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On the path to optimal taxation in an overwhelmed personal income tax regime: the Italian case

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1. INTRODUCTION

As in the majority of the world, Italian personal income taxation (PIT) represents the greatest component of tax revenues. About 28% of the total tax revenue in Italy is derived from the PIT. The ratio between PIT revenues and GDP was around 11% in 2018, compared to an average of 8.5% in OECD countries. In the same year, the total revenue to GDP ratio was around 42.1%, with an OECD average of 34.3%[1]. Moreover, Italy is sadly famous for conceiving a large amount of deductions and tax credits in favour of some specific individuals. According to the Italian Ministry of Economics and Finance (MEF), in 2017 tax expenditures were about 5.5% of GDP. Andrle et al. (2018) observed that in Italy tax expenditures in PIT were significantly higher compared to other countries. Cammeraat & Crivelli (2020) found that Italian fiscal expenditure are largely above the European average.

However, even considering the high efficiency costs that such system would impose, its redistributive power might not be as large. Distinguishing between inequality of outcomes and opportunities, Lefranc et al. (2008) found that Italy, alongside the US, shows the most unequal society by both perspectives compared to other eight most developed countries. Similar results could be found in a comparison between European countries, conducted by Verbist & Figari (2014).

Almost every Italian government in the last 30 years has attempted to reform the Italian "Imposta sul reddito delle persone fisiche" (IRPEF)[2], but strong political frictions and constant political instability have imposed severe limitations to each of these attempts. In fact, no government after 2010 was able to implement a substantial reform of the PIT. Notorious attempts are: the "80 euro monthly" bonus (from now on "the IRPEF bonus") for employees introduced by the Renzi's government in 2014; the tax expenditure cut and the failed proposal of a "flat-tax" by the yellow-green government of *Lega Nord* and *Movimento 5 Stelle* in 2018; the "40 euro monthly" bonus and a revision of the two lowest income brackets actually discussed by the yellow-red government of *Partito Democratico* and *Movimento 5 Stelle*.

All in all, it is clear to both academics and politicians that the Italian PIT should be completely reformed, in order to achieve better results in term of redistribution and efficiency, independently from the political preferences[3]. But how far is the IRPEF from the optimum? Which direction should this reform take? Which of the myriad of tax rules included in the Italian

[1] OECD (2018)
[2] The Italian PIT
[3] Baldini et al. (2017)

PIT is effectively useful on the path to optimal taxation? The purpose of this paper is to answer these questions, by creating a tool that allows to explore the components of the IRPEF regime in details, in order to provide some insights on potential reforms for policy-makers. The final goal is to estimate the efficiency costs and redistribution benefits implied by IRPEF tax rules, and to evaluate potential reforms that generate improvements under both perspectives.

Inspired by the one created by Saez & Zacman (2019) as a complementary tool for their book "*Triumph of Injustice"*, the paper develops a static behavioural macro-simulation model (MSM). Differently from previous Italian macro and micro-simulation models, the novelty of the MSM presented in this paper is the inclusion of behavioural responses upon variation in marginal tax rates, a feature mostly undervalued in previous Italian analyses. Since the IRPEF is a comprehensive income tax, this feature allows the model to take into account for all kind of responses induced by changes in the fiscal burden, including distortions on labour supply, saving, tax avoidance and evasion.

Starting from aggregated tax declaration data, the model computes effective marginal and average tax rates. The MSM uses these figures to estimate the social welfare weights expressed by the actual system, the marginal excess burden (MEB), the implicit impact of each fiscal expenditure on rates, efficiency and redistribution. Moreover, using the Italian Elasticity of Taxable Income (ETI), the model predicts changes in reported income induced by changes in marginal tax rates when a reform is applied[4]. The paper presents an incidence analysis based on the calculations of the model. There are few main conclusion from the analysis.

Firstly, in the Italian PIT, an individual could decide to be taxed for some real-estate income under the "Cedolare Secca" (CS) regime, which has a fixed tax rate. However, the CS regime does not grant most of the tax credits and deductions of the IRPEF. Since individuals are not able to predict the effective value of their credits and deductions, they often opt for the CS regime, even when the IRPEF might be more convenient for them. When the CS regime is removed and all incomes are taxed under the IRPEF, low income classes enjoy a lower tax liability, while higher income classes pay more, relative to the actual system. Consequently, the CS substitutive regime harms the progressivity of the Italian personal income tax and increases the complexity of the fiscal system.

Secondly, the majority of fiscal expenditures have little impact of the effective average and marginal tax rates. While their impact is limited in terms of shrinking the wedge between private and social benefits of taxation, some of them are also very harmful in terms of

[4] The model will focus on intensive margin.

redistribution, as they favour rich house and estate owners over poorer individuals. Consequently, a strong simplification of the system might ameliorate the equity-efficiency trade-off. In addition, having less tax rules simplifies the process of tax payments for taxpayers and alleviate the burden of verification for tax authorities.

Thirdly, the incidence and the social welfare weights function analysis demonstrate that the IRPEF requires an increase in marginal tax rates at the bottom of the income distribution. The IRPEF tends to be regressive at the very bottom of the distribution, with effective average tax rates larger than marginal tax rates. In particular, all self-employed individuals who suffer severe losses during the fiscal year (reporting a negative aggregate income) belong to this part of the distribution. These individuals have to sustain a fixed "minimal" contribution for social security, even in case of losses. For large losses, transfers and tax credits are not sufficient to cover the costs of social security contributions. Consequently, the very bottom of the distribution bears a positive effective average tax rate (EATR) and a null marginal tax rate, while all other income classes between zero and 8,000 euro show negative EATRs. A solution might be reducing minimal contribution for social security, increasing welfare transfers, or making some non-refundable tax credits refundable for the poorest part of the income distribution.

Finally, the analysis shown that, independently from political preferences, the Italian personal income tax is far from the optimum. The paper presents different reforms that could at the same time reduce the after-tax income inequality and reduce the deadweight loss of taxation. Such reforms, from the simplest to the most radical, involve the elimination of the CS regime, the main residence deduction and other fiscal expenditure which have been proven of little impact on the overall system in the analysis.

The paper is structured as follows. Section 2 reviews the literature on the analysis of the Italian personal income tax. Section 3 presents the main estimates used in the model for the Italian Elasticity of Taxable Income (ETI), and provides a theoretical framework for other calculations conducted in the model. Section 4 describes the dataset used for the calibration of the model. Section 5 describes the Italian personal income tax and presents the incidence analysis. Section 6 explores in details the CS regime and all the IRPEF fiscal expenditures. Section 7 describes different policy experiments, including the analysis of a flat rate regime. Section 8 focuses the analysis of the implicit social welfare weights function. Section 9 concludes.

2. LITERATURE REVIEW

In order to evaluate the progressivity and the burden of the Italian PIT, two are the main strategies carried on by various authors. Ex-post analysis are usually aimed at evaluating the impact on redistribution of specific already-existing components of the tax system. On the other hand, ex-ante analysis are normally based on fiscal simulation models, which allow to change rules of the system in order to predict the impact of a reform on the underlying income distribution.

For the Italian case, ex-post analysis have been conducted mostly with the use of Reynolds-Smolensky (RS) index decomposition, following the work of Pfahler (1990), Lambert (1992) and Onrubia et al. (2014). The RS index is simply the difference between the GINI coefficients, calculated before and after taxes. Its decomposition allows to observe the impact of different types of fiscal expenditure on progressivity. Di Caro (2017a, 2017b, 2018, 2019) is the most prominent author in this case. He further decomposes the RS index in order to take into account variation in horizontal and vertical equity. He used this methodology to evaluate the redistributive impact of various components of the Italian tax system starting from micro survey data. Barbetta et al. (2018) used a similar methodology, but with a much larger sample from tax declarations. Monteduro & Zanardi (2005) used the Pfahler-Lambert decomposition to evaluate the impact of regional taxation on overall Italian progressivity. While this type of analysis is quite precise in evaluating equity aspects of taxation, it does not take into account efficiency costs. Nevertheless, comparing this paper findings with those from the RS decomposition could provide a robustness check for the evaluation of redistribution in the macro-simulation model.

Ex-ante analysis are tax incidence evaluations based on fiscal micro and macro simulation models (MSMs). Gastaldi & Liberati (2005) used the micro-simulation model AWARETAX to evaluate the effect of Italian tax reforms between 1995 and 2005[5]. More recent micro-simulation models are applied in the analysis of Italy by Barrios et al. (2019), which used the EUROMOD micro-simulation model to evaluate fiscal and equity effects of tax expenditures in 27 European countries. Cammeraat & Crivelli (2020) applied the EUROMOD model for a more specific analysis of the whole Italian tax system. The EUROMOD model is calibrated on the basis of the EU-SILC dataset. The most recent MSM used by the Bank of Italy is called BIMic, a static non-behavioural simulation based on the income distribution derived from the Italian 2012 and 2014 Survey on Household Income and Wealth (SHIW) collected by the Bank of Italy[6]. Ceriani et al. (2013) constructed a model called TABEITA to compare the precision of the two main micro

[5] Developed by the Bank of Italy.
[6] Details on the model are described in Curci et al. (2017)

datasets used in the literature for fiscal simulation in Italy, the EU-SILC and the SHIW. They found the IT-SILC to improve the regional representativeness of the data, while the SHIW provided more information on individual wealth. Albarea et al. (2015) developed a model called BETAMOD, specific for the IRPEF, which main characteristics are the inclusion of detailed local components of the tax system and the inclusion of estimates of individual specific tax evasion rates. Maitino et al. (2017) developed a micro-simulation model called MICROREG, which is specific to Italian regions, since it has been developed originally for Tuscany.

Regardless of the methodology implemented, there is a strong agreement between authors on the fact that the majority of Italian fiscal expenditure have little impact on redistribution[7]; that fiscal expenditures for house and estate owners, such as the main residence deduction or the CS regime, harms the progressivity of the IRPEF[8]; that the system presents too large fiscal expenditures compared to other European countries[9].

Most of these analysis have been conducted with micro-data, focusing on the progressivity of the IRPEF, and none of the aforementioned simulators includes behavioural responses. Consequently, the macro-simulation model presented in this paper could further expand the literature, by taking into account the elasticity of taxable income and the distortions generated by taxes. Such distortions includes labour supply distortions, saving distortions, tax avoidance and evasion. It is fundamental to take into account of these responses for a complete analysis of the equity/efficiency trade-off, especially in Italy, where tax evasion is considered to be higher compared to the European average[10]. In addition, the "Cedolare Secca" substitutive regime has not been included in the most recent MSMs, namely the EUROMOD and the BIMic. This regime is found to be harmful for redistribution[11] and it is interesting to observe its overall implicit impact on the tax system. Finally, the use of macro-data allows to take into account potentially all of the fiscal expenditure in 2018, compared to micro-data simulators, which normally include only the main fiscal expenditures for simplicity. Previous findings have been mostly confirmed by the analysis conducted in this paper, even when taking into account for behavioural responses.

[7] Di Caro (2017a, 2017b, 2018, 2019); Albarea et al. (2015); Barrios et al. (2019)
[8] Di Caro (2019); Cammeraat & Crivelli (2020)
[9] Barrios et al. (2019)
[10] See Schneider et al. (2015) or Marino & Zizza (2012)
[11] See Di Caro (2019)

3. THE ITALIAN ELASTICITY OF TAXABLE INCOME

In order to calculate the behavioural changes generated by a variation in the taxation system, a proper estimate of the Italian elasticity of taxable income (ETI) is required. The most recent work to my knowledge has been developed by Tomat (2018). Tomat (2018) worked on the Mirrleesian theoretical framework of optimal income taxation explored by Saez (2002). He applies the same methodology as in Piketty & Saez (2013) in order to derive an econometric model aimed at calculating elasticity and semi-elasticities of income. He considers a utility function $u_i = u(c_i; z_i; x_i)$, where c_i and z_i represent respectively individual consumption and gross income, while x_i is a set of observable and unobservable characteristics of the individual i. The budget constraint is equal to $c_i = z_i(1-\tau) + R_i$, where R_i is defined as the consumer's virtual income and corresponds to $R_i = z_i - T(z) - z_i(1-\tau)$. In previous equations, $T(z)$ represents the amount of due taxes for a given amount of income z, while τ is the marginal tax rate for that income level.

Solving the classical maximization of utility problem, Tomat (2018) derived the individual personal income supply function as $z_{i,u}(1-\tau_i; R) = z_u(1-\tau_i; R; x_i)$. Then, following the example of other authors in the field, like Feldstein (1995,1999), Gruber and Saez (2002) and Giertz (2007), he defined the real income of an individual as: $z_i(1-\tau_i; R_i) = z_{i,u}(1-\tau_i; R_i)(1-\tau_i) + R_i$. Therefore, by considering two subsequent time periods t and $t-1$, he applied logarithmic differentiation, which led to the baseline econometric specification of his model:

$$ln\frac{z_{i,u,t}}{z_{i,u,t-1}} = \varphi_{i,c} ln\frac{1-\tau_{i,t}}{1-\tau_{i,t-1}} + \mu_i ln\frac{z_{i,t}}{z_{i,t-1}} + \varepsilon_i \qquad 3.1$$

The model shows the composition of the rate of change of gross personal income. The variation in gross personal income depends on changes in marginal tax rates and net-income between the two time periods, plus an individual random disturbance term ε_i. The values $\varphi_{i,c}$ and μ_i represents respectively individual compensated personal income elasticity and semi-elasticity with respect to marginal tax rate variation. Furthermore, Tomat (2018) defined the average personal income elasticity and semi-elasticity as $\varphi_c = E(\varphi_{i,c}) = \varphi_{i,c} + \varepsilon_{\varphi_{i,c}}$ and $\mu = E(\mu_i) = \mu_i + \varepsilon_{\mu_i}$, where $\varepsilon_{\varphi_{i,c}}$ and ε_{μ_i} are individual random error terms. Then, the previous equation boils down to:

$$ln\frac{z_{i,u,t}}{z_{i,u,t-1}} = \varphi_c ln\frac{1-\tau_{i,t}}{1-\tau_{i,t-1}} + \mu ln\frac{z_{i,t}}{z_{i,t-1}} + v_i \qquad 3.2$$

The error term v_i incorporates all individual random disturbance terms, weighted by their corresponding variations in tax rates and net-income. The average compensated personal income elasticity $\varphi_c = E(\varphi_{i,c})$ corresponds to the elasticity of taxable income required for the calculation of behavioural responses in this paper's MSM. Subsequently, Tomat (2018), to solve for endogeneity, applied an Instrumental Variables approach. He consider as exogenous instruments for both variables the rate of change in marginal tax rates and net income induced by a change in tax schedule, when holding the gross income fixed to the reference period $t-1$. Other observable controls have been subsequently added to the model for more precision.

Tomat (2018) conducts the regression using survey Panel data from 2000 to 2012. The dataset he used is the Italian Survey of Household Income and Wealth (SHIW) combined with OECD tax administrative data. He also develops a regression on the same model with a DID strategy as a robustness check for the results of the main specification. He used two different measures for income, disposable income and labour income. For disposable income, he estimates a (positive and significant) value for the elasticity between 0.106 and 0.154 over the entire period; 0.361 over the period 2000-06 and 0.197 between 2006-12 (using the DID strategy). Estimates derived using labour income are much higher: between 0.168 and 0.264 over the entire period; 0.504 during 2000-06 interval and 0.272 between 2006-12 with the DID method.

The work of Tomat (2018) is the most recent research aimed at estimating the ETI specifically for the Italian case. Other authors have estimated the elasticity of taxable income. For instance, Piketty, Saez & Stantcheva (2014) evaluate the elasticity of taxable income for the top 1% income share over 50 years in different countries. For this peculiar category, they estimate the Italian ETI to be between 0.2 and 0.25. Following a methodology similar to the one of Tomat (2018), Almunia Lopez-Rodriguez (2019) evaluate the ETI for Spain, which is equal to 0.187 according to their estimates. Sicsic (2018) estimate an ETI equal to 0.248 for France. Both these countries share similar culture, legislation and economic relationships with Italy. I would not expect the Italian case to deviate significantly from these countries ETI. In addition, Saez, Slemrod & Giertz (2012) provided a large literature review on methodologies and existing results related to estimates of the elasticity of taxable income. The paper support the idea that a reasonable estimate of the elasticity of taxable income should be confined between 0.15 and 0.40. Given all previous estimates, I decided to consider the ETI in my model to be equal to 0.2. The value comes from the most detailed specification of Tomat (2018) model, it refers to the most recent period, and it is consistent with the existing literature.

