with regional accounts, thus studying more precisely the rich evidence at a sub-national level.

Our study shows that previous works on income distribution in Italy (Alvaredo and Pisano, 2010; Blanchet et al., 2019) have underestimated the concentration of income at the top 10%, 1% and 0.1% by 2 to 3 percentage points. Furthermore, inequality trends appear less flat than previously thought: in the aftermath of the 2008 financial crisis, the richest top 10%, top 1% and top 0.1% have increased their share of national income and the very top income earners are still on increasing trends. We also find that the fall of real income per adult affected all income groups of the population, but it hit particularly hard

[44]However, note that numerical results for the wealth tax reported in Table 8 should be taken with some caution, and for this reason are reported in italic, as the introduction of a wealth tax should probably be coupled with a major revision of some capital income taxes to avoid or limit double taxation and also because some behavioural effects should be considered.

the youngest individuals, between 18 and 35 years old, belonging to the bottom 50% of the factor income distribution, who lost about 44% of their income in real terms between 2004 and 2015. Looking at the gender composition, we find that a gender income gap is present throughout the whole income distribution, and it is particularly relevant for the very top of income earners, wherein women represent less than 10% of the top 0.1% and earn, on average, half of the income earned by men. Finally, we find higher income levels in the North throughout the distribution, in addition to higher top concentration in the Northern area.

Combining our fresh estimates of income distribution with the amount of direct and indirect taxes paid by individuals, we estimated the progressivity of the Italian tax system (similarly to Bozio et al., 2018; Piketty et al., 2018; Saez and Zucman, 2019, for France and US respectively), both at the percentile level and across primary types of income. To the best of our knowledge, this is the first time such an analysis is carried out for Italy. We show that the Italian tax system is very mildly progressive for most part of the distribution and it turns *regressive* for the top 5%, with a tax rate falling from a peak of 50% to 35%. Such a result is driven by a progressive personal income tax that is insufficiently compensating for the empirically-found regressivity of indirect taxes on consumption and social security contributions. Indeed, by dividing the population according to each individual's main source of income, we show that pensioners are the only category for which a significant tax progressivity is present, where individuals mostly earning capital income are subject to a slightly regressive overall income tax, as capital income is taxed with a flat rate and exempted from compulsory social security contributions. Strikingly, when we rank individuals on wealth, the tax system is regressive throughout the wealth distribution.

Finally, we performed some simulation exercises to study how different taxation regime impact on the progressivity of the Italian tax system. We find that a dual-income taxation reform is ineffective in increasing redistribution, while a comprehensive regime is able to significantly affect only the relative progressivity. The introduction of a wealth tax on the top 5% is able to remove any regressivity from the Italian tax system, allowing to achieve a mild degree of progressivity throughout the whole income percentiles. Such new fresh results should be taken into account in the ongoing debate about the reform of the Italian tax system.

Our work can be extended along several directions. First, by taking into account the various tax reforms introduced in the last decades, we aim at studying how the progressivity of the Italian tax system has varied through time. Second, more advanced simulation exercises could be performed taking into account possible behavioral responses due to tax changes. Finally, we aim at including inheritance taxes in the overall assessment of the progressivity of the tax system.

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Appendix A Methodological details

A.1 Rescaling the sampling weights

To correct the IT-SILC survey for non-sampling errors, we use the "BFMcorrection" algorithm created by Blanchet et al. (2018). This method requires the identification of a taxable income definition that is as close as possible to the one in tax returns. By comparing the data from survey and tax returns, the algorithm proceeds with the recalibration of the sample weights of the survey by identifying the merging point between the distribution of income in the survey and the distribution of income in tax returns elaborated through the use of the Generalized Pareto interpolation method (Blanchet et al., 2017).

A similar procedure was followed by Blanchet et al. (2019) (henceforth BCG) in their study about European countries. However, in that case, the authors apply a definition of taxable income for Italy that is not entirely homogeneous with tax returns data. See also Appendix A.7 for a comparison between our method and theirs.

More specifically, the authors use the following definition of income: Gross employee cash or near cash income (PY010G) + Company car (PY021G) + Gross cash benefits or losses from self-employment (including royalties) (PY050G) + Pensions received from individual private plans (other than those covered under ESSPROS) (PY080G) + Unemployment benefits (PY090G) + Old-age benefits (PY100G) + Survivor benefits (PY110G) + Sickness benefits (PY120G) + Disability benefits (PY130G) + Education-related allowances (PY140G) + Income from rental of a property or land (HY040G) + Interests, dividends, profit from capital investments in unincorporated business (HY090G) + Income received by people aged under 16 (HY110G).

From this income, they subtract the social contributions paid by employees and self-employed workers, estimated using OECD macro-aggregates. However, there are some inaccuracies in this definition. Not all the income they use is actually part of the total income reported on tax returns. Regarding social transfers, only transfers due to unemployment and old-age pensions are subject to IRPEF, the Italian personal income tax. In contrast, transfers due to illness, disability etc., do not contribute to the formation of the total income for IRPEF purposes and, therefore, are not reported in the income tax return.

In this study, therefore, we use a different definition of taxable income that is closer to the definition of the Italian tax system. We start from the income determined by BCG, but we also subtract Disability benefits (PY130G) and Education-related allowances (PY140G), as these do not represent taxable income. Regarding income received by people aged under 16 (HY110G), this counts for a small part. Still, in general, the incomes of the under-aged must be included in the parents' tax return unless the under-aged are subject to legal usufruct. In that case, the under-aged's income must be declared in the under-aged's name. This eventuality is particularly rare, so for simplicity, we include the income received by people under 16 as income of the household's head.[45] The so-called Fringe Benefits contribute to the formation of the employee's total income and are subject to IRPEF taxation if they exceed 258 euros (Article 51 paragraph 3 of the TIUR).

[45]Note however that throughout our analysis we only focus on the adult population aged 18 years old or more.

Therefore, we include them if they exceed this threshold as opposed to BCG, which only includes the variable company car (PY021G).

As for social contributions, in BCG they are approximated through OECD aggregates and both the contributions of self-employed workers and employees are excluded. We instead use the values of the variables already present in the IT-SILC ("csa" and "csdi"), including, however, contributions from self-employed workers in the definition of total income. Although they are deducted for the calculation of the taxable income, this type of contributions are still reported in tax returns and have to be part of the total income used for the correction of the sample weights. Regarding dividends and other capital income, only part of this income must be reported in tax returns; therefore, we follow Alvaredo and Pisano (2010) by correcting IRPEF tax returns revaluing the capital income in tax returns by 2.5.

Another important update with respect to previous studies is that we apply this correction at the regional level. We indeed use the regional tax returns from 2004 to 2015 and rescale the sample weights individually for each one of the 21 regions present in the IT-SILC. Furthermore, unlike BCG, we do not correct the survey through replacement income above the merging point since the statistical office already considers this type of error by making an individual matching with administrative data. Finally, we constrain the correction of the weights to keep the gender and age covariates constant for each region.