4. THE DATA

All data presented in this paper, as well as those used for the calibration of the model, came from the same dataset provided by the Italian Ministry of Economics and Finance (MEF) department "MEF – Dipartimento delle Finanze"[12]. The MEF collects, checks and publishes aggregated data derived from individual tax declarations. In particular, the "Agenzia delle entrate", the Italian national fiscal authority, provides the MEF with what in Italy are known as "Modello 730" and "Certificazione Unica" (CU). These two modules are standard declaration forms for all individuals, depending on the type of income and the regime chosen. In particular, the data used in the MSM refers to 2019 tax declarations. This means that the starting point of the model is the fiscal year 2018. Data are classified according to the most detailed classification available: 34 income classes, unequally weighted in terms of population, with a total of 41.372.851 taxpayers. The dataset includes the monetary value of virtually all fiscal expenditures of the Italian IRPEF, as well as associated frequencies and means[13]. For a complete list of all the tax expenditures considered in the MSM, the MEF provides well-organized tables describing the composition of each variable considered in the model, including a description of the legal framework of each fiscal expenditures[14]. In the dataset, monetary values are reported in thousands, null values indicate a monetary amount below the three digits, while three asterisks (***) indicate that the frequency of a particular item is below three[15].

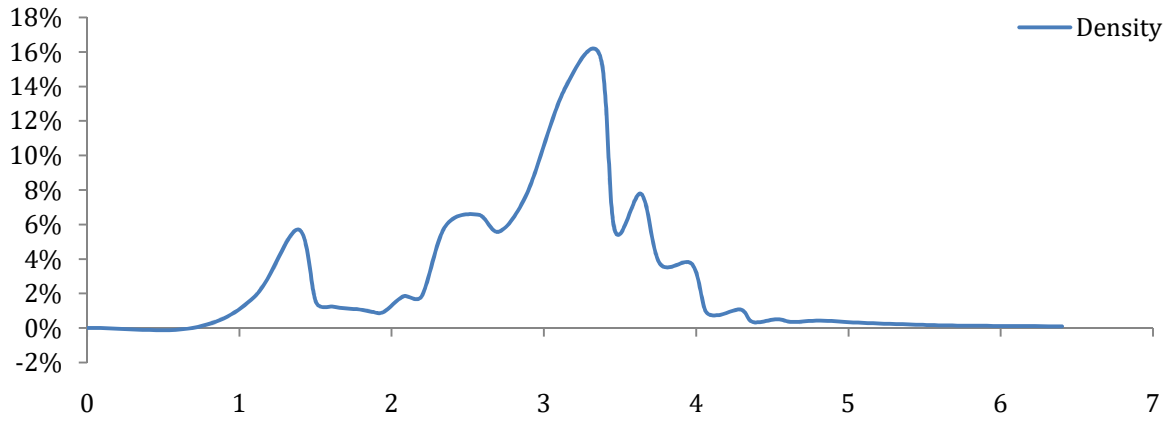

Figure 4.1 Density distribution

Source: MEF data

For a preliminary analysis of income distribution, Figure 4.1 shows the income density distribution, measured as the proportion of taxpayers in each income class of the dataset. On the

[12] Dataset available on the Italian MEF website. The link is provided in the bibliography.
[13] "Imposta sul Reddito delle Persone Fisiche"
[14] Available on the Italian MEF website. The link is provided in the bibliography.
[15] Thus, the monetary value is not reported in order to protect the identity of taxpayers.

x-axis, gross incomes are reported in natural logharitmic scale. The average income for the lowest class in the distribution is around -8,000 euro while the top income class has an average income around 600,000 euro.

The density function follows a normal distribution, with the only exception for the initial 6% spike around the "zero" income class. The majority of taxpayers are concentrated between 15,000 and 26,000 euro, with the median income equal to 17,412 euro and a weighted average of 20,891 euro. Following optimal taxation theory, we would expect marginal tax rates to be quite high before 15.000 euro compared to the rest of the distribution. This would ensure higher gain for redistribution at lower costs in terms of distortions. However, the relatively high density around zero might mitigate the optimal marginal tax rates level at the bottom. The more people are affected by a certain marginal tax rate, the more are the efficiency costs generated, even if at the very bottom of the income distribution. Moreover, we would expect marginal tax rates to fall in the interval in which the density is higher, and to growth again, passed the 40,000/50,000 thresholds. The comparison between the density function, a major determinant of the optimal tax schedule, and the Effective Marginal Tax Rates distribution, presented later in this paper, allows to better understand strengths and weaknesses of the Italian individual taxation.

5. THE IRPEF: MAIN CHARACHTERISTICS AND INCIDENCE ANALYSIS

The Italian Personal Income Tax (PIT) is known as "Imposta sul reddito delle persone fisiche"[16], or IRPEF. The IRPEF is a personal, comprehensive, progressive tax on all sources of individual income[17]. Main sources of income in the IRPEF are categorized as follows: rental and agricultural incomes, real estate income, dependent employment and self-employment incomes, pensions, capital income, business income, and a category including other sources not accounted in previous categories, known as "Miscellaneous Incomes" (e.g. royalties)[18].

Agricultural incomes refer to all sources of income related to the cultivation of a land. Rental incomes depend on the simple property of a land. Both these forms of income are imputed by

[16] Tax on "physical" individual's income.
[17] All information regarding the IRPEF structure, its fiscal expenditure and the related calculations are included in a comprehensive manual distributed yearly from "Agenzia delle entrate". The last update was on April 2020. The "Agenzia delle entrate" provides also a glossary to help with a more specific translation from the Italian legal vocabulary to English. In this paper, I used the terminology from this glossary. Both documents could be found online on the "Agenzia delle entrate" website. Links are available in the bibliography.
[18] In Italian, "Redditi Diversi".

the central authority, based on predetermined value of productivity and the dimension of the land. Real-estate income includes all sources of income derived by the property of an estate[19]. This includes leasing of an estate, as well as the property itself. In this case, the taxable rent is imputed by the central authority. In Italy, these imputed rents are defined as "cadastral" rent. The cadastral rent is centrally decided by local offices of the Italian Land Registry[20]. Depending on the characteristics of each estate and of the municipality, the local office assigns a provisional rate. This rate is multiplied by the volume of the property to form the cadastral rent[21].

Dependent labor income includes all sources of income derived by a dependent relationship from an employer. It includes income derived from continuous contracts, fixed-terms contracts and temporary collaborations between individuals and firms. Self-employment income refers to the income derived from freelance professional and artistic activities, net of costs and losses referred to the same activity. When losses from these activities are larger than the income generated, they could also be used to reduce other types of income in the tax calculation. Pension income indicates all forms of income derived from retirement, in some cases for the death of a spouse, and for disability insurances[22]. Business incomes are derived from businesses for which an individual has the sole-proprietorship or a partnership, for its share of ownership[23]. The value is reported net of the business losses. Capital incomes includes all forms of income produced by investing capital, such as interests and income derived from bonds or other financial instruments. The "Miscellaneous Incomes" category legally refers to all other sources of income that are not directly related to previous definitions. Royalties and the surplus on real estate appreciation are examples of incomes in this generic category.

While, in principle, the ordinary regime (the IRPEF) should cover all these sources, in practice there are a plethora of fiscal expenditures and different substitutive regimes, which makes the Italian taxation system an extremely complex web of rules. For instance, there are regimes like the IMU and TASI, which are local taxes levied by municipalities on real estates, and, in some cases, partially substitute the IRPEF for these specific sources of income. There is another substitutive regime for real-estate income, under some specific condition, known as "Cedolare

[19] According to the Italian legislator, capital gains derived from appreciation of an estate price, when the property is sold, are not included in the category of real estate income, but in "Miscellaneous Incomes" category.
[20] In Italian, "Catasto".
[21] There is an ongoing political debate on the definition of this particular imputed rent. Unfortunately, aggregated data does not allow to observe how cadastral rent would change with different rules, as the value is already reported after the necessary calculations. The model is not able to predict how taxation would change for different definitions of the imputed rent.
[22] As it will be explained later, social security contribution are deducted from the tax base. The reason is to avoid double-taxation, as pension income is included in the IRPEF tax base.
[23] Corporate Business Income is taxed under another regime called "IRES".

Secca" regime, and another substitutive regime for some form of self-employment income, called the "Regime Forfettario", a flat rate scheme. Later in this section, I will describe these substitutive regimes in details.

As in many modern taxation systems, the basic structure of the IRPEF is straightforward:

Aggregate Income – Total Deductions = Taxable Income

Taxable Income * Statutory Tax Schedule = Gross Tax Liability

Gross Tax Liability – Total Tax Credits = Net Tax Liability

The Aggregate income is the sum of all income sources liable under the IRPEF regime. The deductions are all fiscal expenditures that can be deducted from the aggregate income. The taxable income is equal to the difference between Aggregate Income and the total amount of deductions. The taxable income is employed as input for the statutory tax schedule. The result is defined as Gross Tax Liability, or Gross Tax for simplicity. The Gross Tax is reduced by the amount of the total tax credits[24]. The result of this operation is called Net Tax Liability (Net Tax for simplicity), which is the effective amount due to the authorities.

When the aggregate income is negative or smaller that the total value of deductions, taxable income is equal to zero. When the gross tax is smaller than total tax credits, the net tax is equal to zero. Therefore, except when accounting for the IRPEF bonus, which will be discussed in detail later, all fiscal expenditures specific of the IRPEF included in the MSM do not result in a "negative" tax debt. This means that all deductions and tax credits except for the IRPEF bonus are non-refundable. The statutory tax schedule is summarised in Table 5.1. The acronym T.I. stands for Taxable Income:

Table 5.1 IRPEF Statutory Schedule

Rates	*Income Brackets*	*Tax Debt*
23%	0 - 15.000	T.I. * 23%
27%	15,000.01 – 28,000	3,450 + (T.I. – 15,000)*27%
38%	28,000.01 – 55,000	6,960 + (T.I. – 28,000)*38%
41%	55,000.01 – 75,000	17,220 + (T.I. – 55,000)*41%
43%	Above 75,000	25,420 + (T.I. – 75,000)*43%

Source: MEF (2020)

[24] In order to respect the specific distinction present in the Italian legal framework and to avoid confusion, I will always indicate with deductions all fiscal expenditures that reduces the taxable income, and with tax credits all fiscal expenditures deducted from the Gross Tax.

Fixed components used in the calculation are the sum of all the debt derived from previous brackets. For example, the number 6.960 in the third bracket is the sum of: $23\% * 15{,}000 + 27\% * (28{,}000 - 15{,}000) = 3{,}450 + 3{,}510 = 6{,}960$. The possibility to obtain (and the effective value of) a tax credit or a deduction depends on each single case, usually with conditions linked to some specific characteristics of an individual, his household and the level of total income.

As in Saez & Zucman (2019), the simulation model has been developed using the software Excel. A detailed description of each worksheet presented in the model file is in Appendix. The model computes Effective Average Tax Rates (EATRs) and Effective Marginal Tax Rates (EMTRs) for each income class, and uses these variables to determine the Marginal Excess Burden, the level of concentration of income and the social welfare weights expressed by the system. The model also (partially) decomposes EMTRs and EATRs, to distinguish the implicit impact of each fiscal expenditure on rates. Furthermore, when a reform is applied, the model computes changes in marginal tax rates, and calculates the potential behavioural responses for each income class. Effective average tax rates are defined as the ratio between effective tax liability and the gross income. Effective marginal tax rates are calculated as the ratio between the variation in effective tax liability over a small income variation[25]. Income-dependent fiscal expenditures and transfers have been taken into account for the EMTRs calculation. In some cases, deductions and tax credits increases with income by the same percentage. For the tax credits for dependent employment, self-employment, pension, dependent family members and the IRPEF bonus , a strategy based on percentage variation predicted by the legislator has been implemented. The Appendix provides specific details on how the EATRs and EMTRs have been computed and decomposed.

For the upcoming analysis, it is important to keep in mind that redistribution is achieved whenever the EMTR is larger than the EATR. Firstly, Figure 5.1 shows the EATR and EMTR distributions in the current IRPEF.

On the aggregate level the IRPEF is clearly progressive, with an increasing EATRs distribution, which remains constantly below EMTRs up to the end of the distribution. There is only one exception for the lowest income class of the distribution. Almost all individuals with negative self-employment income belong to this class. In Italy, for all self-employed, there is always a minimum contribution due for social security that is fixed and independent from income. Consequently, when suffering severe loses, self-employed people at the very bottom of the distribution ended up paying a positive amount of taxes, as welfare transfers are not sufficient to

[25] The model considers a 3% income increase.

cover the minimum contribution. Therefore, the average tax rate is higher than the marginal tax rate, equal to zero, for the poorest income class, and the system tends to be regressive in this point.

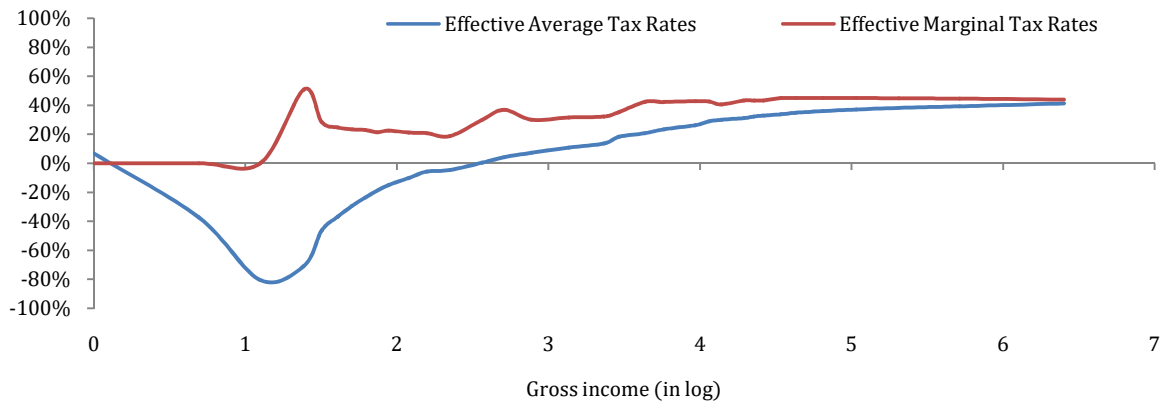

Figure 5.1 IRPEF Incidence Analysis
Source: Author calculations

The marginal tax rates are consistently below 45%. The pattern of the EMTRs replicates the one estimated by Di Nicola et al. (2017), with some small differences at the bottom and at the top. Differences at the bottom are explained by the inclusion of welfare transfers, which are not fully included in the analysis of Di Nicola et al. (2017), while difference at the top are only driven by the aggregation process. Di Nicola et al. (2017) considers decile of the population, instead of specific income classes. By computing the weighted average for the top 5 income classes in this paper's model, which corresponds to the top decile in terms of population, the effective marginal tax rate becomes almost equal to the one of Di Nicola et al. (2017).Overall, the similarity in results increase the confidence in the precision of the methodology.

The marginal tax rates at the bottom are nearly equal to zero for income classes with negative or null incomes. This happens when the tax liabilities for these individuals remain always equal to zero, even for a marginal income increase. The only elements affecting marginal tax rates in that case are the IRPEF bonus and the welfare transfer. The latter does not change, since, for null or negative incomes, its value is fixed to the maximum. The IRPEF bonus changes insignificantly for negative income classes and it is not reported in the dataset (because of frequency lower than three) for income class "zero".

In general, a whole set of fiscal expenditures are related to the level of income of each single individual. In many cases, an income increase causes the value of the tax credit to decrease or vanish completely. Consequently, when a system is progressive, the EMTRs are consistently

above EATRs, up to the end of the distribution where the two rates converges. The EMTR distribution shows that marginal tax rates remain substantially stable around 22% for all income classes below the no-tax area threshold. This happens because all non-refundable tax credits are sufficient to keep the tax liability at zero, even for a marginal income increase. The implicit effect of the statutory tax schedule on marginal tax rates is perfectly off-set by the one of non-refundable tax credits and deductions. Thus, only the IRPEF bonus, the welfare transfer and the social security contributions are effectively influencing marginal tax rates in that part of the distribution. This can be easily observed in Figure 5.2, which shows the decomposition of the EMTRs along the income distribution. The impact of SSCs in particularly large on the first class with positive average income, as contributions starts to be income-dependent for all categories of incomes (in addition to the minimum fixed contribution for self-employment).