In Table A.1 we show for each variable the average amount, maximum values, standard deviation and totals in the survey. Minimum values exists only for PY050G Gross cash benefits or losses from self-employment which can be negative due to losses. In 2015 the minimum value of PY050G was €-40,000.

Table A.1: Descriptive statistics on SILC variables in 2015

Variable code	*Variable name*	*Mean*	*Max*	*Standard Deviation*	*Total, Millions*
py010g	Gross employee cash or near cash income	7,901	857,552	15,777	480,699
csdi	SSC employee	708	9,502	1,328	43,073
csda	SSC employer	2,676	94,529	5,047	162,799
py021g	Company car	14	8,646	217	856
py020g	Fringe benefits	108	17,822	534	6,595
py050g	Gross cash benefits or losses from self-employment	2,937	390,428	12,481	178,689
csa	SSC self-employed	489	27,754	2,088	29,771
py080g	Pensions received from individual private plans	2	9,882	123	132
py090g	Unemployment benefits	417	161,161	2,911	25,342
py100g	Old-age benefits	3,582	280,708	9,312	217,925
py110g	Survivor benefits	736	76,537	3,285	44,793
py130g	Disability benefits	226	90,133	1,849	13,733
py140g	Education-related allowances	26	54,000	712	1,572
hy040g	Income from rental of a property or land	431	181,285	3,154	26,238
hy090g	Interests, dividends, profit from capital investments	167	21,927	811	10,172
hy110g	Income received by people aged under 16	2	10,207	90	110

A.2 Data Fusion

The IT-SILC micro-data released by the Italian statistcal office (Istat) are part of the European EU-SILC survey. They include the target variables of the EU-SILC survey, but also the detail of social contributions paid by employees and self-employed workers. It is an annual survey and it is representative both at the national and regional level. This allows us to have an additional level of detail to distribute national income. Nevertheless, although very rich in terms of income variables, the survey does not have information about the consumption of households or about financial and real estate properties, which are fundamental for estimating the distribution of taxes.

The Survey on Household Income and Wealth (SHIW) is carried out by the Bank of Italy every two years and is representative of the population residing in the macro areas of the country. Although SHIW has less detailed information on household incomes, it contains rich information on financial, real estate assets and consumption. Therefore, we build an augmented IT-SILC survey, with data on wealth and consumption added using the joint distributions between income and wealth and between income and consumption that emerge from the SHIW. To merge the two surveys, we use a propensity score matching method with Mahalanobis distance between income, age, macro-region and gender similar to what was done in Albarea et al. (2015), with the difference that, in our case, we proceed with matching on a personal rather than a family level. To proceed with the propensity score matching, we have aggregated the incomes in SILC and SHIW following a comparable definition of income given by the sum of income from employment, self-employed, pensions, and other transfers. In SHIW we have combined: Compensation of Employee (yl) + Pensions and other transfers (yt) + Net income from self-employment and entrepreneurial income without profits and dividends (ym-ym3). In SILC, on the other hand, after having divided family incomes equally among the adult members of the family, we have combined: Employee cash or near cash income (py010n) + Fringe benefit (py020n) + Cash benefits or losses from self-employment (py050n) + Pension from individual private plans (py080n) + Unemployment benefits (py090n) + Old-age benefits (py100n) + Survivor benefits (py110n) + Sickness benefits (py120n) + Disability benefits (py130n) + Education-related Allowances (py140n) + Family / children-related allowances (hy050n split) + Social exclusion not elsewhere classified (hy060n split) + Housing allowances (hy070n split). At this point, we proceed by joining the two surveys using propensity score matching with Mahalanobis distance to obtain a single database with SILC data but with the addition of richer information on real estate, property and consumption.

However, both consumption and wealth present in SHIW are recorded at the family level, so we divide the wealth between family members following the methodology in D'Alessio (2018), while we allocate consumption to family members in proportion to personal income. In addition, since the SHIW takes place every two years, we add the missing year in SHIW using the same data from the previous year. In this way, we obtain an annual SHIW questionnaire to be matched with the SILC questionnaire.

Acciari et al. (2020) (hereinafter AAM) observed that the distribution of wealth deriving from SHIW data is significantly less concentrated than reported in their study, which uses data from administrative sources to distribute the national wealth at the individual level. Therefore, we opted to use the distribution of wealth estimated by AAM as our benchmark series. To integrate this

distribution in our income data, we use the joint distribution between income and wealth obtained matching IT-SILC and SHIW. First of all, we rank individuals by total net wealth. Then, we associate to each individual the share of wealth obtained by AAM for that specific rank-position (fractile). By multiplying this share by the total national wealth derived from AAM, we obtain the final individual amount.

This method has the advantage of keeping the same distribution of wealth found by AAM at the fractile level, while allowing us to keep the same relationship between income and wealth derived from the SHIW.

As a further detail on the composition of wealth, we use the components in SHIW to divide the wealth determined by AAM into seven different categories. For each individual, we calculate the share of wealth held in real estate, business, government bonds, equity shares and other securities, valuables, deposits and savings, liabilities in SHIW. Next, we partition the net wealth of the AAM data by multiplying the share of the relative type of wealth with net wealth.

We use the same method of ranking households by the level of expenditure (one thousand fractiles) for consumption. Then, we attribute the consumption derived from the Household and Budget Survey (HBS) of that specific rank (fractiles) to each household. Finally, we share the family consumption among the members in proportion to the individual post-tax disposable income. Also, in this case, we take advantage of the joint distribution derived from merging SHIW and IT-SILC. At the same time, the use of HBS data allows us to be more consistent with the national statistics derived from Istat on consumption. In addition, the HBS is also extremely precise in terms of the type of expenditures and it is conducted with a high degree of rigour with repeated interviews at pre-established intervals, making it a highly reliable source.

A.3 Distribution of taxes

A.3.1 Direct Taxes

Direct taxes in the national accounts (NA) are grouped under item D5 and are divided according to the payments made by the various institutional sectors. We can regroup the sectors into three main macro aggregates:

1. The household sector made up of producer and consumer households but also of non-profit institutions serving households;
2. The corporate sector, which includes both financial and non-financial companies;
3. The Public Administration sector (in some cases together with the rest of the world sector).

The Istat data for Public Administrations allow us to divide direct taxes into 34 sub-categories received by the public administration. Out of these 34 sub-categories, some are paid by households, others by the corporate sector, and some are paid by all institutional sectors. The Istat, however, does not publish the details of the payments made by the various institutional sectors for each sub-category. Therefore, we intend to identify for each of the 34 sub-categories to which institutional sector it refers. Once this division is achieved, we distribute the value of each tax to individuals.

Specifically, we have identified the following 23 categories as direct taxes paid by households, and we distribute them to each individual as follows:

- D51A C01 C W0 taxes on the income of individuals or families excluding income from capital -> distributed in proportion to the personal income tax present in SILC;
- D51A C02 C W0 additional regional income tax -> distributed in proportion to the personal income tax present in SILC;
- D51A C03 C W0 additional municipal income tax -> distributed in proportion to the personal income tax present in SILC;
- D51A C04 C W0 withholdings on interest and income from capital - households -> distributed in proportion to financial income;
- D51A C05 C W0 local income tax (ilor) - households -> distributed in proportion to financial income;
- D51A C06 C W0 tax on income from mobile wealth -> distributed in proportion to financial income;
- D51A C07 C W0 complementary and additional taxes -> distributed in proportion to financial income;
- D51A C08 C W0 gescal contributions paid by employees -> distributed in proportion to the income of employees;
- D51A C09 C W0 tax on the increase in the value of real estate (invim) - households -> distributed in proportion to real estate properties;
- D51A C10 C W0 withholdings on profits distributed by companies - households -> distributed in proportion to financial income;
- D51A C11 C W0 municipal tax on industry and the arts and professions (iciap) -> distributed in proportion to income from self-employment;
- D51A C12 C W0 taxes on life insurance and supplementary pension -> distributed in proportion to financial income;
- D51A C13 C W0 tax on mathematical insurance reserves -> distributed in proportion to financial income;
- D51A C14 C W0 substitute tax on "cedolare secca" real estate rental income -> distributed using real estate properties and tax income tables. By identifying the corresponding income classes and regions in the SILC data, we divide the income from cedolare-secca in that class in proportion to the real estate wealth present in that class and region. Having thus distributed the income from cedolare-secca, we can calculate the related tax. With this division, we remain consistent with results from the Ministry of Economy and Finance (MEF) regarding the regional distribution of the cedolare-secca (Di Caro et al., 2018).
- D51C T C W0 taxes on profits -> distributed in proportion to financial income;

- D51D C01 C W0 tax, skill games and prediction competitions (direct) -> distributed in proportion to the pre-tax national income;
- D51E C01 C W0 additional to the state and local income taxes (8%) -> distributed in proportion to the pre-tax national income;
- D59A C01 C W0 municipal real estate tax (ici) - building areas -> distributed in proportion to real estate properties;
- D59A C02 C W0 municipal real estate tax (building areas) -> distributed in proportion to real estate properties;
- D59A C03 C W0 imp. boats and aircraft -> distributed in proportion to Valuables assets;
- D59A C04 C W0 television subscription fee for private household use -> distributed in proportion to the pre-tax national income;
- D59D C01 C W0 tax on driving licenses -> distributed in proportion to the pre-tax national income;
- D59D C02 C W0 car taxes paid by households -> distributed in proportion to the pre-tax national income.

Moreover, we identify eight categories as direct taxes typically paid by businesses, and we distribute them proportionally to business assets, equities and shares. The variables are the following:

- D51B C01 C W0 withholdings on interest and income from capital - companies;
- D51B C02 C W0 taxes on corporate income or profits, excluding equity ones;
- D51B C03 C W0 local income tax (ilor) - companies;
- D51B C04 C W0 tax on the increase in the value of properties (invim) - companies;
- D51B C05 C W0 corporate and bond tax;
- D51B C06 C W0 withholdings on profits distributed by companies - firms;
- D51B C07 C W0 tax on corporate equity;
- D51B C08 C W0 new substitute tax revaluation of company assets.

The last direct tax D59F T C W0 is considered as a tax paid by other institutional sectors. It is essential to underline that this division of direct taxes, between the institutional sectors Households, Businesses and other sectors, does not perfectly reflect the division present in the national accounts. All institutional sectors pay some of the items reported, and it is not always possible to make a precise distinction between the amount paid by households and the one paid by firms. However, the division carried out allows a good approximation of the amount paid by each institutional sector. In Table A.2 we compare the aggregate of direct taxes D5 D, as published in the national accounts, and the sum of the 34 sub-categories of direct taxes divided with our identification between families, companies and other sectors. As can be seen, the share paid by households and businesses with

our subdivision is always very close to the percentage actually reported in the national accounts in the aggregates D5.

Furthermore, by using official macroeconomic data we can compare the amount of taxes reported in national accounts and the corresponding income category in order to derive the macroeconomic tax-rate of several income components. We can then compare the aggregate tax-rate with the microeconomic one derived from our analysis to understand who are the individuals that are subject to higher tax-rates. On a pure macroeconomic note, we find that most of the income collected by the government through direct taxation is levied via the personal income tax (PIT). This is unsurprising since most of the income received by individuals is subject to these type of taxes. In 2015 the PIT was levied on a wide range of income sources, such as employed and self-employed income, pensions, some specific type of rents, and dividends and capital gains received through qualified shares.[46] Resources collected through indirect taxes, which mainly include value-added tax (VAT) and other taxes on consumption, are also particularly high. Jointly with PIT, they sum up to about 87% of total tax collection, meaning that the distribution of these taxes will be key for understanding the overall level of fiscal progressivity.

Taxation of financial income in Italy has varied substantially over the period considered in this analysis. Although these types of income are mainly subject to a flat-tax rate, with few exemptions subject to PIT, the tax-rates have changed frequently over the years. While from 2004 to 2010 all the financial income were subject to a flat tax-rate of 12.5%, in 2011 the flat rate has been increased for several financial instruments to 20%.[47] Moreover, the last legislation reform of 2014 has increased again these rates to 26% for most of the financial income sources, leaving a flat rate of 12.5% only for National Bonds, Pensions Funds and a few other cases.[48] Using the income reported in PIT published by the MEF, we are able to extrapolate dividends reported that are not subject to a flat-rate. Furthermore, using the balance sheet compiled by the Bank of Italy, which contain the overall level of bonds directly held by households, we can proxy the amount of income received by individuals through bonds that are taxed at 12.5%. By doing so, we can disentangle the portions of financial income that are subject to different tax rates, obtaining an overall macroeconomic rate on financial income of about 23.5%. The latter rate is in line with current legislation if one considers that there are still parts of those incomes that are subject to a 12.5% rate. Moreover, the time series of these macroeconomic financial tax rates exhibit the same jumps that one would expect following the changes in fiscal legislation, meaning that our reconciliation between financial income at the macroeconomic level and the fiscal legislation is robust.

Jointly considering taxes levied on financial assets with other direct and indirect taxes paid, the overall national tax rate is about 36% of national income (shown in figure A.3), well above countries like Spain, Germany or US and somewhat closer to France (which has an overall tax rate of 33%).