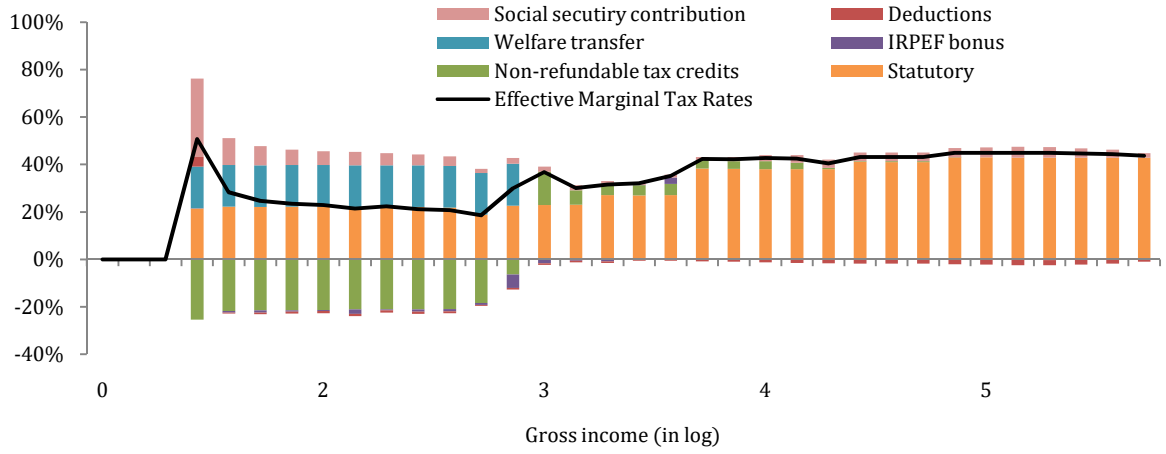

Figure 5.2 Effective Marginal Tax Rates decomposition
Source: Author calculations

The marginal tax rate suddenly increases right after the income threshold of 8,000 euro. It is around 19% between 7,500 and 10,000 euro, and it reaches 36% between 10,000 and 12,000, when the tax credits for employment starts to decrease consistently. The marginal tax rate would be even higher in this point without the effect of the IRPEF bonus, which increases significantly after the 8,000 euro threshold. The increase is followed by a reduction after 12,000 euro, with the marginal tax rate that drops to 30% and then growth steadily up to 35% again between 26,000 and 29,000 euro. The marginal tax rate in this point is increased by the impact of the IRPEF bonus, which suddenly drops to zero. From this part of the distribution, marginal tax rates remain stable around 42%, driven by the increase in statutory rates, with a slight reduction until 55,000 euro, and a deeper drop at the income class "from 55,000 to 60,000", where the EMTR falls to 40%. Marginal tax rates tend to be higher below this point mostly because of the tax credits for employment, self-employment, and pension. When income

marginally increase, the value of the credit scale down with it, increasing the relative amount paid on the last euro earned, and, consequently, the marginal tax rate. When this credit is no longer effective, right after the income threshold of 55,000 euro, an income increase would not correspond to a reduction in the value of the tax credit, so the tax debt on the last euro earned is relatively lower, and the marginal tax rate decreases. After 60,000 euro, there are mostly deductions (and for a minimum part the tax credits for dependent family members) that keep marginal tax rates above average tax rates. In the last part of the distribution, for all incomes above 80,000 euro, the effective marginal tax rates rise up to 45%.

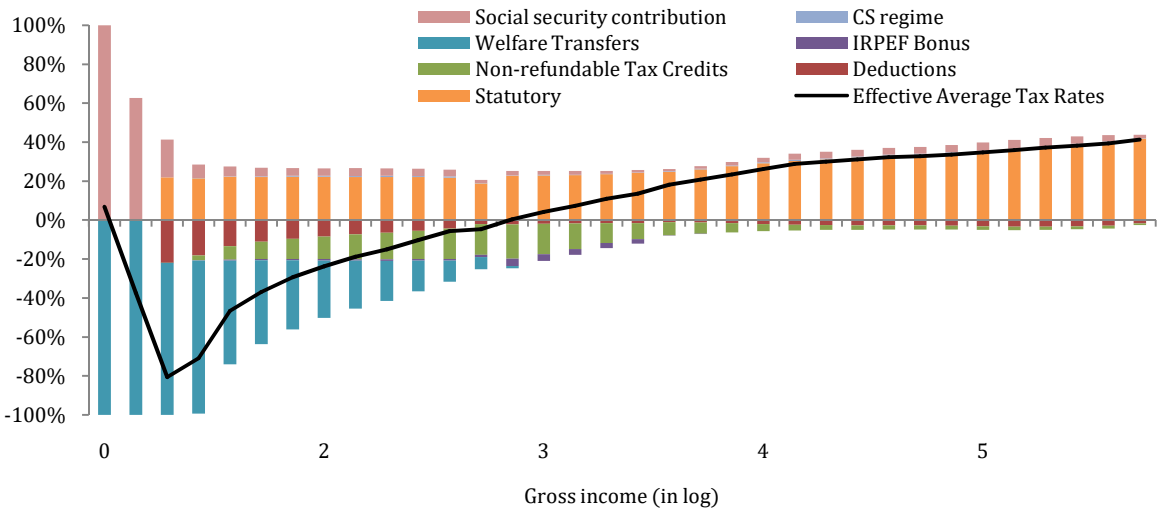

Figure 5.3 Effective Average Tax Rates decomposition
Source: Author calculations

By focusing the analysis on the EATRs, Figure 5.3 shows the implicit impact of each component of the IRPEF on the effective average tax rates.

As previously mentioned, the effective average tax rate is positive for the poorest income class. The tax liability from the IRPEF in this case is equal to zero. Thus, the effective tax liability is represented only by the amount of social security contributions, while the gross income consists in the welfare transfers. As social security contributions are larger than transfers, the effective average tax rate is positive for the poorest individual in the distribution. In it is important to notice that this class is entirely formed by self-employed individuals who suffer severe losses. This indicates that the minimum fixed SSC might be too large and harms the progressivity of the Italian PIT. This fact is further confirmed by the second poorest income class, also formed mostly by self-employed individuals. Even if the EATR is negative for this class, it is still higher compared to the "zero" income class, that reach the minimum average tax rate at -80%.

Given the structure of the tax credits for dependent employment, self-employment and pension, the non-refundable tax credits component should be sufficient to match precisely the statutory tax liability. However, it does not seems to be the case, especially for really low income classes. Many individuals in these income classes possess only low real estate incomes, which are not affected by the employment tax credits. Moreover, such incomes are often taxed under the "Cedolare Secca" substitutive regime. By giving up the possibility to access deductions and tax credits on real estate income under the substitutive regime, low income classes tends to pay more than what they effectively have to, because their income bracket would not change even with an enlarged tax base. They would pay taxes at the same rate, but with access to all tax credits. People are not always aware of how much they are going to deduct in the moment they have to decide for one regime or the other. Thus, their decisions are often not optimal and they ended up paying more taxes, harming the progressivity of the system. In addition, social security contributions are not affected by tax credits, adding a positive component to the effective average tax rates. However, the welfare transfers compensate these effects, substantially reducing tax rates on low income classes. The EATRs remain negative up to the virtual no-tax area threshold at 8,000 euro.

After this point, the impact of the IRPEF bonus became much more significant in keeping the debt low for his targeted income classes, up to 26,000 euro, the welfare transfer component disappears, while the non-refundable tax credits diminish substantially. The latter will become almost insignificant on the overall computation after 60,000 euro, when the employment tax credit falls to zero. For the rest of the distribution, mostly deductions will contribute to the reductions of the effective tax liability. The implicit impact of deductions and non-refundable tax credits in each income class is perfectly coherent with the one estimated by Cammeraat & Crivelli (2020) with the EUROMOD, but tax rates appear to be lower on the top income class. This is easily explicable by considering that the EUROMOD aggregates data in deciles, and the last Italian income decile includes more or less all aggregated income above 40,000 euro. Consequently, the average in a less detailed classification is lower, as shown by the comparison.

What does this analysis suggests about the IRPEF? Overall, it is immediately notable that the majority of fiscal expenditures included in the model have little impact on the final level of marginal and average tax rates, with little consequences in terms of redistribution. This finding confirms what have been highlighted by many authors and with different methodologies[26]. Effectively relevant elements are the dependent employment, self-employment and pension tax credits, the IRPEF bonus, the tax credits for dependent family members and the welfare

[26] Di Caro (2020), Barbetta et al. (2018), Barrios (2019), Cammeraat & Crivelli (2020)

transfers. All other fiscal expenditures' effect on the tax regime is at least an order of magnitude lower compared to the four previously mentioned credits. This fact will be later confirmed in a deeper analysis of each fiscal expenditure accounted in the model.

Many of these expenditure have been put in place with specific goals, such as the tax credits for anti-seismic measures or for some health expenditures. However, one might question the cost/benefit trade-off of such measures. While there are benefits other than redistribution, the gigantic amount of rules and the required documents effectively increase the complexity of the system. Adding layers on layers of rules without simplifications caused great confusion to all individuals involved. Taxpayers must preserves accounts of each single expenditure to legally enjoy for some credits and they are often ignorant about which fiscal expenditures they have rights for. Tax consultants complain about the impossibility of constructing a proper tax plan, given the extremely variable and detailed system. Tax authorities face higher costs in order to keep track of all rules, and are less efficient in spotting anomalies, in the intricate web of the IRPEF system, leaving more space for tax evasion.

Another issue is related to the marginal tax rates schedule. In optimal taxation theory, we would expect the marginal tax rates to be higher at the bottom compared to the rest of the distribution. In particular, given the density distribution, we would expect high equity gains at relatively low efficiency costs from higher marginal tax rates up to 15,000 euro, a drop in marginal tax rates between 15,000 and 40,000 euro, around the mode, and a further increase after this threshold. While the precise optimal schedule depends on various factors, not only on the income density function, the lower level on marginal tax rates at the bottom observed in the Italian tax system compared to the rest of the distribution suggests that a reform which increases such rates might bring higher benefits in terms of redistribution with relatively lower costs in terms of efficiency. It should be noted that the marginal tax rates at the very bottom, below 8,000 euro, are almost totally explained by the artificially constructed welfare transfer, as the non-refundable tax credits in that range are constructed to exactly match the impact of statutory tax rates on the marginal schedule. As previously observed, the welfare transfer in the model might underestimate the real impact of income-dependent transfers on marginal tax rates. However, even if the estimated rates in the model are, in a bad case scenario, half of the real marginal tax rates, there might still be gains in terms of redistribution from an EMTRs increase. One way to do so would be to increase the number of income-related transfers, or to make some tax credits refundable for very low income classes.

6. IRPEF SUBSTITUTIVE REGIME AND FISCAL EXPENDITURES

This section focuses on a deeper analysis of the CS substitutive regime as well as the main Italian fiscal expenditures, shading some lights on the equity-efficiency trade off of these elements.

6.1 THE "CEDOLARE SECCA" REGIME

The substitutive regime included in the model is called the "Cedolare Secca" (CS) regime. Access to this regime is available for some form of income derived from real estate. In particular, it is possible to declare real estate income under the substitutive regime when the related property is employed for housing purposes, for business purposes, when the business is particularly small, or for real estate contracts below 30 days of duration. All these sources of income could be taxed at a flat rate of 21%. In addition, in case the estate is located in a specific seismic area or is located in areas with high population density and scarce housing (areas directly defined by the central government each year) the rate is further reduced to 10%. In exchange for access to this regime, the individual looses the right for deducting all of his expenditure (on the real estate income). In addition, the individual cannot change the value of the rent established in the contract when the CS option is activated for the entire duration of the contract itself. While at first glance this regime seems convenient, in fact its effect on the final tax of an individual depends on the amount of tax credits or deductions the individual is entitled for. Often, taxpayers do not know the effective values of all the fiscal expenditure they have right for (or will have right for) in the moment they decide for the ordinary or the CS regime. Consequently, especially when individual lack in tax "literacy", the choice of the regime is often not optimal. Later in this paper, I will provide evidence of this mechanism on the MSM, and how in fact low income classes would have much more fiscal advantage remaining in the ordinary regime compared to the CS, while high income classes are favored by the CS regime.

6.2 IRPEF MAIN FISCAL EXPENDITURES

Aggregated data from tax declarations have an important advantage. Even considering that the model is less precise, compared to one calibrated on micro-data, as some tax rules are computed on average level, this macro dataset allowed for the inclusion of virtually all tax expenditures directly related to the Italian PIT. According to the Tax Expenditure Reports (2019)[27] published by the Ministry of Economics and Finance (MEF), related to the 2018 fiscal period, there are 533 different tax expenditures in all the Italian taxation system, of which around 350 are included in the IRPEF. The total value of deductions and tax credits reported in aggregated tax declarations

[27] Available on the Italian MEF website. Link in the bibliography.

amount for 65% of the total net tax liability, or 5% of the Italian nominal GDP in 2018. Table 11.1 in the Appendix summarize all main fiscal expenditures included in the model, with their nominal value and share over total.

It is important, from a perspective of an incidence analysis, to focus the attention on the main fiscal expenditures included, in terms of nominal value, on how these expenditures are distributed along different income classes, or on how many tax payers effectively obtain fiscal advantages.

As previously noted, Italian fiscal expenditures could be divided in two macro-categories: deductions, subtracted from the total income in order to obtain the taxable income, and tax credits, subtracted from the gross tax.

6.2.1 MAIN DEDUCTIONS

There are three main deductions that covers more than 80% of the total: social security contribution (SSC), complementary SSC, and the main residence deduction.

Social security contributions in Italy are mandatory and centrally established, amounting for 33% of the wage of an individual. For dependent workers, the burden is shared with the employer, who has to cover 23.81 percentage points, leaving the remaining 9.19% of the burden on the worker. For the self-employed, it is normally around 25%, but with a lot of variation depending on different factors, like the type or the legal framework of the business. The Italian social security contributions covers pension, as well as disability, maternity and unemployment insurances. The entire amount of mandatory social security contributions is deductible from total income for the calculation of taxable income. Moreover, individuals can voluntary take part to complementary pension schemes, for which regular payments are fully or partially deductible, depending on the type. In total, all SSCs cover around 66% of all deductions, of which 54% are from mandatory SSC and the remaining from complementary SSC. The distribution of SSCs along different income class reflects a pretty even situation, without large concentration of nominal value of deductions in some particular income class, nor unexpected changes in average value per tax payer, which shows a steadily increasing pattern, as one would expect given the structure of the mandatory SSC.

The second main deduction provided by the Italian legislator is the main residence deduction. This rule allowed all tax payers (independently from the level of income) to deduct the cadastral rent of the main residence of property from the total income for the calculation of taxable

income. Figure 6.1 shows the average value of this fiscal expenditure and the share of beneficiaries who receive the credit in each income class, with respect to the total number of taxpayers in that class. The graph indicates how in fact this deduction tends to favor middle and middle-high income classes. The share of beneficiaries of the credit increases with income, from the minimum value detected of 15.43 % between 2,000 and 2,500 euro, up to its apex at 71.81 % between 80,000 and 90,000 euro. Moreover, the average value per person remain stable for low income classes, but starts growing consistently with income after 20,000 euro.

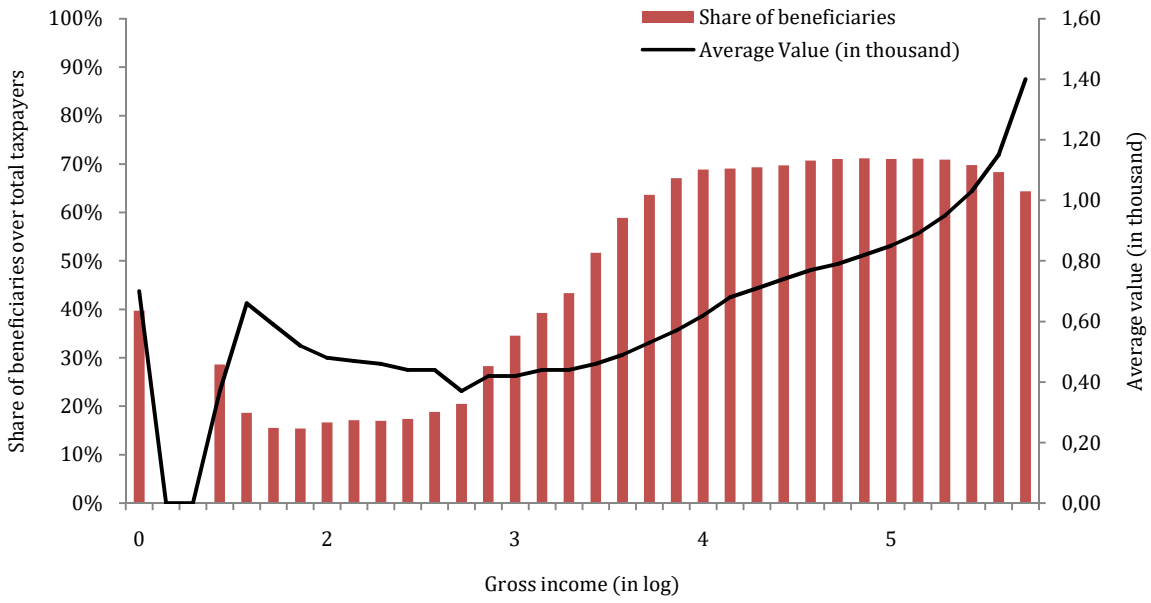

Figure 6.1 Main Residence Deduction
Source: MEF data

All in all, this suggests that the deduction on main residence might be a regressive component of the IRPEF regime. The result would confirm what have been often sustained by the literature on fiscal expenditures related to housing property[28]. The main residence deduction amount for 25% of all total deductions in 2018, and covers around 43% of all tax payers, one of the largest coverage, even considering both deductions and detractions.

6.2.2 MAIN TAX CREDITS

Tax credits are the most complex part of the Italian taxation system. There are 28 variables related to tax credits included in the MSM, which encompass around 60% of all Italian fiscal expenditures in the IRPEF.

[28] See Barbetta et al. (2018), Di Caro (2020), Cammeraat & Crivelli (2020), Barrios et al. (2019).

Most of these credits are related to individual costs sustained for different purposes the government wants to incentivize. Some of these expenditures could be fully subtracted from the gross tax debt, while others could be subtracted for a certain percentage of their total value. All together, this last category of credits amount for 21% of the total tax credits. The major component of this share (almost nine percentage points) is related to expenditures for "building heritage" renovations. To this variable belongs 50% or 36% of the expenditures for restoration, renovation, or anti-seismic measures of a building or a private garden exposed to public views, with a maximum cap value dependent on the type of expenditure.

Around eight percentage points of the share of tax credits for individual expenditures derives from individual expenditures deductible at 19% of their value. A list of this particular group is provided in Table 6.1.

Table 6.1 Tax credit for individual expanses imputed at 19% of their value

Name	% Share over total
Expenditures for healthcare	61,89%
Mortgage interests on main residence expenditure	15,17%
Interests on agricultural loan or mortgage	0,03%
Life, injury and disability Insurance	4,68%
Expenditures for education	9,63%
Funeral expenses	2,34%
Expenses for dependent personal care worker	0,76%
Real estate intermediary expenditures	0,33%
Physical activity expenses for young people	1,35%
Rental cost for dependent students abroad	1,53%
Natural disasters insurance	0,04%
Other tax credits at 19%	2,25%

It is clear that the main components of this particular type of tax credits are deductible expenditures for personal (and dependent family member) healthcare and the interest on mortgage for the acquisition of the main residence. The interest is deductible for a maximum value of 2.582,28 euro. This particular tax credit tends to favour middle and middle-low income classes, which have normally the possibility for accessing the mortgage (differently from low income classes), and the value of passive interest is likely below the threshold (compared to high income classes). Around 9% of all tax payers have deducted the mortgage interest on main residence. This is in line with results derived from Di Caro (2019), which found almost insignificant impact of the credit on progressivity.

Similarly to this category, there are three types of individual expenditures which can be subtracted from the gross tax for a partial amount of their value: donations to (generic) non-profit organizations and political parties; donations to non-profit organizations inscribed in the national registry for social utility; donations to voluntary organizations. The shares that could be detracted from the gross tax liability in these cases are respectively 26%, 30%, and 35%[29].

The greatest credit in term of gross value, with 60% over total tax credits, is the one granted for dependent employment (or legally similar to dependent employment), self-employment and pension. These group of tax credits are non-refundable working tax credits and are known in Italy for generating a baseline no-tax area for certain income levels. This means that the right to obtain the credit depends on the condition that the individual is actually earning one of the aforementioned incomes. Understanding the structure of these credits is fundamental for evaluating the marginal tax rates of the actual system and how it changes for a given reform. Table 11.2 in the appendix summarize how it is calculated respectively for dependent employment income, pension income and self-employment income. Table 6.2 shows the values and frequency of these tax credits along the income distribution.

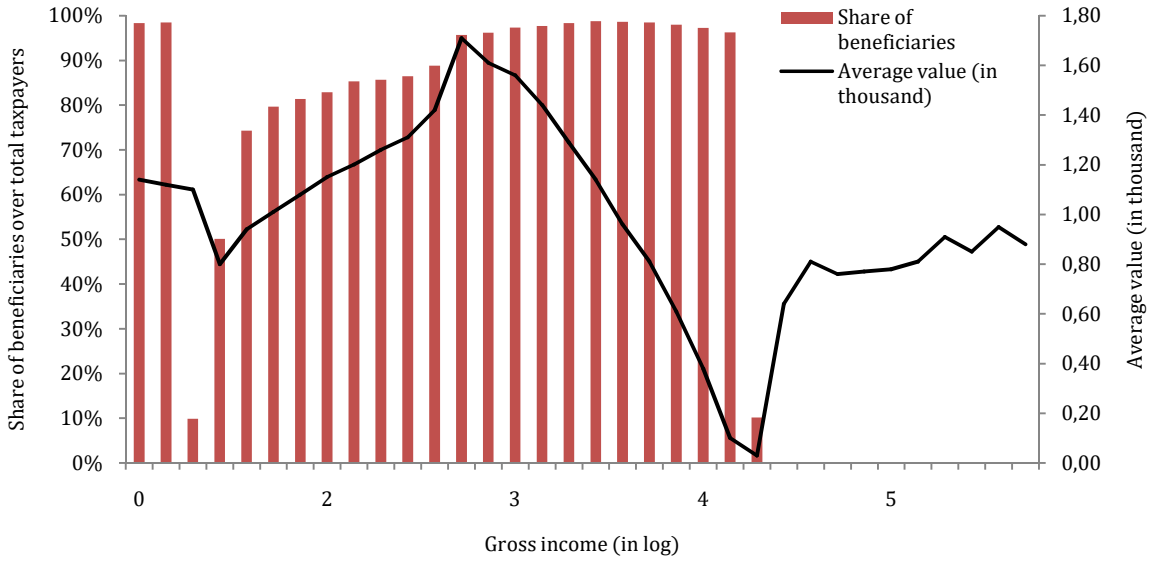

Figure 6.2 Tax credit for employment, self-employment and pension
Source: MEF data

Real estate rents taxed under the substitutive CS regime are also included in the aggregated income used to establish the right income bracket. The value of 1.880 euro (or 1.104 euro for

[29] In the simulation model, all these individual expenditures are grouped separately from other tax credits in the worksheets called "Partial Individual Expenditures".

self-employed) is exactly equivalent to the tax of an individual with taxable income equal to 8.000 euro (or 4.800 euro for self-employed). Therefore, these two numbers represents the bound under which one is exempted from individual taxation, respectively for dependent employee/pension income and for self-employed income. In fact, these credits rapidly increase in value and frequency between 4,000 and 8,000 euro, with its maximum average reached at this point, and a structure of decreasing values up to 55,000 euro. Consequently, I expect a significant impact of this credit on marginal tax rates. In the aggregate dataset, there are really few individuals (0.004%) which appears to have access to this credit even if their income classes are above the boundary of 55,000 euro. While from the aggregated data it is not clear why such individuals received the credit, the average values for those classes is far from zero and does not decrease with average income. This is important to keep in mind later on for marginal tax rate calculations.

The second largest tax credit in the Italian system is the one for dependent family members, which account by itself for 17% of total tax credits. A family member is considered dependent if his total income was below 2.840,51 euro in the antecedent fiscal year. When there are more than one taxpayer in the household, the credit could be divided according to pre-established criteria or entirely assigned to the main taxpayer of the family. The latter is usually the favourite option.

To be precise, the variable "Dependent family members" considered in the model is the sum of four different tax credits:

- For children between 3 and 24 years old: up to a maximum of 950 euro per child scaled with income, which become zero for income above 80,000 euro. This upper bound increase with the number of dependent children. The theoretical value per child is increased by 400 euro for handicapped children, by 270 euro for children below 3 years old, and by 200 euro when the number of children is bigger than 3.
- For dependent spouse: up to a maximum of 800 euro scaled with income, which become zero for income above 80,000 euro.
- For large families: fixed amount of 1,200 euro, recognised when the individual is entitled for dependent children credits and the number of children is bigger than 3.
- For other dependent family members: up to a maximum of 750 euro scaled with income, which become zero for income above 80,000 euro.

6.2.3 THE IRPEF BONUS

The IRPEF Bonus, better known as "Renzi's Bonus" from the name of the Prime Minister who introduced it, is a refundable working tax credit for dependent employment, an individual direct transfer recognised only to dependent employees and similar. This transfer could be added to the monthly wage from the employer, who generate a credit with the tax office, or directly paid at the end of the year by the tax office itself. The first condition to access this Bonus is to have a gross income bigger that the tax credit for dependent employment. This means that all individual below the threshold of 8,000 euro do not receive this credit. With a total income between 8,000 and 24,400 euro each individual is entitled to receive a fixed amount equal to 960 euro. Between 24,400 and 26,600, the theoretical value of the bonus scales down with income according to the following equation:

$$IRPEF\ Bonus = \frac{(26{,}600 - Total\ Income)}{2{,}000} * 960 \qquad 6.1$$

The theoretical value of the bonus scales proportionally with the days worked in the entire year. Above 26,600 euro the bonus is no longer accessible. For sake of precision, in February 2020, with the D.L. 2020 n.3[30], the government has substantially reformed the structure of this bonus. The theoretical value have been permanently increased up to 1.200 euro, the top boundary extended to 28,000, and the bonus will be temporarily recognised to individuals with total income between 28,000 and 40,000 euro in form of credits, and not as a direct transfer, just for the corresponding part of the Bonus between 1st of July and the end of the fiscal year 2020. However, the MSM has been calibrated starting from aggregated data of the fiscal year 2018, when the Bonus was structured as in the original form. Consequently, I decided not to implement the most recent development, also in consideration of the fact that this decree has been designed to be impermanent and changed in the next fiscal year. Figure 6.3 shows the average values and frequencies of the IRPEF Bonus for each income class. The IRPEF Bonus amounts to almost 9% of all IRPEF tax credits in term of gross value and covers 29% of the entire population of taxpayers. Its distribution clearly reflects the structure, being equal to zero outside of boundaries with a sharp decline around 26.000 euro. Given that the amount of the Bonus is fixed as soon as income pass the lower bound, we would expect a huge reduction in marginal tax rates around the lower bound, with a less sharp but meaningful increase in marginal tax rates at the top.

[30] "Decreto Legge 2020 n.3". In English "Law Decree 2020 n.3". The abbreviation follows the Italian official legal quotation methodology. Full Text available on the official web page of the Italian Senate. Link in bibliography.

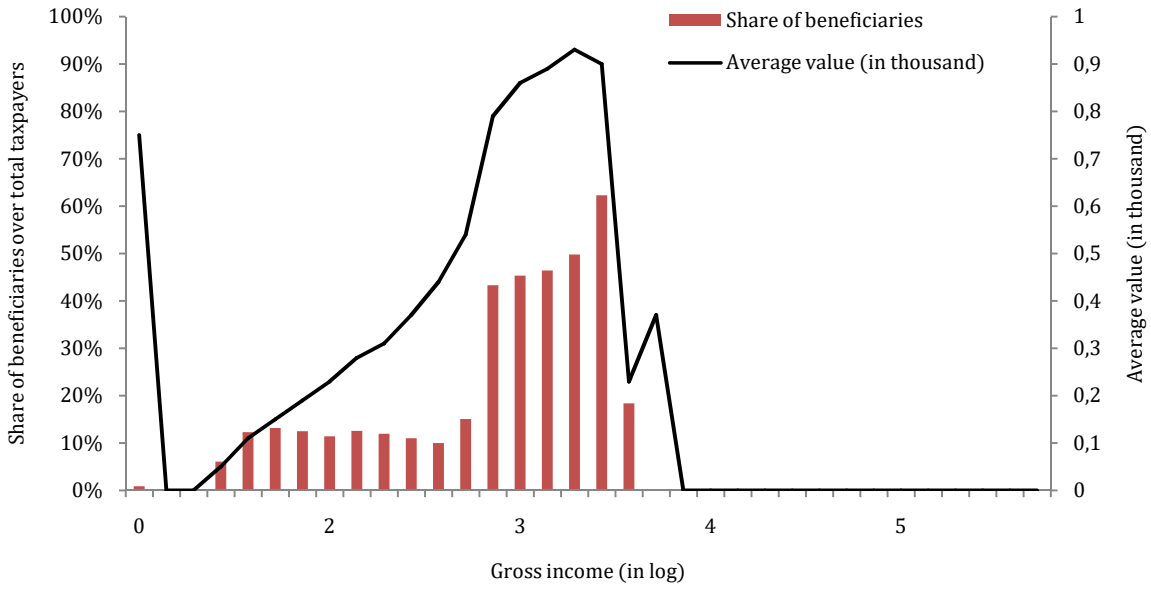

Figure 6.3 IRPEF Bonus
Source: MEF data

The IRPEF Bonus is the only component strictly related to the Italian PIT administration which can generate a "negative" tax debt. This means that the credit in this case is considered refundable.

6.2.4 WELFARE TRANSFERS

To compute marginal tax rate, it is important to consider all kind of income-dependent transfers to individuals. A marginal increase in income would cause such transfers to change. The amount of tax an individual have to pay on the next euro earned should also take into account the negative (or positive) variation of the transfer with respect to income, as an additional cost (or benefit). Consequently, the marginal tax rate is affected by such transfers, and they need to be included in the model.

There are two main income-dependent transfers in the Italian system (beside the IRPEF Bonus directly included in the IRPEF): the allowance to family household (known in Italy as ANF[31]) and a peculiar form of basic income, called "Reddito di Cittadinanza" (RdC) or "Pensione di Cittadinanza" (PdC), for workers and pensioners respectively.

The ANF is an allowance granted to certain family households for which the aggregate income of all members of the family is earned at least for 70% of its value through dependent employment

[31] In Italian, "Assegno al Nucleo Familiare".

or pension. The amount of the transfer depends on the number of dependent family members in the household, their relationship with the main earner (like brothers, children or parents), their age and condition (if with disabilities), and ultimately, from the aggregate income of the entire household. Each year, the Italian legislator provides a table that specifically indicates the rightful amount for each case. To obtain the allowance, the household must contain at least three members. For a given set of conditions, the ANF could remain positive for aggregated family incomes up to 101.499,40 (for households with seven or more members). Above this level, the allowance is always equal to zero.

The RdC/PdC are also transfer to households. In particular, this type of allowance is distributed to household that respect certain personal and patrimonial characteristics and for which the ISEE income is below 9.360 euro. The "Indicatore della Situazione Economica Equivalente", or ISEE, roughly translated to "Equivalent Economic Status Indicator", is a peculiar methodology to calculate the effective total income and properties of an household. The transfer consist in a monetary integration of income up to a specific ISEE income level established by the Italian legislator. This level depends on the number of dependent family members of the household, from a minimum of 6.000 euro for household with one member, to 13.200 euro for household with four member, one of which with disability. In addition, the ISEE income level is increased by a maximum of 3.360 euro for household families living in a rented dwelling. For these cases, the economic integration will also include the amount of the rent.

Both these allowances are managed by the INPS[32], another Italian institution entitled for the collection of social security contribution, as well as for the distribution of any form of welfare transfer established by the Italian legislator. Unfortunately, the MEF dataset does not include data related to such transfers. The INPS provides some data[33], but they are scarce and follows different classification from the one employed in the MEF dataset. Moreover, given the nature of these allowances, which are distributed to households and not to individuals, it is impossible to precisely estimate the value of such welfare transfers with aggregate data. However, the analysis of behavioural responses requires that at least the impact of such transfers on marginal tax rates must be taken into account.

Therefore, I decide to create ex-novo a transfer which emulate the behaviour of the RdC/PdC. For now on, I will refer to this element as "Welfare Transfer". The amount of this transfer in each income class is equal to the difference between the mean aggregated income and 9.360 euro, multiplied by the frequency of the transfer in each income class. To calculate the frequency, I

[32] In Italian, "Istituto Nazionale Previdenza Sociale".
[33] INPS data on the RdC/PdC are available on the website. Link in the bibliography.

consider the total number of individuals who benefit from the RdC/PdC in 2018 from the INPS dataset (2.216.919 people). I assigned the number of beneficiaries in each income class proportionally to the number of taxpayers, with respect to the total taxpayers of all income classes below the threshold. The total value of this welfare transfer is roughly equal to eleven billions euro, which more or less equates the total amount of all income-dependent allowances distributed by the INPS, according to their data. Consequently, it is reasonable to believe that this personalised structure of the welfare transfer is not far from reality, but leads the model to overestimate marginal tax rates below 9.360 euro and to slightly underestimate them for some income classes above (but near) that figure.