[46] Qualified shareholdings are those which allow a voting percentage higher than 2% if the financial instruments are listed on regulated markets, or which relate to a shareholding in the capital (assets) higher than 5%. If the financial instrument is not listed on regulated markets, the percentages rise to 20% (voting rights) and 25% (equity) respectively.

[47] Legge 248/2011.

[48] Decreto Legge 66/2014.

Table A.2: Direct taxes in National Accounts

Year	*Type*	*Total Direct Taxes D5*	*Direct taxes paid by Families*	*Direct taxes paid by Firms*	*Direct taxes paid by other sectors*
2004	Our Distrib.	185,289.00	83.06%	16.26%	0.68%
2004	NA original	185,289.00	80.92%	18.13%	0.95%
2005	Our Distrib.	191,001.00	81.84%	17.61%	0.56%
2005	NA original	191,001.00	81.31%	17.73%	0.96%
2006	Our Distrib.	213,472.00	78.70%	20.54%	0.76%
2006	NA original	213,472.00	78.44%	20.81%	0.75%
2007	Our Distrib.	233,507.00	77.66%	21.65%	0.69%
2007	NA original	233,507.00	77.05%	21.81%	1.15%
2008	Our Distrib.	239,880.00	79.39%	19.97%	0.64%
2008	NA original	239,880.00	79.00%	20.14%	0.86%
2009	Our Distrib.	222,527.00	82.31%	16.83%	0.86%
2009	NA original	222,527.00	82.28%	17.13%	0.59%
2010	Our Distrib.	226,675.00	82.95%	16.22%	0.84%
2010	NA original	226,675.00	83.01%	16.52%	0.46%
2011	Our Distrib.	226,939.00	83.13%	15.78%	1.09%
2011	NA original	226,939.00	83.36%	16.21%	0.42%
2012	Our Distrib.	239,794.00	83.05%	15.76%	1.19%
2012	NA original	239,794.00	83.10%	16.25%	0.65%
2013	Our Distrib.	241,066.00	82.45%	16.77%	0.78%
2013	NA original	241,066.00	82.28%	17.07%	0.65%
2014	Our Distrib.	237,175.00	84.30%	14.83%	0.87%
2014	NA original	237,175.00	83.89%	14.98%	1.13%
2015	Our Distrib.	242,579.00	85.30%	13.78%	0.92%
2015	NA original	242,579.00	84.95%	14.07%	0.98%

A.3.2 Indirect Taxes

Indirect taxes, like direct taxes, are grouped into a single category in the national accounts under item D2 D, recorded as a payment paid by the various institutional sectors. Also in this case, the Istat releases a long detail about the revenues of public administrations due to the indirect taxes D2 C reporting 65 different sub-items of indirect taxes.

Many of these taxes are paid by businesses. However, the final price of consumer goods and services are calibrated according to taxes. Therefore, although formally paid by businesses, indirect taxes affect the final consumption of households. The classic example is VAT, the tax incidence of which is perceived by consumers for each purchase, although it is formally the retailers who pay this tax into the state coffers. Therefore, in line with the Distributional National Accounts (DINA) guidelines, we have decided to divide the value of indirect taxes that refer to consumption in proportion to the individual expenditure.

Therefore, we opt to distribute VAT (D211 C01 C W0) and other indirect taxes on consumption in proportion to the final expenditures of individuals, while the following taxes are distributed as follows:

- D214B C06 C W0 mortgage tax -> in proportion to the real estate property;
- D214B C07 C W0 cadastral rights -> we distribute it in proportion to the real estate properties;
- D214C C01 C W0 tax on financial transactions -> we distribute it in proportion to the financial assets equities and shares
- D29A C01 C W0 municipal property tax (ici) - buildings -> we distribute it in proportion to the real estate properties;
- D29A C02 C W0 single municipal tax (imu) -> we distribute it in proportion to the real estate properties;
- D29A C03 C W0 tax on indivisible services (tasi) -> we distribute it in proportion to the real estate properties;
- D29C C01 C W0 gescal contributions paid by employers -> we distribute them in proportion to the income from employment;
- D29H C06 C W0 regional tax on productive activities (irap) -> we distribute it in proportion to self-employed income, income withdrawn by members of quasi-corporations, compensation to the directors and statutory auditors of the joint-stock companies and the profit distributed to the members of the cooperative, income from dividends and undistributed profits;
- D29H T C W0 other taxes on production not classified elsewhere (net of D29H C06 C W0) -> we distribute it in proportion to pre-tax income.

It is important to notice that in our analysis we never include taxes on "D9 Capital transfers". This type of taxes are very low in Italy and they only represent 0.25% of total revenue[49] in 2015, whereas in countries as Spain or France they represent about 2% of total revenue. Our decision to exclude

[49]Total revenue calculated as "D2 taxes on production and imports", "D5 current taxes on income, wealth, etc." and "D9 Capital transfers".

this type of taxes is however related to the limited availability of information on their distribution. As an example, in 2015, these taxes were composed of 55% by inheritance and gift taxes, and with our data we are not able to distribute them in a meaningful way to specific individuals.[50]

A.4 Specificities of Italian National Accounts

The national accounts compiled by the Italian statistical office follow the European System of Accounts 20190 (ESA2010), which is consistent with the System of National Account of 2008 (SNA08), jointly built by the OECD, UN, IMF, EU Commission and World Bank. By means of a common system of national accounts, the income flow produced yearly by each economic sector of a country becomes readily comparable not only through time but also across countries. However, each country may make some relevant changes that need to be taken into consideration in a work of reconciliation between micro and macro data.

With specific regard to the Italian NA, there are a few differences with the standard SNA08 that we can underline. One first important difference is the treatment of actual and imputed rents. Actual rents are included in mixed-income of the Household sector, while imputed rents are included in the Operating surplus of the Household Sector.[51] Furthermore, among the Capital incomes recorded under the variable "D42 - Profits Distributed by companies" the Italian NA adds an extra income component that is not envisaged by the ESA2010 guidelines: "D423 - other profits distributed by companies". It represents the compensation to the directors and statutory auditors of the joint-stock companies and the profit distributed to the members of the cooperatives. Although this type of income is included as capital income in NA, the actual source of income is debatable since it is still received due to some type of work carried out within the company. Moreover, with respect to tax purposes, it represents income received as an employed worker and, thus, it is subject to a tax rate which is different than the one levied on capital. A similar reasoning has to be done for the sub variable "D422 - income withdrawn by members of quasi-corporations". This is the income actually withdrawn by members of individual proprietorships, family businesses and simple and de facto partnerships with more than 5 employees and all partnerships (in Italian "Società di persone") for their own needs out of the profits earned by their quasi-corporations. Such income is recorded in NA gross of all current income taxes, and it is added to the income of the owner and, thus, taxed as labor income, at a rate which is different from the tax on capital income. As a matter of fact, only the subcomponent "D421 Dividends" is capital income in the standard definition of income received due to investments, and will be taxed mainly at a flat-tax rate.[52]

[50] Although inheritance and gift taxes are important in shaping the long-run income and wealth inequality of a country, they are particularly low for the case of Italy and would not significantly influence our analysis on the progressivity of the tax system.