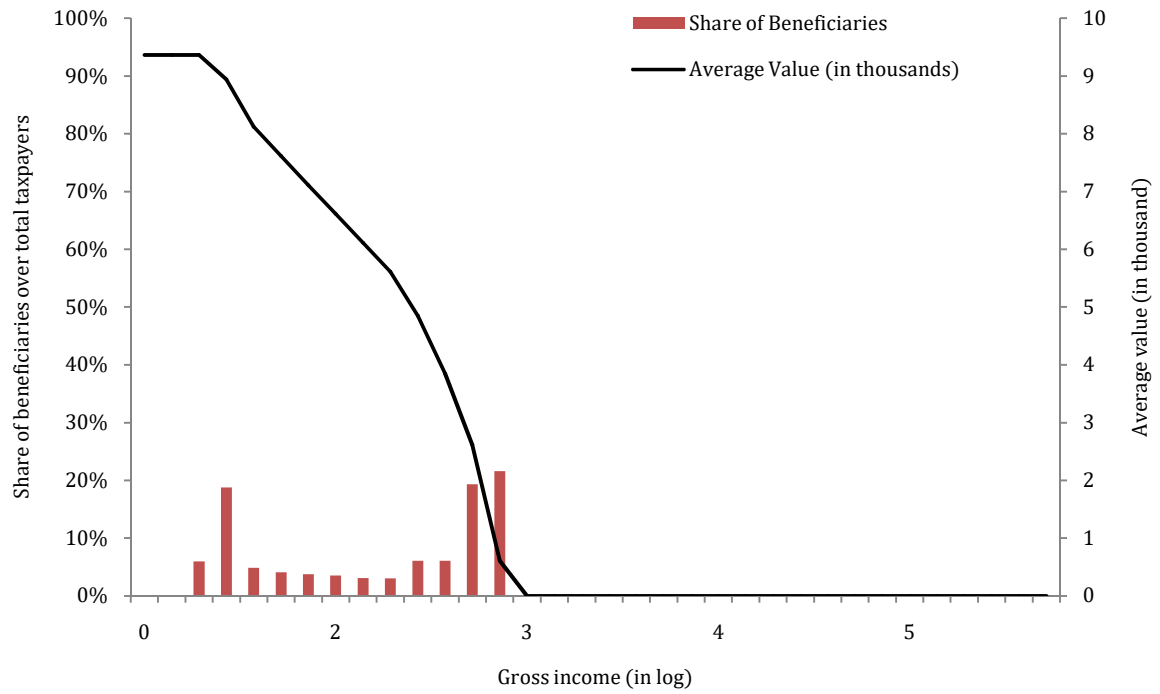

Figure 6.4 Welfare Transfers
Source: Author calculations

Moreover, this modification does not allowed measures of inequality included in the model to precisely reflect the real level of inequality in the economy, which is in fact underestimated. Anyway, the structure of the generic welfare transfer should emulate the one of the RdC/PdC, and should be able to capture its average impact on marginal tax rates. The frequencies and the average values of this welfare transfer along the income distribution are plotted in Figure 6.4.

6.3 FISCAL EXPENDITURES ANALYSIS

As previously stated, the model is able to compute the Marginal Excess Burden, the GINI coefficient (the RS index) and the behavioural responses induced by variation in marginal tax

rates. Details on the calculations of these elements are reported in the Appendix. All indicators used in the analysis aimed at shed some lights on the Italian fiscal expenditures' equity-efficiency trade off.

With the option for deactivating any fiscal expenditure, the model allows to compare changes in incidence, progressivity, and related distortions of each component. It is possible to use this strategy to infer on the overall effects of each fiscal expenditure on the entire system. Figure 6.5 have been constructed following this principle.

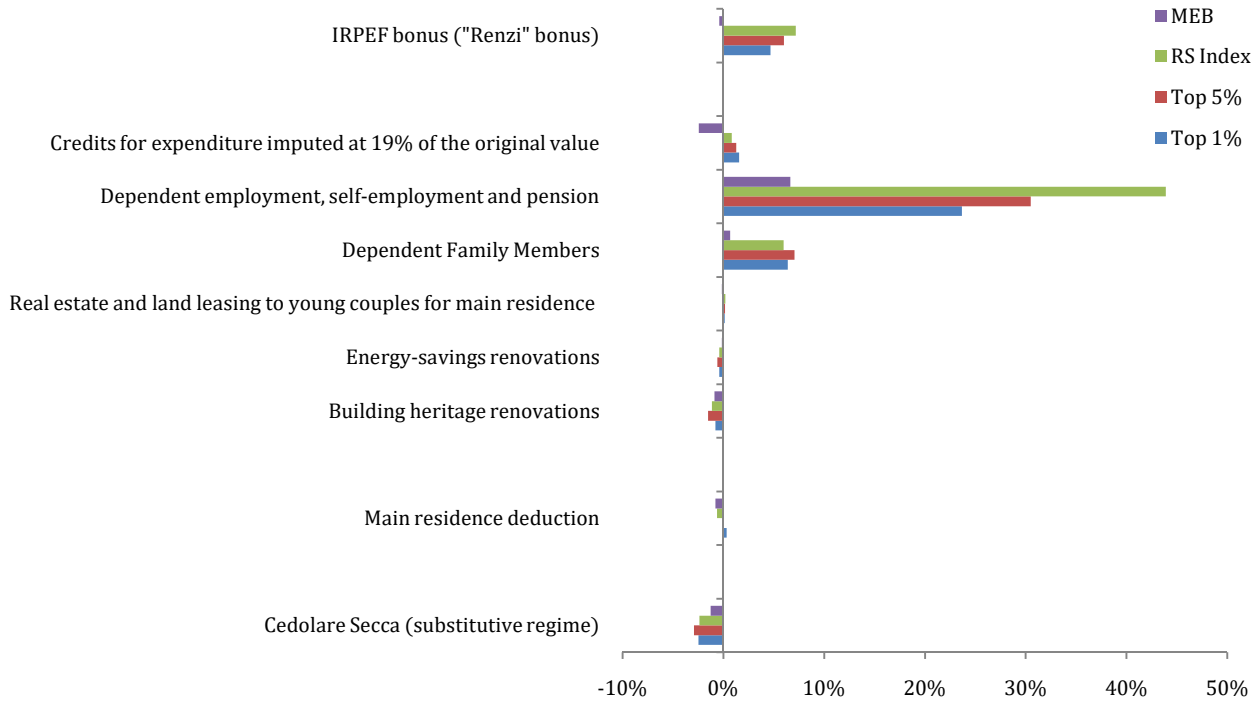

Figure 6.5 The equity-efficiency trade-off of fiscal expenditures
Source: Author calculations. The purple bar represents the impact of the tax expenditure on marginal excess burden. Red, blue and green bar represent the impact on redistribution, according to different measures.

The graph shows the impact of tax credits, deductions and the CS regime on distortion and redistribution[34]. The purple bars represent the percentage variation in marginal excess burden between the IRPEF with and without the corresponding element. When negative, the fiscal expenditure reduces the distortions in the system. Blue, red and green bars accounts for the variation in redistribution. The model computes the difference in aggregate income before and

[34] Some fiscal expenditures have not been included in the graph to increase readability. However, values of redistribution and distortion are reported in the worksheet "Distortions vs Redistribution" in the Excel file. Expenditures have been excluded because are insignificant, or because they do not gave particular insight for the analysis., as structural components of the IRPEF (for example the SSC deduction).

after taxes for the top 1%, and top 5% income classes. Then, the model calculates the percentage variation of these values, as well as the percentage variation of the RS index, upon deactivation of a specific fiscal expenditure. Thus, when these newly constructed indexes are positive, it means that the corresponding fiscal expenditure increases the level of redistribution of the system.

Firstly, the graphs shows that the effects of tax credits for dependent employment, self-employment and pensions is one order of magnitude larger compared to other tax expenditures. This credit is responsible for the majority of the redistribution in the IRPEF regime. This finding confirms the results of ex-post analysis of Di Caro (2020) and Barbetta et al. (2018). In both cases, authors estimates these credits, combined with the dependent family members credits, to account for most of the redistribution in the IRPEF. The IRPEF bonus also presents a significant contribution in terms of equity.

With the classic trade-off between redistribution and distortions generated by taxes, a "bad" tax rule would present a positive impact on distortions and a negative one on redistribution. None of the components of the IRPEF has this feature. On the contrary, there are three "good" taxes: the IRPEF bonus; the tax credit which partially covers real estate income and rental income of properties used by young couples as main residence; the tax credits for expenditures imputed at 19% of their value. These credits have a positive impact on redistribution, and at the same time reduce the marginal excess burden of the IRPEF regime. The latter group of credits is also responsible for the largest percentage reduction in the IRPEF Marginal Excess Burden.

The deduction on main residence presents a unique feature among other fiscal expenditures. It reduces redistribution from the top 5% and overall, by account of the RS index, but it increases redistribution from the top 1%. As previously noted, this happens because the bulk of beneficiaries of this deduction in concentrated among middle, middle/high income classes. Consequently, this part of the distribution, between 55,000 and 100,000 euro, tends to benefit more from this deduction relative to other income classes. The gain in terms of increased efficiency appears smaller compared to other fiscal expenditures with similar purposes, such as the building heritage renovation credit and all credits for expenditures imputed at 19% of their value.

The "Cedolare Secca" regime and the Building heritage renovation tax credit shows the classic dichotomy of taxation. Their presence reduces the amount of distortions in the model, at the costs of harming progressivity. It must be noticed that the Building heritage credit also serves the purpose of incentivising building renovation with anti-seismic measures, or for old

historical building. Thus, its benefit could be underrated by looking only at redistribution and distortions. However, both these components of the IRPEF favour house-owners, which tends to be in the richer part of the income distribution.

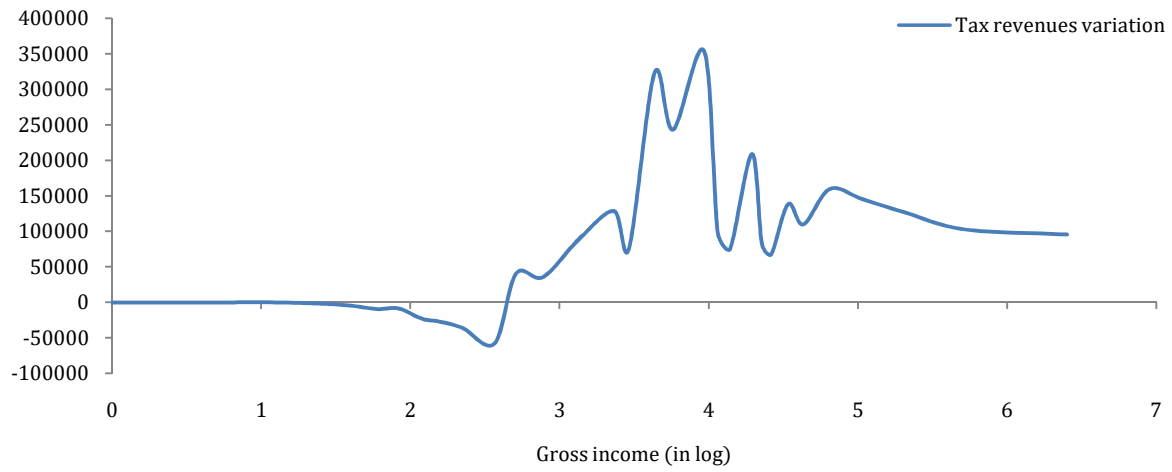

Figure 6.6 Tax Revenues Variation without CS regime
Source: Author calculation. Value reported in thousands

Focusing the attention on the CS substitutive regime can provide some more insights on its impact. Figure 6.6 shows the tax revenue variation upon deactivation of the CS regime for each income class.

The first thing to notice is that the removal of the CS regime reduces tax liabilities (and tax revenues) at the bottom of the income distribution, up to 10,000 euro. These reductions confirm the argument against the CS regime presented earlier. Losing access to tax credits and deductions represents a higher cost for low income classes, compared to the benefit of enjoying a flat rate on the entire value of the rent. Moreover, by including real estate income under the linear substitutive regime in the non-linear ordinary system, the higher is the income, the higher is the relative increase in tax revenues. Consequently, the system became more redistributive[35]. This argument is further confirmed if we look at the variation of tax revenue per capita in Figure 11.1 in the Appendix.

In light of the policy experiments conducted in the next section, it comes handy to look at the behavioural responses induced by the removal of the CS regime from the system. Figure 6.7 plots the per capita variation in reported income for each income class along the distribution.

[35] This finding is in line with the results derived by Di Caro (2018) with the RS index decomposition.

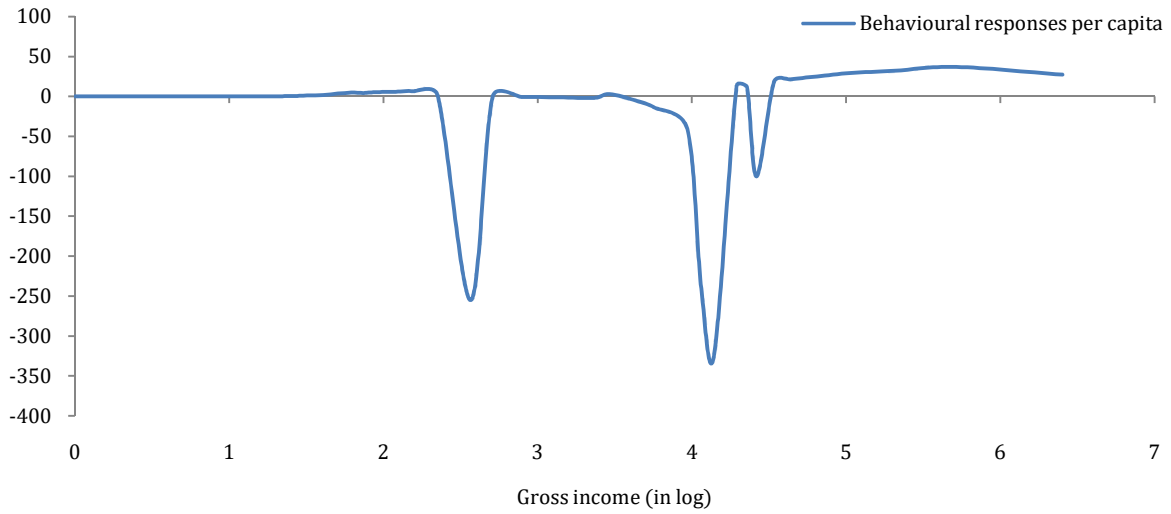

Figure 6.7 Behavioral responses per capita without CS regime
Source: Author calculations

It is immediately clear that the main responses are focused around statutory income thresholds. The reason is that the inclusion of real-estate income under the substitutive regime in the calculation for aggregate income "pushes" more individuals near or above relevant thresholds. This effect increases significantly marginal tax rates, compared to the rest of the distribution. The higher burden on the next euro earned increases distortions, inducing individual to report less income, or to reduce the amount of effort (and the earnings supply). That's exactly the case around 8,000 euro, because of the virtual no-tax area derived from tax credits for employment and pension, after 55,000 euro, when the statutory rate get almost to the top level and the credits for employment and pension drop to zero, and above 75,000 euro, the last income bracket threshold. Overall, the removal of the CS regime would increase tax revenues by 1.7%, roughly three billion euro, reduce the burden on low income classes, and increase redistribution by including more real estate income in a non-linear progressive scheme.

The analysis of each fiscal expenditure suggests that many of the elements included in the IRPEF have little impact on the overall system. All these rules carry another implicit costs related to the efficiency of the regime. Individuals have to bear the burden of providing evidences to obtain certain credits and to constantly update their knowledge on fiscal matters, while tax authorities bear the burden of verification. It might be the case that the IRPEF regime could reach the same level of redistribution at the same efficiency costs without the whole set of rules actually included, which would save costs in terms of collecting taxes and would reduces space for tax evasion practices. The next section will provide a more detailed analysis of such case, as well as other potential balanced-budget reforms.

6.4 ELEMENTS EXCLUDED FROM THE SIMULATION MODEL

Before digging deeper into the analysis of the model, it is important to keep in mind the set of taxes at personal level which have not been included in model for various reasons.

An important element not included is one peculiar substitutive regime, in Italy known as "flat" regime[36]. This regime allows VAT number holders, under strict conditions, to have some self-employment and business income taxed under a micro-regime, different from the IRPEF. In such a case, they would no longer have access to most of tax credits and deductions (except for those related to social security contributions). In exchange, taxable income is computed by reducing the part of income covered by the substitutive regime by a fixed percentage previously established by the legislator, for different categories of businesses. Then, the substitutive regime imposes a flat tax rate equal to 15% (which is reduced to 5% for new businesses). Around 770 thousands tax payers fall under this regime in the year 2018, for a total value in terms of tax liability of 787 million euro, which means that 0,5% of total tax revenue is not included in the MSM.[37] I decided to exclude this substitutive regime from the model because there are numerous and specific conditions, related to both current and previous tax declarations of an individual, to obtain access to this scheme. In addition, aggregated data reported in the MEF are only classified by Region or by type of business, differently from other variable in the IRPEF dataset. Consequently, it is not possible to emulate the effect of a marginal increase in income for each income class (in order to compute marginal tax rates), because it would be impossible, with aggregated data, to understand when stated conditions changes with income, losing the right for the substitutive regime. However, given the relatively small value of the regime per se compared to the ordinary IRPEF, the analysis should not be heavily affected, keeping in mind that for a complete welfare analysis one should consider this regime.