[51] As in the 22 December 2020 report at the following link: https://www.istat.it/it/archivio/248596.

[52] Depending on whether dividends are due to qualified or not qualified shares and according to the geographical location of the company paying the dividends, individuals could be subject to a flat-tax rate or to the personal income tax progressive rate.

A.5 Social Security Contributions

Social security contributions (SSC) in the national accounts provided by Istat allow the division by employers and workers, and also between employees (D613CE C) and self-employed workers (D613CNAS C). Therefore, we distribute the contributions from employees (D613CE C) in proportion to the social contributions paid by employees present in the IT-SILC (variable "csdi"), while we distribute the contributions paid by self-employed workers (D613CNAS C) in proportion to the contributions paid by self-employed workers ("csa" variable). For the contributions paid by employers, we distribute both the actual and figurative contributions of the entire economy, in proportion to the relevant variable in IT-SILC ("csda" variable). It is helpful to notice that the amount of contributions present in SILC is always very close to the totals present in the national accounts.

A.6 Distributional National Accounts

Following the DINA guidelines, we build four concepts and related distributions of national income: (i) factor income, i.e. the distribution of income deriving solely from the remuneration of labor and capital, which therefore includes the contributions paid by workers; (ii) pre-tax national income, or the distribution of income deriving from work and capital net of contributions paid but with the addition of transfers from the pension system; (iii) post-tax disposable income, calculated as the pre-tax national income but after direct and indirect taxes; (iv) post-tax national income, calculated as post-tax disposable income but including public expenditure as a source of income of the population. Furthermore, for the household sector, Istat releases the national accounts with a regional breakdown. Therefore, we estimate the distribution of the household sector not only at the national but also at the regional level.

To proceed with the distribution of the income variables that are present in the national accounts, we assume that the net amount declared in the survey more reliable than the gross one. Hence, we take the net variables and add the distribution of taxes paid adjusted by national accounts, as described in section A.3. Thus, we obtain a new provisional value for gross incomes given by net incomes in SILC plus the distribution of taxes. We use this provisional gross income to distribute the income components of the national accounts. Moreover, suppose the total of this provisional gross income (i.e. net income in SILC plus the distribution of taxes) is higher than the gross income reported in the NA. In that case, after distributing the values of the national accounts in proportion to the provisional gross incomes, we create a new value of net incomes given by the difference between the final adjusted gross incomes and the distribution of taxes. Using this method, we keep fixed the amount and distribution of taxes, and we have a new net income consistent with the distribution of gross income and taxes.

A.6.1 Factor Income

Factor income is the income that remunerates self-employed workers, employees and investments, and its sum is equal to the total net national income of the national accounts. For the household sector, these incomes are equivalent to:

- D11 C gross wages net of contributions to be paid by employees D613CE C -> we distribute them in proportion to the income from employees;
- D12 C social contributions paid by employers -> distributed in proportion to the contributions paid by employers;
- B2N net operating profit -> as reported in SNA08 would be the set of income for imputed rent in the household sector, we then distribute it based on real estate properties;
- B3N net mixed-income, net of contributions to be paid by self-employed workers D613CNAS C -> According to Istat[53] this income component is the sum of self-employment income and rents from real estate of the household sector. Therefore we split this income source using the same ratio of self-employment income and income from rents present in the IT-SILC. Then we distribute the portion relative to rents in proportion to the real estate properties and the rest in proportion to self-employment income;
- D41 C-D interest -> the total interest income received. we distribute them in proportion to bonds, deposits and savings, equities and shares;
- D421 C-D profits distributed by companies -> we distribute them in proportion to equities and shares and using tax income tables;
- D422 C-D income withdrawn by members of quasi-corporations -> we distribute them in proportion to business assets;
- D423 C-D other profits distributed by companies -> we distribute them in proportion to equities and shares;
- D44 C-D other investment income -> we distribute them in proportion to deposits and savings, equities and shares;
- D45 C-D rental of land and exploitation rights of fields -> we distribute them in proportion to the previous capital income previously distributed.

The sum of these incomes, adding the previously distributed social security contributions, perfectly recreates the net national income of the institutional sector of households. This method of distribution of capital income is equivalent to that made by Piketty et al. (2018) for the United States, in which it is assumed that the return on capital is constant for each level of wealth. Although this is a relatively strong assumption, as recent findings pointed out that a higher level of wealth is associated with a higher rate of return (Fagereng et al., 2020; Iacono and Palagi, 2021; Bach et al., 2020), it is a conservative assumption and, if anything, it would underestimate inequality levels.

In addition to the household sector of national income, we also want to include the incomes of the corporate sector. These incomes, also called retained earnings, can be considered as an actual income for the business owners even if it is not distributed yet. Therefore, we also distribute the net income of the corporate sector (B5N) in proportion to the equities and shares. As for the income obtained by the public administration sector, in line with the DINA guidelines, it is distributed in proportion to factor income, so that only the absolute level of income earned is affected and not relative shares.

[53] https://www.istat.it/it/files//2020/12/REPORT-CONTI-TERRITORIALI_2019.pdf.

A.6.2 Pre-tax National Income

To construct the pre-tax national income distribution, we must start from the distribution of factor income. However, it is also necessary to include the transfers for the pensions due for the payment of contributions in working age and to deduct the social contributions paid. In the national accounts, pensions and transfers are reported in the aggregate D62. This, in turn, is composed of the following sub-items:

- D621 and D622, i.e. pensions due to the payment of social contributions;
- D623, i.e. social transfers not subject to the payment of contributions.

However, Istat does not release the composition of aggregate D62. In order to make this division, we follow BCG and use OECD data on social expenditure to identify component D623 and subtract it from aggregate D62 and obtain the total of the pensions paid for contributory rights.

Furthermore, to reach the total net national income, we must also consider the difference between expenditure on social contributions of the corporate sector and the public sector. Some companies set up their own social security systems in which families can participate by paying a periodic fee. These companies generally have a surplus account and, therefore, they have higher contribution income than the transfers they issue. This surplus between expenditure and contributions must be included in the net income of firms.

The opposite is true for public administrations. In fact, they usually issue more contributions than what they receive, so we must include this debt in the net income of the general government. In addition, in order to perfectly match the total national income, we add to the public sector any debts or credits (albeit small) towards the rest of the world sector and towards households.

A.6.3 Post-tax Disposable and National Income

Post-tax disposable income aims at reconstructing the post-tax and post-transfer income received by the population, excluding in-kind transfers. Therefore, we deduct all direct and indirect taxes that we distributed as previously described, while adding back subsidies on production and distributing social assistance benefits in cash. This income concept is smaller than national income, by construction, since collective public expenditure is missing from the totals. To revert to total national income, we use the income concept of the post-tax national income, to which we add back the public expenditure and any deficit/surplus of the government sector. We follow the DINA guidelines by distributing collective expenditure as a lump sum that is equal for the whole population and distribute the rest in proportion to the post-tax disposable income. It is important to notice that any distributional choice of public expenditure has crucial consequences in terms of inequality statistics. Nevertheless, including public expenditure has the advantage of making countries with highly different public spending comparable. Since Italy has a very fragmented public expenditure that vastly depends on the region of residence, we depart from the standard distributional assumption of the DINA guidelines. Relying on data on public expenditure by regions published by the "Ragioneria Generale dello Stato", we first distribute the national public expenditure to regions and then we distribute the spending among the residents of the regions. However, using a regional distribution rather than the national total, does not change significantly the distributional impact.

A.7 Comparison with previous inequality estimates for Italy

In this Appendix we show a comparison of our inequality indicators with previous estimates in the literature. Furthermore, we discuss more in depth how our measures introduce some improvements on previous ones. Although the paper focuses on individuals as unit of analysis, in this Appendix in order to make a precise comparison with previous studies, we calculate the series by equally dividing all household income among the adult household members, in addition to considering only the population starting from 20 years old.

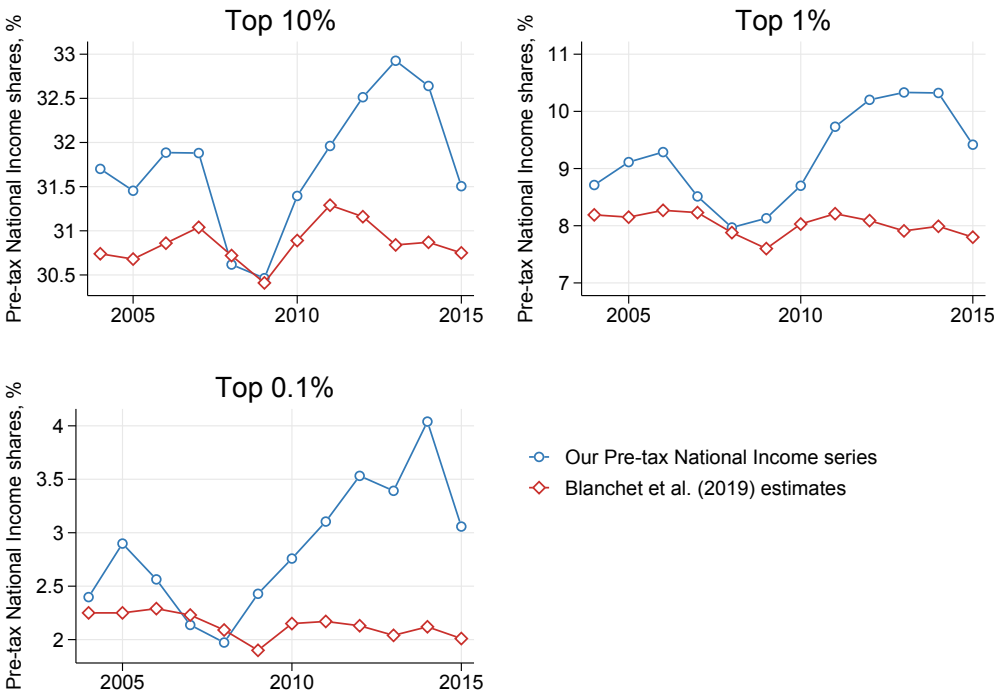
First, we find higher income concentration at the top with respect to Blanchet et al. (2019). Moreover, in contrast to what was originally found by Blanchet et al. (2019), where top income earners had roughly constant national income shares in the last 10-15 years, our study shows a different trend, especially for the top 1% and top 0.1% (see Figure A.1). Top income earners have increased their pre-tax national income share respectively from 9% to 10% and from 2.5% to almost 4%. It can be noted that, while being subject to a decline of income shares during the Great Recession, top income earners entered in a growth path after 2009.

Our income distribution series are different from those obtained by BCG for a number of reasons which also makes our series more reliable and consistent with NA. First, not all income categories (actually, only imputed rents and retained earnings of corporations) were distributed in order to match NA in the work by Blanchet et al. (2019). Furthermore, contrary to BCG, we do not impute social security contributions based on marginal tax rates from OECD but we are able to use the survey data collected at the micro-level and matched directly by Istat using administrative data. This allows us to have a more precise estimate of SSCs that we then scale up to match NA but that was already more than 90% close to the total from NA (see also Appendix A.1 for differences in the re-weighting procedure of sample weights). Another fundamental improvement that we were able to make is the use of real and financial assets already consistent with Financial Accounts and distributed using administrative records on inheritances by Acciari et al. (2020) (AAM). Instead, BCG relied mainly on the HFCS survey conducted by the European Central Bank which is only available in 2013 and 2014 and still presents a considerable amount of under-reporting of total net wealth. By using the distribution of net wealth as estimated by AAM we are able to cover a longer time span and to be much more precise on the actual distribution across the population and across asset types. Finally, contrary to BCG, we proceed by distributing all direct taxes and then adjusting each income component in order to match all the items composing national income.

Although useful in some contexts, allocating household income equally to adult members leads to lower concentration levels of the national income. Indeed, since many young individuals with relatively low income still live with their parents, distributing an equal portion of parents' income to this category leads to a more equal distribution of total income. However, in Italy, taxes are paid by the single individuals and, given our aim of ultimately estimating tax progressivity, we therefore consider more meaningful, in our baseline analysis, to consider the distribution of national income at the individual level (as opposed to equal split as in Figure A.1).