There are four taxes related to individuals not included in the model, because levied at local level. In particular, there are a regional and a municipal IRPEF supplements, the IMU and the TASI. The regional supplement could increase the statutory rates on the same income brackets decided by the central authority, by a minimum of 1.21 percentage points to a maximum of 3,33. The additional rates must be progressive, or equal for all income brackets. The municipal supplement follows similar rule, with no minimum and a maximum of 0.8%[38]. The IMU and TASI are local taxes levied by municipalities on some form of real estate income. In particular, for rental income and for some real estate income of properties that are not for rent. The taxable

[36] "Regime Forfettario" in Italian
[37] Data on the "flat" regime refers to 2018 and are published at aggregate level from the Italian Ministry of Economics and Finance (MEF).
[38] 0,9% in Rome.

income for these properties corresponds to the cadastral rent. The main residence is exempted from IMU and TASI. When the individual posses more than one non-rented estate in the same municipality, the value of that second estate is taxed under the IMU and reported at 50% in the IRPEF. Otherwise, the real estate income taxed under IMU and TASI is fully exempted from the IRPEF tax. In this regard, the IMU and TASI could also be considered a substitutive micro-regime. These taxes are set and collected by local authorities. Aggregated data are not sufficiently detailed to implement such taxes in the model, also considering that are not classified according to income classes. The regional supplement accounts for 1,796 million euro, the municipal supplement for 1,271 million euro, and IMU and TASI together are worth 610 million euro[39]. That is, 0.003% of the total national tax revenue.

7. IRPEF POLICY EXPERIMENTS

The model allows to experiment with many changes, by deactivating, increasing or decreasing each single element of the IRPEF regime. This section focuses on the analysis of various balanced-budget reforms, to shed some lights on the potential improvement applicable in the current system.

7.1 A FLAT RATE REGIME

In various occasion and forms, the Lega Nord party have proposed a flat rate regime for the Italian personal income taxation. The goal would be to drastically reduce the fiscal burden in order to enhance economic growth.

While the model does not account for the impact of taxation on long term growth, it can still provide some insights on the impact of such a system on the efficiency and the income distribution.

A roughly balanced-budget reform, keeping everything else constant, would require a flat rate equal to 27%. Figure 7.1 shows the equity-efficiency trade-off, as measured in Figure 6.5 in Section 6. It presents the percentage variation of the MEB, the RS index and the top 1% and top 5% income share reduction.

[39] Data from the Tax Revenue Bulletin of the MEF. Link available in the bibliography.

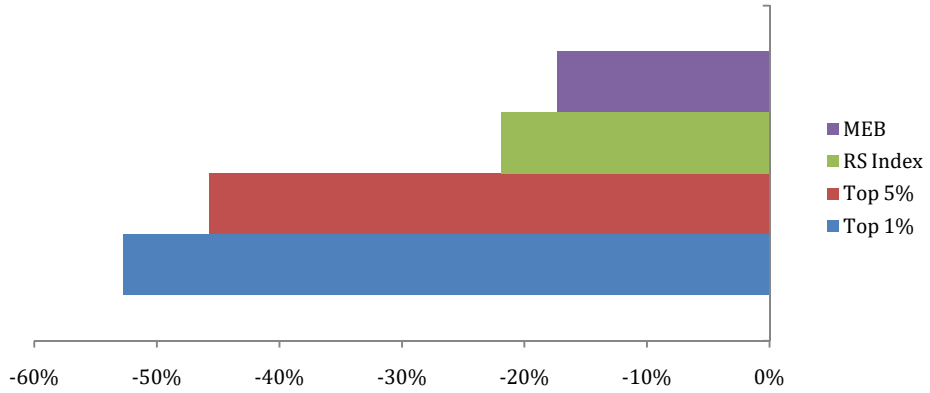

Figure 7.1 The equity-efficiency trade-off in a flat rate regime
Source: Author calculation

A flat rate scheme would in fact reduce the Marginal Excess Burden by around 17%, but the costs in terms of equity are enormous. The reform would reduces the RS Index by 22%, but the greatest change would be observed in the ability to redistribute from top 1% and top 5% income shares. These two groups are strongly advantaged by the reform, especially at the very top of the distribution. Consequently, we would expect this reform to increase income polarization, with lower taxes at the top of the distribution, and an increase on middle incomes.

This argument is further confirmed by looking at the tax revenue percentage variation (with respect to gross income) for each income class in Figure 7.2. The tax revenue does not change for negative and "zero" income classes, it increases up to 6% for all incomes between zero and 50,000, and it significantly and continuously decreases after this threshold. The top income class, with all income above 300,000 euro, experience a 13% reduction in due taxes. Overall, around 90% of the total taxpayers would experience a moderate increase in taxation, while only 9% of taxpayers would pay significantly less taxes. On the other hand, Figure 7.2 also shows that a flat rate would significantly reduces the marginal tax rates on the second half of the distribution, with increased reported income above 29,000 euro.

Another way to analyse the flat rate regime would be by asking the question: "What flat rate is capable of keeping the same level of redistribution of the actual system?". If the flat rate regime reduces distortions while keeping the redistributive power of the system at the same level, it would be a preferable choice. Ceteris paribus, a flat rate that would keep the RS index (as referring measurement for redistribution) constant in the IRPEF regime would be equal to 69%.

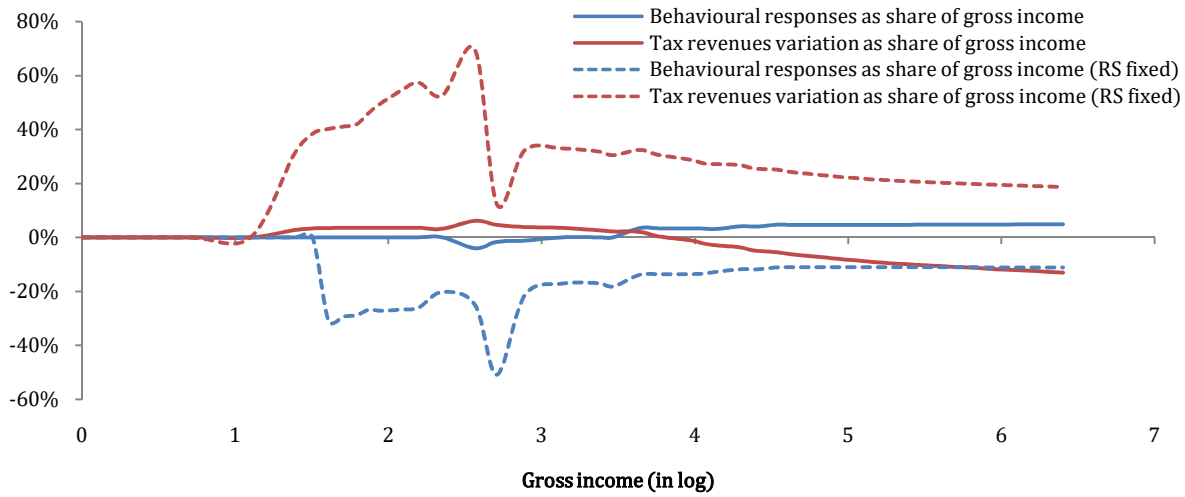

Figure 7.2 Tax revenue variation as share of gross income
Source: Author calculation

Such a large rate would be completely ineffective in reaching the original goal of ameliorating efficiency. As denoted by the dotted lines in Figure 7.2, all individual would ended up paying more taxes, with all negative behavioural responses, especially concentrated on the bottom part of the distribution. The results is that with the flat rate reform the marginal excess burden would be four times larger and the total reported income would be reduced by 143 billion euro. In addition, even if the RS remains constant, redistribution from top 1% and top 5% income classes would be about 10% less. On the other hand, the tax revenues would increase by a total of 250 billion euro. The surplus might be used to create other fiscal expenditures with the goal of reducing the MEB. However, it would be more convenient to manipulate tax rates directly, instead of introducing other complex rules on the top of an already intricate system. In other words, such flat rate regime would lead the Italian PIT further away from the optimum level.

In light of these evidences, it is hard to advocate in favour of such regime. While it is clear that a flat regime might reduce distortions in the system, the efficiency gains appears too small compared to the costs in terms of redistribution. This is even more true considering, as previously noted, that Italy does not shine in Europe in terms of economic equality. Only a government with extremely right-wing preferences might find such a reform desirable. Moreover, the impact skewed in favour of rich income classes raises questions on why Lega Nord voters are usually concentrated among poor income classes[40].

[40] Monti (2019). Distributed by "Centro Studi Argo". Link available in the bibliography.

7.2 BALANCED-BUDGET REFORMS

The previous analysis allows to draw some conclusions about the effect of fiscal expenditures included in the model.

The CS substitutive regime analysis suggests that such tax rule tends to benefit mostly rich people, reducing the redistributive power of the IRPEF. Moreover, it makes the system more complex from the perspective of tax payers, which are not able to take an optimal decision before observing the effective value of available tax credits. Consequently, it might be advisable from a policy perspective to remove it, with an adjustment in statutory rates to compensate for increased distortions.

Another disputable fiscal expenditure is the deduction for the main residence. This deduction seems to have controversial effects on the IRPEF, by reducing redistribution on the top 5% income class. The share of beneficiaries highlights a clear advantage of house-owner in middle-high income classes. Moreover, this deduction is quite costly to sustain. The analysis conducted with the EUROMOD by Cammeraat & Crivelli (2020) and by Barrios et al. (2019) argue against the high presence of fiscal expenditures in favour of house owner in the Italian personal income tax system. Di Caro (2020) further argue that the main residence deduction decrease both vertical and horizontal equity. Therefore, it should be removed, again, adjusting statutory rates by consequence.

The IRPEF bonus has proven to be a valuable tool for both redistribution and efficiency. Moreover, this credit does not require difficult verification process by tax authorities. Its effects and simplicity make it a potential valuable tool in the hands of the legislator. The tax credits for individual expenditures imputed at 19% of their value is another group of credits that greatly reduces distortions, with little but positive impact on redistribution. Therefore, it might be kept even with the goal of simplifying the tax system. All other fiscal expenditure seems to have little impact on the overall system, with the exception of credits for building-heritage and energy-saving constructions and renovations. These credits help reducing the fiscal burden, but at large redistributive costs, as favouring mostly house-owners.

Drawing on these conclusions, I propose a series of balanced-budget reforms of the IRPEF. These proposals are shaped according to the analysis previously developed on incidence and fiscal expenditures and aim at reducing the number of rules, while ameliorating the equity-efficiency trade off. All proposed reforms have positive but relatively insignificant (below 10 million euro) budget surplus, increase the redistributive power of the system, as well as reduce the MEB.

Table 11.3 and 11.4 in the Appendix summarize the details of the reforms with regards to statutory tax rates and fiscal expenditures.

There is one reform, the "no-tax credits", which eliminates almost all fiscal expenditures, with the exception of all deductions that avoid double-taxation, such as social security contributions and the divorce transfers, and of the tax credits for self-employment- dependent employment, pension and dependent family members. The "strong" reform is similar to the previous one, with the difference that the IRPEF bonus and tax credits for expenditures imputed at 19% of their value are included. The "soft" reform removes only the Cedolare Secca regime and the main residence deduction. The latter is also tested with a 20% increased IRPEF bonus, while the "strong" reform is additionally tested alongside a 50% increase in the IRPEF bonus. All statutory rates are adjusted accordingly to provide a balanced-budget reform.

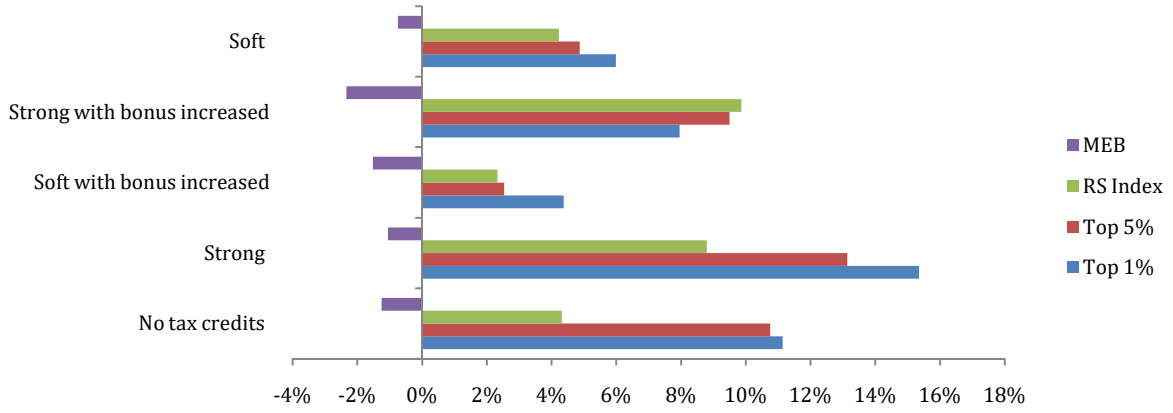

Figure 7.3 The equity-efficiency trade off for different reforms
Source: Authors calculation

Figure 7.3 shows the equity-efficiency trade off of each reform as measured by the indicators for efficiency and redistributions included in the model. Firstly, all reforms considered have the potential to ameliorate the IRPEF regime, with increased efficiency and lower inequality.

The most radical reform, the "no-tax credits" one, shows how, by removing all fiscal expenditures, the government can save a large amount of revenues, which is then used to manipulate the statutory schedule. In this way, it is possible to reach a far better redistributive power and reduce the costs in terms of efficiency. Moreover, the reform would greatly simplify supervisory activities for tax authorities. However, when compared to the "strong" reform, it is clear that the inclusion of the IRPEF bonus and the tax credits for expenditure imputed at 19% of their value offer much greater benefits in terms of redistribution, with a little sacrifice in terms

of increased efficiency. In addition, when the IRPEF bonus is increased by 50%, the reduction in marginal excess burden more than doubles, while the RS index variation reaches the maximum of all reforms considered.

The "soft" reform shows that with the simple elimination of the CS regime and the main residence deduction, the system can largely improve in terms of redistribution, as both these elements favour estate-owners. However, the limited amount of resources available with this removal does not allow for a large increase in the IRPEF bonus. When the IRPEF bonus is increased by 20%, the system becomes much more efficient, but gains less in terms of redistribution.

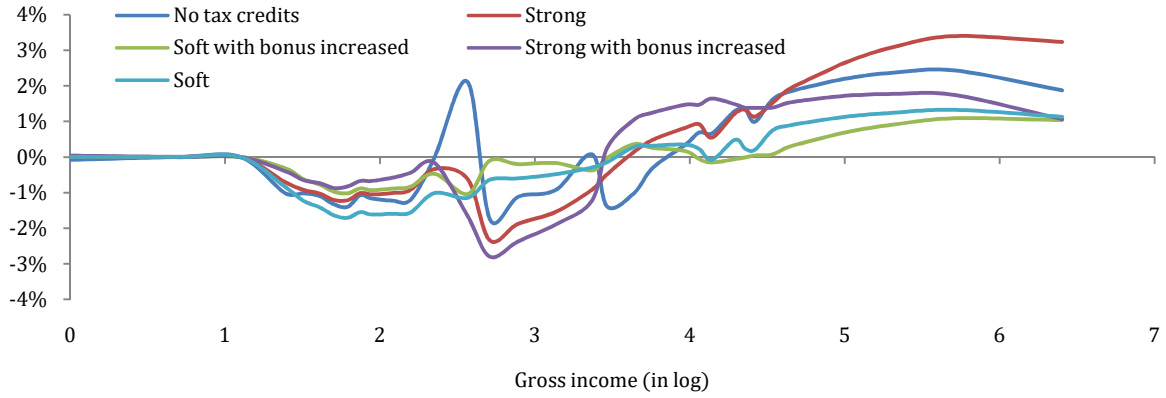

Figure 7.4 Tax revenues reforms variation as share of gross income
Source: Author calculation. Difference in tax revenues before and after the reform divided by gross income

Figure 7.4 shows the tax revenues variation as share of gross income for each income class. The "soft" reform is the one providing the greater reduction for low income classes, but it is also the one with the least increment in tax revenues at the top of the distribution. The "soft" version with increased IRPEF bonus brings little changes to the original system. On the contrary, the "strong" reform greatly increases the burden on the top of the income distribution, provides smaller but significant advantage below the no tax-area, and significantly reduces taxes for all individuals between 8,000 and 29,000 euro, where the density reaches its peak. This is the reason why the IRPEF bonus is able to strongly affect efficiency, as it reduces the fiscal burden on the part of the distribution, where efficiency costs are higher. This is clearer when observing the larger effect in this range accounted by the reform with increased IRPEF bonus. However, the higher cost of the bonus in this case does not allow for a reduction of tax rates for middle,

middle-high income classes, which experience the largest increase in due taxes with this reform. This effect is compensated in terms of efficiency by a lower increase in taxes at the top, compared to the "strong" reform without increased bonus.

The "no-tax credits" reform allows for a reduction in all statutory rates, except for the top bracket, which experience a 1% increase. The effects are perfectly reflected in the tax revenues variation. Most income classes below 50,000 euro, except for those around statutory income thresholds, experience a reduction in the amount of due taxes. After this level, all taxes increase.

7.3 BEHAVIOURAL RESPONSES

The model provides estimates of the behavioural responses of each income class upon changes in the marginal tax schedule for each reform. Figure 7.5 presents the difference in reported gross income before and after the introduction of a specific reform as a share of gross income.

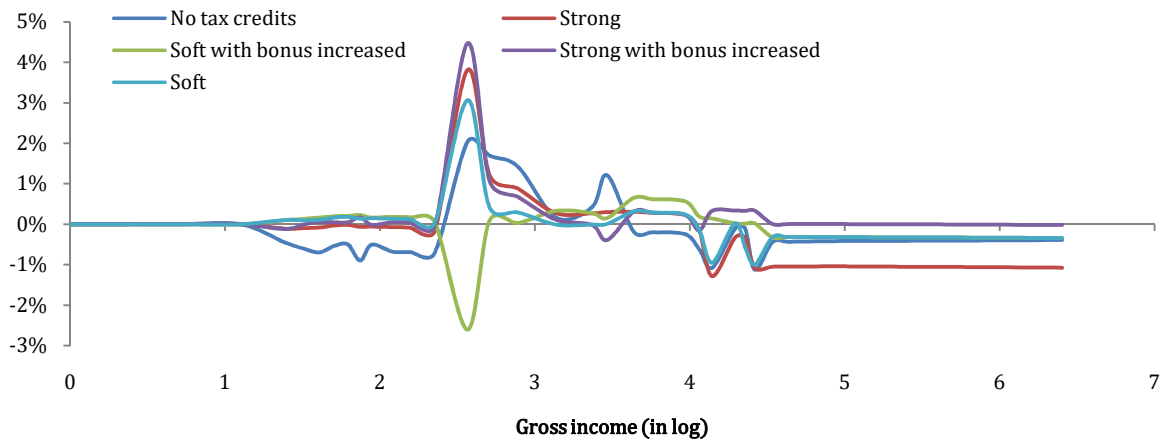

Figure 7.5 Behavioral responses to reforms as share of gross income
Source: Author calculations. Difference in reported gross income before and after reform, divided by gross income.

Taxation drives a wedge between the social and private benefits of earnings. It make leisure relatively cheaper with respect to consumption, inducing individual to work less, save less, or evade taxes. These distortions cause a decrease in the earning supply, effectively reducing the reported income, and, consequently, the revenue collected. The model uses the estimated elasticity of taxable income to capture this effect. Positive behavioural responses corresponds to a reduction in the EMTR, while the opposite is true for negative responses. Overall, all experimented reforms increase the amount of reported income, as one would expect considering that all reforms reduce the marginal excess burden of the IRPEF. The greater changes are concentrated among statutory income thresholds, especially around the "no-tax area" limit.

Here, most reforms reduces the marginal excess burden, except for the "soft" reform with increased IRPEF bonus. Most of the change in this case is explained by the slight 1% increase in statutory rate on the first income bracket, used to finance the 20% bonus increment.

Removing all tax credits increase marginal tax rates at the very bottom of the income distribution. The difference with others reform in this part depends on the impact of the tax credits for individual expenditures imputed at 19% of their value, which are sufficient to cover a large part of due taxes. Its removal increases the average fiscal burden, reducing the earnings supply.

The IRPEF bonus decreases the marginal tax rates along all of its income range, except around its upper-bound, when the bonus suddenly disappears. The impact is sufficient to reduce the reported income around this threshold, in the case of the "strong" reform with increased bonus. The latter reform is also able to reduce the marginal tax rates between 50,000 and 90,000 euro, with only a small reduction in reported income after this level. All other reforms tends to have a negative effects on individual responses after 50,000 euro, as they all significantly increase the fiscal pressure at the top of the income distribution.

7.4 EXPERIMENTS RESULTS

All the experimented reforms above allows to drive some important conclusions about the individual taxation in Italy.

Firstly, results provided from the analysis of flat rate regimes suggests that such reform is not advisable. Keeping total tax revenue constant, the flat rate reform would be too costly in terms of redistribution. Keeping redistribution constant, the reform would increase the marginal excess burden by four times. The reform would effectively allows for a tax reduction only to the top 5% of the taxpayers population. This change would be even more problematic considering that the Italian PIT redistributive power is already limited compared to other European countries. In addition, the reform would greatly reduce the marginal tax rates at the top, compared to the middle-part of the income distribution, where the density is higher. Optimal taxation theory would suggests that there might be higher equity gains at lower costs in terms of labour supply by lowering the marginal tax rates in the middle, in favour of an increase at the top, even for strong right-wing preferences.

Secondly, all proposed reforms have shown that the Italian IRPEF is far from the equilibrium. Given certain redistributive preferences and a constant tax revenue, the tax regime would be in a stable equilibrium if the sum of all efficiency costs and redistribution benefits are equal to zero.

In other words, it would not be possible to increase taxation without facing higher efficiency costs than redistribution gains. The model has shown as, in fact, it is not such a case with the IRPEF. All reforms considered simultaneously increase redistribution by all accounted measures and mitigate the reduction in social welfare induced by tax distortions, by alleviating the pressure on the earnings supply and increasing the average reported income.

Moreover, these results have been obtained with the simple removal of already existing tax credits and deductions. Not only such observation confirms the concerns previously expressed by many fiscal experts on the questionable utility of these expenditures. It also indicates that there are other implicit gain from simplification reforms. Individuals would no longer bear the burden of prove, nor they would need particular "fiscal literacy", in order to get the tax reduction planned by the legislator for them. At the same time, tax authorities would face lower verification costs, freeing resources to fight tax evasion.

In particular, given the presented results, it would be advisable to firstly remove all tax rules that gives particular advantage to house and estate owners in general, as they have been proven to give little benefits in terms of reduced distortions at high redistributive costs. In all case considered, the Cedolare Secca regime seems to worsen the equity-efficiency trade-off. Consequently, its removal is highly advisable. On the contrary, the IRPEF bonus and the tax credits for individual expenditures imputed at 19% of their value are precise tools that decrease the marginal tax rates on high-density income ranges and increase redistribution. Therefore, these credits are effective in their purpose and could be used to meet specific preferences for certain marginal tax rate schedules, especially for reducing the marginal tax rates on middle-income classes. Moreover, an increase in marginal tax rates at the bottom is required, through the introduction of larger income-related transfer and increased measures to fight tax evasion[41].

8. SOCIAL WELFARE WEIGHTS

To further expand the analysis, the model provides with sufficient information to calculate the implicit social welfare weights of the IRPEF.

In optimal taxation theory, the distribution of marginal tax rates that maximize social welfare depends, among other things, on the government preferences for redistribution. The more "weight" a government give to low income classes, the higher is the value of redistribution in term of social benefits. These preferences are usually expressed by the social welfare weights

[41] Gahavari & Micheletto (2019) observed, for the Italian case, that marginal tax rates are higher for a greater government effort to deter tax evasion.

function. The social welfare function measures how much a government "care" about a specific level of income.

Bourguignon & Spadaro (2012) draw on this insight to understand the preferences implied by the current system. In other words, if we assume that the actual marginal tax schedule is the optimal expression of the government redistribution preferences, it is possible to derive the social welfare weights as a function of the elasticity of taxable income and the marginal tax rates.

Jacobs et al. (2017) derive an expression from the Mirrlees optimal non-linear tax schedule to compute social welfare weights using observable parameters. In particular, the social welfare weight g_z associated with income z satisfy:

$$g_z = 1 + \frac{1}{f(z)}\frac{\partial MEB_z}{\partial z} + \eta_z \frac{T'(z)}{1 - T'(z)} - \zeta_z \frac{\tau_z}{1 - \tau_z}, \qquad 8.1$$

where the derivative of the Marginal Excess burden with respect to income is given by:

$$\frac{1}{f(z)}\frac{\partial MEB_z}{\partial z} = (\xi_z + \theta_z)\varepsilon \frac{T'(z)}{1 - T'(z)} + \varepsilon \frac{T''(z)}{(1 - T''(z))^2} \qquad 8.2$$

In the equation above, η_z and ζ_z represents respectively income and participation elasticity, and are assumed to be zero in this paper's model. Moreover, the second derivative of the tax schedule is also assumed to be insignificant. Empirically, all these elements have shown little impact on the final distribution of social welfare weights. Consequently, their exclusion should not severely affect the results.

The final equation used by the model is:

$$g_z = 1 + \theta_z \varepsilon \frac{T'(z)}{1 - T'(z)} \qquad 8.3$$

The variable θ_z represents the elasticity of a local tax base with respect to income, and is given by $\theta_z = 1 + \frac{z f'(z)}{f(z)}$, where $f'(z)$ represents the variation in density for a marginal income increase, i.e. the first derivative of the density function. Having a discrete population, the model is not provided with a continuous function $f(z)$ to compute $f'(z)$. Therefore, the model derives a continuous density function as a log-normal distribution with appended Pareto-tail, starting from the mean and median gross income, as well as from the Pareto-parameter. The strategy have been inspired by the optimal tax simulation created by Hummel & Jacobs (2018).

Specifically, the model consider as median the average income before taxes of the income class that split the (population) distribution in half, the class "from 15,000 to 20,000". The mean income is given by the population-weighted average of gross income. The Pareto-parameter α is computed with income and population share, using the following expression:

$$\alpha = 1/\left(1 - \frac{\ln\left(S_x/S'_x\right)}{\ln\left(x/x'\right)}\right), \qquad 8.4$$

where $x\%$ of the population earns $S_x\%$ of the total income. The mean income is 20,891 euro, the median 17,412 euro, while the Pareto-parameter is equal to 2.24. All values are coherent with estimates found on both the EUROSTAT and the World Income and Wealth Database.

Furthermore, the model computes the natural logarithm of mean income $\mu = \ln(\text{mean income})$, the standard deviation $\sigma = \sqrt{2 * (\ln(\text{mean}) - \ln(\text{median}))}$, and the income level at which the Pareto-tail starts $z^* = e^{\mu+\alpha\sigma^2}$. Given that Φ indicates a normal density distribution function, the calibration income parameter for the Pareto-tail is given by:

$$z_m = \left(\frac{\Phi\left(\frac{\ln(z^*) - \mu}{\sigma}\right)}{z^*}\right) * z^{*\left(\frac{1+\alpha}{\alpha}\right)^{\frac{1}{\alpha}}} \qquad 8.5$$

Therefore, the probability density function has the following form:

$$f(z) = \begin{cases} \rho\Phi\left(\frac{\ln(z) - \mu}{\sigma}\right), & z \leq z^* \\ \rho(1 - z_m^{\alpha} z^{-\alpha}), & z > z^* \end{cases}, \qquad 8.6$$

where ρ is an adjustment factor ensuring that all $f(z)$ add up to one. The model uses the average gross income z of each income class to compute the probability density in different points of the distribution. Then, the model marginally increases the income and computes the first derivative of $f(z)$. These parameters are implied for the calculation of the elasticity of local tax base, and, along with the marginal tax schedule and the ETI, of the social welfare weights.

Figure 8.1 shows the calculated implicit SWW. Firstly, it should be noted that the implicit SWW function presents all the characteristics predicted from optimal taxation theory: it is mostly decreasing in income and it never reaches negative values. However, there are a couple of exception that are important to notice.

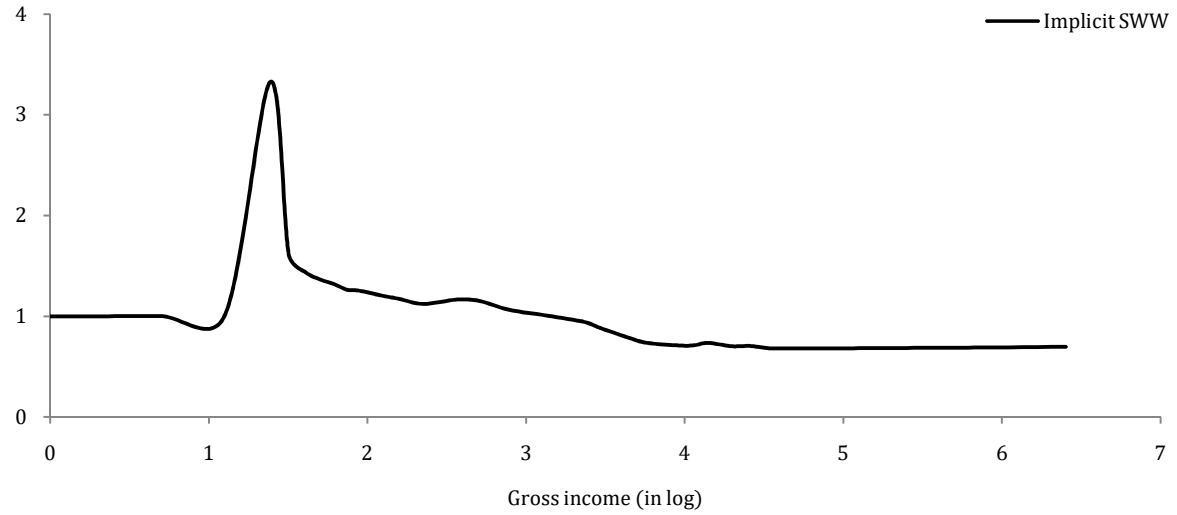

Figure 8.1 Implicit Social Welfare Weights function
Source: Author calculation

In the very first part of the distribution, the implicit SWW is not increasing. On the contrary, social welfare weights are constant around one for negative and "zero" income classes, while reaching a spike of more than three points on the first positive income class. This difference is explained by the null marginal tax rates at the bottom. One would expect SWWs to be higher for lower level of income. Thus, it is possible to conclude that the Italian legislator should increase the marginal tax rates for negative or null income classes, in order to get closer to an optimal tax schedule. Such goal could be obtained by increasing the number of income-dependent refundable credits for low income classes, or by allowing the welfare transfer to be larger and to change with income also for negative income classes.

Another similar anomaly is observed around the virtual no-tax area threshold (around 2.5 in logarithmic scale). The little spike around 8,000 euro is the result of a 20 percentage points jump of the EMTR. Such difference causes SWWs to be higher for individuals just above the threshold compared to most individuals below that same point. This finding further reinforces the idea that the Italian EMTRs should be increased just below the no-tax area threshold, or reduced just above. All reforms presented in Section 7, except for the "soft with bonus increased", make the shape of the SWW more coherent with optimal taxation theory, by reducing the marginal tax rate above the no-tax area threshold. This result could be observed in Figure 8.2.

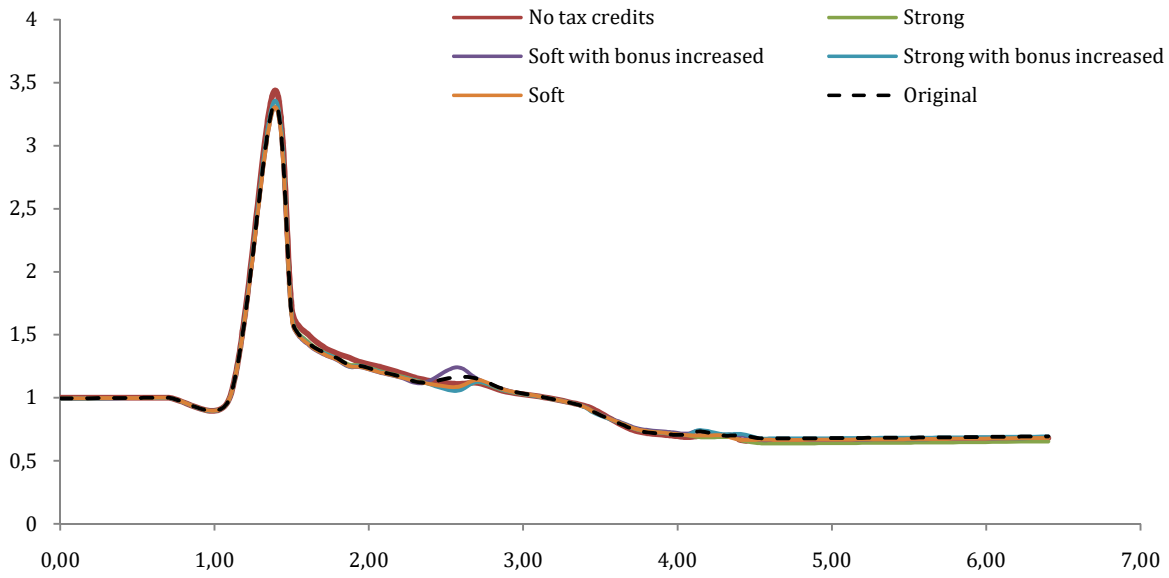

Figure 8.2 Social Welfare Weights functions of all reforms
Source: Author calculations

Reducing the statutory tax rates, as well as the impact of non-refundable tax credits, the effective marginal tax rate on the threshold is significantly reduced, compared to the original system. The only exception is for the soft reform with bonus increased, since it increases the statutory rate on the first bracket. It should also be noted that all reforms tends to increase the overall preference for redistribution expressed by the IRPEF. Weights are slightly higher at the bottom and slightly lower at the top, compared to the original implicit SWW.