Another contribution with the aim of building DINA series for several European countries, including Italy, is the one by Ederer et al. (2020). One major improvement that our work adds on the latter paper is how we handle capital incomes. Survey data are imperfectly taking into account the

Figure A.1: Top Income shares of Pre-tax National Income: Our estimation and Blanchet et al. (2019)



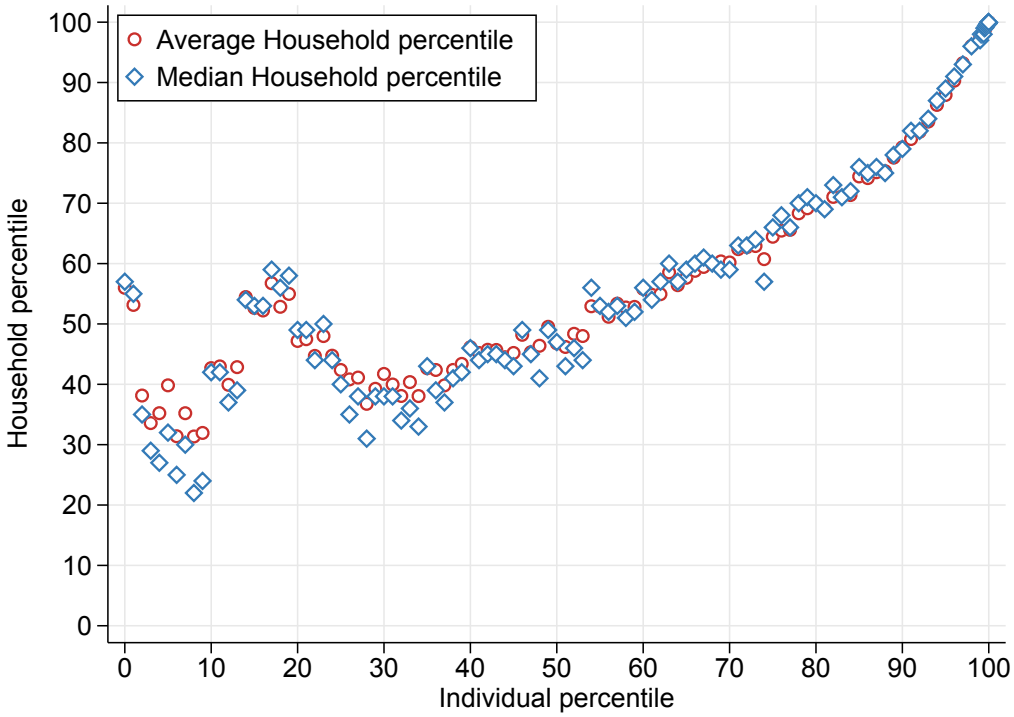
Notes: All series are calculated among adults from 20 years old. All household income is equally divided among the adults members.

very top of the income distribution, which is often characterized also by high wealth levels. Instead, by using propensity score matching techniques and by utilizing the novel dataset on wealth by Acciari et al. (2020), as thoroughly discussed in the methodological Section 2, we are able to better take into account capital incomes in the analysis. This is a crucial improvement as capital income tends to be more concentrated than labor income. Furthermore, by considering only Italy, we are able to better grasp some specificities of the country, as previously discussed (see e.g. Section 2.3).

A.8 From individual to household

As already explained in Section 3.4.2, we can analyze both the distribution of individual income and the distribution of family income with our dataset. In this appendix, we study how the two distributions correlate. By preserving the household ID, we can find both the individual and household positions in the respective income distribution. Therefore we can calculate for each income percentile where individuals rank in the distribution of household income. In Figure A.2, we find that the family's redistributive effects are especially useful in the lower part of the distribution. In this case, those in the bottom 30% of the personal income distribution find themselves, on average, around the 40th percentile of the family income distribution. However, this effect is much less visible at the top of the distribution. Indeed, we find that individuals with high personal income also tend

Figure A.2: Mean and Median individual income ranking vs Household ranking, 2015



to live in households whose family income remains at the top of the income distribution.

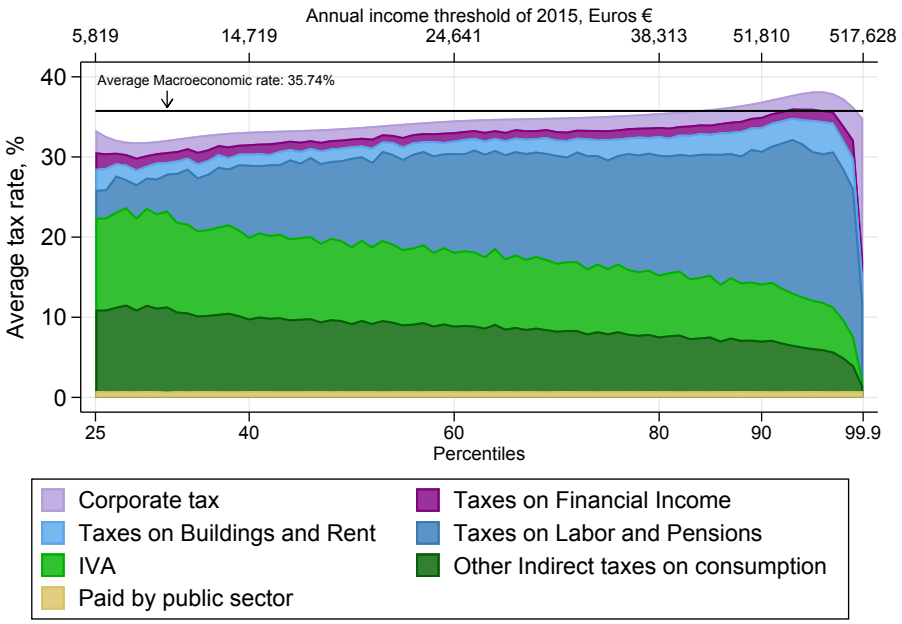
A.9 Descriptive statistics on distribution of taxes

For each category in Figure 9, Table A.3 shows the list of correspondent taxes included, the average amount of taxes paid, maximum values and the standard deviation. Minimum taxes paid are in each category equal to 0.

Table A.3: Descriptive statistics on taxes paid

Legend	*Type of Taxes included*	*Mean*	*Max*	*Standard Deviation*
Corporate Tax	Direct taxes paid by firms Indirect taxes paid by firms IRAP share	731	2,270,486	18,074
Taxes on Financial Income	Direct taxes paid on financial income (dividends, interests, profits) IRPEF share on capital	346	70,459	1,201
Taxes on Buildings and Rent	IRPEF share on buildings and rent Direct taxes paid on buildings and rent Indirect on buildings and rent	656	322,671	2,275
Taxes on Labor income and Pensions	IRPEF share on labor and pensions indirect taxes on self-employment IRAP share	3,795	546,102	8,211
SSC employer	Social Security Contribution paid by employer	3,432	106,679	5,835
SSC employee	Social Security Contribution paid by employee	820	10,029	1,385
SSC self-employed	Social Security Contribution paid by self-employed	638	34,651	2,472
IVA	Indirect taxes on Value Added	1,968	24,369	1,944
Other indirect taxes on consumption	Indirect taxes on consumption other than VAT	1,749	21,663	1,728
Paid by public sector	Share of corporate tax paid by public sector Other small direct taxes distributed proportionally to total income	175	41,973	413

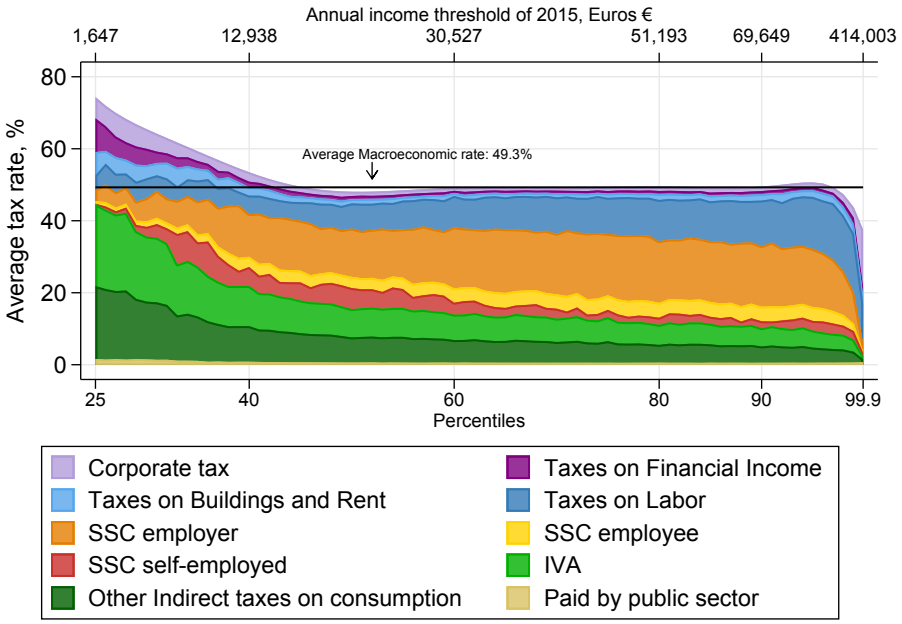
Figure A.3: Tax rate by Pre-tax National Income percentile, 2015



Notes: Income is calculated as the pre-tax national income.

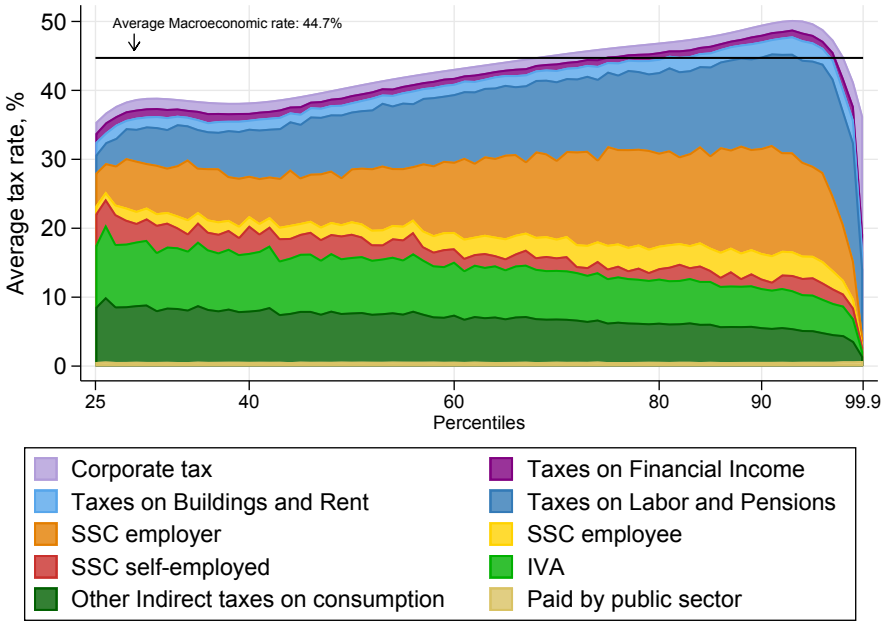
A.10 Progressivity of the tax system by Factor and Pre-tax National Income

Figure A.4: Tax rate by Factor National Income percentile of working age population, 2015



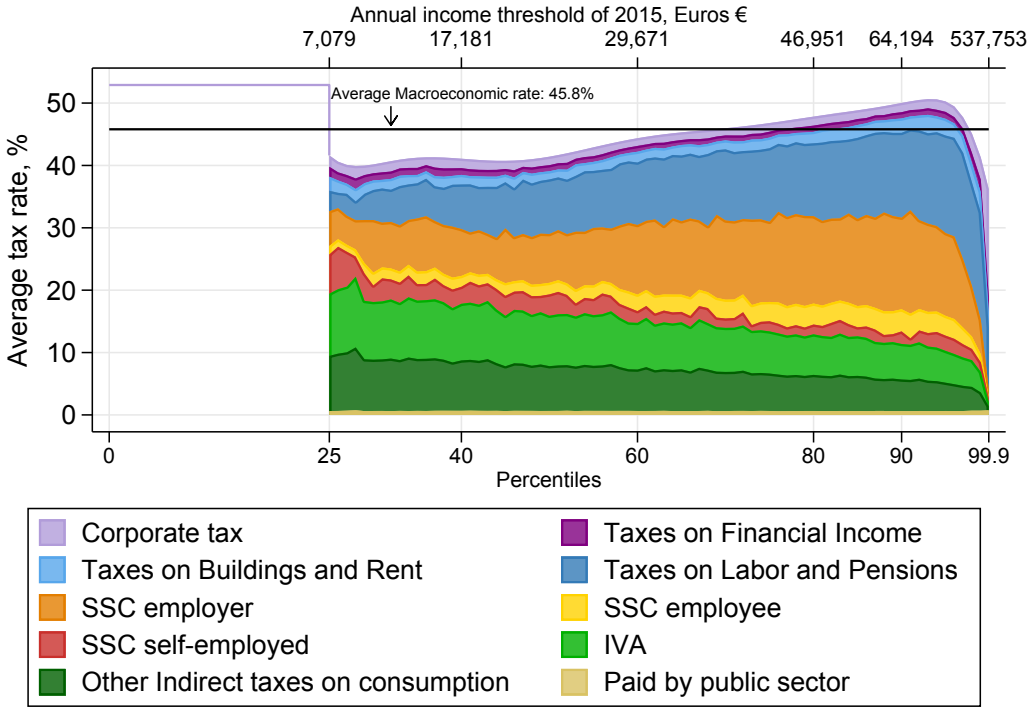
Notes: Income is calculated as the factor national income in working age population 18-65.

Figure A.5: Tax rate by Pre-tax National Income percentile including SSCs and social assistance transfers, 2015



Notes: Income is calculated as the pre-tax national income but including also social security contributions and social assistance transfers.

Figure A.6: Progressivity with all percentiles



Notes: The Figure shows results presented in Figure 9, with the addition of a horizontal line for the bottom 25%, which shows the average tax rate related to this income group. As previously mentioned, we avoid making strong statements on tax progressivity for the bottom 25% of income earners due to possible measurement errors associated with low absolute income levels.