9. CONCLUSION

This paper has explored in details the characteristics of the Italian personal income taxation. As in Saez & Zucman (2019), a static behavioral macro-simulation model have been constructed. The model calculates the distribution of Effective Marginal Tax Rates and Effective Average Tax Rates; estimates the implicit impact of each fiscal expenditure on effective rates, on distortions and on redistribution; estimates the Upper Average Marginal Social Welfare (UAMSW) function, as a representation of social welfare weights expressed by the actual system; predicts behavioral responses induced by changes in EMTRs when a reform is applied.

These tools have been used to conduct an incidence analysis of the IRPEF. The IRPEF presents the characteristics of a progressive income tax, with marginal tax rates consistently above average tax rates. However, marginal tax rates at the bottom are lower, compared to the rest of

the distribution, contrary to what optimal income taxation theory would predict. There are few main conclusion derived from the analysis.

Firstly, the "Cedolare Secca" substitutive regime benefits richer estate-owners over taxpayers in lower income classes. The reasons are twofold. It increase the complexity of the system, inducing taxpayers in lower income classes to take non-optimal decisions, reducing the effective amount of enjoyable fiscal expenditures. It allows taxpayer in high income classes to get taxed at a fixed rate on some real-estate income, reducing the progressivity.

Secondly, the Italian personal income tax is pointlessly complex, as many fiscal expenditures have little impact on the EATRs and EMTRs and reduce the potential for redistribution. Most problematic expenditures seems to be those in favor of house and estate owners. Moreover, the removal of such expenditures allows for balanced-budget reforms which ameliorate the equity-efficiency trade-off, increasing redistribution and reducing distortions. This fact serves as clear evidence that the Italian PIT is far from an optimal level of taxation.

Thirdly, the IRPEF is regressive at the very bottom part of the income distribution. Large fixed "minimal" contribution for social security makes the EATR, for self-employed individuals with negative aggregate income, positive and larger than the EMTR. In fact, individuals in the bottom part of the distribution with higher aggregate income tends to have negative effective average tax rates smaller than the poorest income class. In addition, the SWW analysis suggests there might be benefits from an overall increase in marginal tax rates below the 8,000 euro threshold.

While conclusions derived by this paper are solid, further exploration should be done in the analysis of behavioral responses. Using aggregated data allows to include much more fiscal expenditures compared to previous simulation models, but limits the potential to estimate the effects of a marginal income increase on tax credits, and consequently, to estimate marginal tax rates with absolute precision. Moreover, the dataset presented by the MEF does not provide sufficient information to evaluate the tax credits for employment, self-employment and pension separately. As these income-related credits are structured in slightly different ways, they have different implicit effects on marginal tax rates. Different marginal tax rates would affect the labor supply differently. Consequently, a more precise behavioral analysis would require these tax credits to be evaluated (also) separately. Finally, the reforms proposed are only for preliminary experimental purposes, as they does not take into account all welfare effects, as well as other taxes of the Italian fiscal system, such as the VAT tax or the corporate tax.

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11. APPENDIX

Table 11.1 IRPEF Main Fiscal Expenditures

Panel A: IRPEF Deductions

Name	Value (in thousands)	Share over total deductions	Share over total fiscal expenditures
SSC	19,397,006	54.31%	16.81%
Contribution for domestic and family services	465,031	1.30%	0.40%
Donations to religious institutions	21,764	0.06%	0.02%
Health Expenditure for Disability	1,161,440	3.25%	1.01%
Divorce transfer	860,447	2.41%	0.75%
Complementary SSC	4,257,089	11.92%	3.69%
Other deductions	563,306	1.58%	0.49%
Main residence Deduction	8,987,490	25.17%	7.79%
Total	35.713.573	-	30,95%

Panel B: IRPEF Tax Credits

Name	Value (in thousands)	Share over total tax credits	Share over total fiscal expenditures
Dependent Family Members	12,173,972	15.28%	10.55%
Dependent employment and pension	42,493,231	53.33%	36.82%
Building Heritage renovations	6,716,981	8.43%	5.82%
Energy-savings renovations	1,676,183	2.10%	1.45%
Real estate and land leasing to young for main residence	225,574	0.28%	0.20%
Expenditure for furniture and VAT on Main residence (at 50%)	388,731	0.49%	0.34%
Investment in Start-up	30,079	0.04%	0.03%
Others	54,817	0.07%	0.05%
Credits imputed at 19% of the original value	5,958,758	7.48%	5.16%
Credits imputed at 26% of the original value	51,845	0.07%	0.04%
Credits imputed at 30% of the original value	21,769	0.03%	0.02%
Credits imputed at 35% of the original value	3,236	0.00%	0.00%
IRPEF Bonus	9,890,491	12.41%	8.57%
Total	79,685,667	-	69.05%

Source: Authors calculations

Table 11.2 Tax credits for dependent employment, self-employment and pension income

Panel A: Credit For Dependent Employment Income	
Income Boundaries	*Value*
Up to 8000 €	1880*(Days Worked/365)

Between 8001 € and 28000 €	(978 + 902*(28000 -Total Income)/20000)*(Days Worked/365)
Between 28001 € and 55000 €	(978*(55000 -Total Income)/27000)*(Days Worked/365)
Above 55000 €	0

Panel B: Credit For Pension Income

Income Boundaries	*Value*
Up to 8000 €	1880*(Days In Retirement/365)
Between 8001 € and 15000 €	(1297 + 583*(15000 - Total Income)/7000)*(Days In Retirement/365)
Between 15001 € and 55000 €	(1297*(55000 - Total Income)/40000)*(Days In Retirement/365)
Above 55000 €	0

Panel C: Credit For Self-employment Income

Income Boundaries	*Value*
Up to 4800 €	1104*(Days Worked/365)
Between 4801 € and 55000 €	(1104*(55000 -Total Income)/50200)*(Days Worked/365)
Above 55000 €	0

Source: MEF(2018)

11.1 EATRs AND EMTRs CALCULATION AND DECOMPOSITION

11.1.1 EFFECTIVE AVERAGE TAX RATES

The "Gross tax liability calculator" computes the taxable income from the aggregate income, using reported deductions, and subsequently applies the statutory schedule to calculate the gross tax liability for each income class. The aggregate income considered in the actual version does not include the real estate income taxed under the CS substitutive regime. When the CS is deactivated, the model automatically adds such incomes to total gross income.

Following the definitions introduced in section 5, the model subtracts all the reported deductions in each income class from aggregate income. The resulting taxable income is nearly identical to the one originally reported in the dataset. Then, the model uses the reported frequency in taxable income to compute the average level of income in each income class. The model uses the inputs from the statutory schedule and the mean taxable income to compute the average gross tax liability for each income class. Unfortunately, this methodology with aggregated data lack in precision for really low levels of income[42]. The reason is that these classes likely include a high variability of taxpayers, for which in many cases values are reported as zero or as ***, consequently harming the potential of the model to replicate accurately the gross tax liability for very low or negative income classes. In order to adjust for this issue, the

[42] Specifically, for classes of income from the first class "below -1.000" to the fourth class "from 0 to 1.000".

model computes a ratio r between the calculated and the officially reported value of gross tax liability:

$$r = \frac{Gross\ tax\ liability\ calculated}{Gross\ tax\ liability\ reported} \qquad 11.1$$

The ratio r is then fixed to remain constant. The model divides the calculated tax liability by the corresponding ratio to obtain the reported gross tax liability. When a reform is applied, the model uses the fixed ratio obtained in the original specification. In this way, changes between the original and the reformed schedule depends only on the reform itself. When the ratio is equal to zero, that is, when the calculated gross tax liability is null, the model simply considers the reported gross tax[43]. For the absolute majority of income classes, the ratio is very close to one, supporting the precision of the calculation for the rest of the dataset. In case of reforms and when the ratio is zero the model adds the old reported gross tax debt to the new computed one (if it is now positive). In this way, the model can still capture changes in marginal and average tax rates due to the new reform.

The "Net Tax liability calculator" starts form the gross tax liability and applies all tax credits, at the aggregate level, to compute the net tax. Then, it adds the tax debt under the CS regime and subtracts the IRPEF bonus and the Welfare Transfer. The result is the effective tax debt for each income class. Once the net tax liability is computed, it is possible to notice some inconsistencies with the net tax liability reported, particularly for low income classes. Such differences derive from the aggregation process. By diminishing the gross tax liability with the aggregate amount of tax credits, I consider that all taxpayers have effectively access to a part of the value of a specific credit. In reality, none of the tax credits cover all the taxpayers in each income class. In fact, some individuals might have a positive net tax, even if in low income classes, but it is not possible to identify such individuals in aggregated data. Moreover, the frequency in very low income classes is limited, harming the precision of an average calculation. Consequently, the model tends to underestimate the net tax debt for low income classes. The higher an income class is in the distribution, the more precise the estimates of the model are. For income classes above 15,000 euro, the value computed is almost identical to the one reported. In order to take into account of this issue, I used a peculiar strategy which captures variation directly from the gross and tax debt reported in the MEF dataset.

When, for a certain income class, the difference between computed gross tax liability and total tax credits is zero, but the net tax liability reported in the MEF dataset is positive, the model

[43] There is only one such case, for the income class "Zero".

considers as effective value of total tax credits the difference between gross and net tax liability reported in the dataset. In such case, when a reform is applied, the model accounts for changes by subtracting this value from the newly computed gross tax debt. When a tax credits is deactivated, such value is reduced proportionally to the average share of that credit with respect to all tax credits. Specifically, if x is the difference between gross and net tax liability reported in the MEF dataset, the effective total tax credits would be equal to $(1 - s)x$, where s is the average share of removed tax credits over total tax credits. Roughly 2.5 billion euro, or 1.5% of the total tax debt do not appear in the original calculation. This figure is relatively small. Consequently, I believe that the adjustment strategy should not negatively affects the precision of the model.

Finally, the model computes the Effective Average Tax Rate (EATR) for each income class as the ratio between effective tax debt and aggregate income, including real estate income under the substitutive regime, IRPEF bonus and Welfare transfers.

11.1.2 EFFECTIVE MARGINAL TAX RATE

In order to compute effective marginal tax rates, the model simulates a marginal increase in income and computes the difference in tax debt, given the new level of income. The ratio between this difference and the income increase represents the marginal tax rate for a specific income class. Aggregated data are an obstacle for this type of calculation. In fact, it is difficult to assess how the accessibility and the value of tax credits or deductions changes for a marginal increase in income without having specific details on each individual. Consequently, in order to replicate the potential effect of sudden changes in available tax credits, a series of assumptions are required.

First of all, I considered a 3% increase in aggregate income. For simplicity, I excluded real estate income under the substitutive regime from this increase. This assumption should not affect marginal tax rates, given that the access to the CS regime is conditioned on the housing purpose or the length of contracts, and not on the value of the location.

Secondly, I assumed that some deductions and tax credits would not change at all for a given marginal increase. This assumption relies on the fact that many tax credits originate from those individual expenditure that tends to be sticky for a small increase in income. A clear example is the credit for interests on mortgage, or the main residence deduction, of which effective values depend on decisions of the government. In all cases, I evaluate the underlying legal framework of each fiscal expenditure to clarify if the assumption was reasonable. Table 11.3 presents a list of all the unchanged tax credits. Because of this assumption, these fiscal expenditures do not affect the marginal tax rate.

Table 11.3 Unchanged Fiscal Expenditures

Type	*Name*
Deductions	Divorce Transfer
	Other deductions
	Main Residence
Tax Credits	Building Heritage renovations
	Energy-savings renovations
	Land leasing
	Expenditure for furniture and VAT on Main residence (at 50%)
	Sec. VI box RP
	Residual Investment in Start-up
	Other tax credits
	Mortgage Interest on main residence
	Mortgage Interest on other estates
	Mortage Interest on buolding renovations
	Mortgage Interest Construction Main Residence
	Interest on agricultural loan or mortgage
	Life, injury and disability Insurance
	Expenditures non-graduate education
	Expenditures graduate education
	Funeral Expenses
	Expenses for dependent personal care worker
	Real Estate Intermidiary Expenditures
	Physical Activity Expenses for young people
	Rental Cost for dependent students abroad
	Natural Disasters Insurance

Thirdly, in some cases I assumed that the credit would marginally increase with income by the same percentage. These fiscal expenditures refer to all costs sustained by an individual in the short period, or, as for SSC, that are mathematically related to the aggregate income. For example, I could expect an individual to increase the amount of donation he did, the amount of money he spends for regular healthcare, or the value of his social security contributions by the same 3% increase considered for aggregate income. For cases that present an upper limit to the deductible monetary value, I also verify that a marginal increase in the average value of the credit in each class would not pass such limit. In all variables under this assumption, that is never the case. In practice, all these variables are fundamentally fixed to be a constant share of the total income. Table 11.4 provides a full list of all fiscal expenditures under this assumption.

Table 11.4 Increased Fiscal Expenditures

Type	*Name*
Deductions	SSC
	Contribution for domestic and family services
	Donations to religious institutions
	Healthcare Expenditure for Handicapped
	Complementary SSC
Tax Credits	Investment in Start-up
	Expenditures for heathcare
	Donations to non-profit organizations and political parties
	Donations to non-profit organizations inscribed in the national registry
	Donations to voluntary organizations

Four fundamental tax credits are not included in the two categories above: employment and dependent family members credits, the IRPEF bonus and the welfare transfer.

For the dependent employment tax credit, the variation induced by a marginal increase is computed using the original equation for the computation of the credit and the average income per class. Specifically, I computed the percentage variation for a given increase and a given income, and I applied this percentage to the original aggregate value of the tax credit. In order to compute this variation, I define as *TC(w)* the function that assigns the value of the credit for a given level of income *w*, computed as predicted by the legislator for that specific level of income. Therefore, the percentage variation for a k increase, where $k = 1{,}03$, is simply given by: $\frac{TC(kw)-TC(w)}{TC(w)}$. The function *TC(w)* for different income brackets is reported in Table 11.2. I further assumed that an individual would work the same number of days for a marginal increase in income. By substituting the average income in the equation and with the required simplifications, I derived the percentage variation induced by a k increase in income. In particular, the equations used are[44]:

- For income classes with average income between 8,001 and 28,000 euro:

$$\frac{\Delta TC(w)}{TC(w)} = \frac{0.902 * w * (1-k)}{(28-w) * 0.902 + 0.978 * 20} \qquad 11.2$$

- For income classes with average income between 28,001 and 55,000 euro:

[44] As in the model, the unit of measure for the equation is in thousand.

$$\frac{\Delta TC(w)}{TC(w)} = \frac{w * (1-k)}{55-w} \qquad 11.3$$

For all other income classes, the aggregate value of the credit should not change by construction. The reason why I decided to compute a percentage variation, instead of directly using the average income to construct a gross measurement of the credit, depends on the fact that the MEF has aggregated all the tax credits for dependent employment, pension and self-employment into the same variable. Consequently, I would not be able to disentangle the effects on each fiscal expenditure. However, the three tax credits included in the variable follow a similar pattern in terms of inverse relationship with the level of income, and share common boundaries of income brackets. Therefore, it is plausible to believe that, at aggregate level, the percentage variation for a marginal increase in income is similar for the three credits.

For the tax credits for dependent family members and for the IRPEF bonus, unfortunately, the dataset from MEF does not provide all the information required to directly calculate with sufficient precision the variation of the credit for a given increase in income.

For the IRPEF bonus, the dataset lacks of data on the number of days worked by each income class for a gross calculation. Moreover, by constructing a reference individual for each income class, the marginal variation it is not sufficient to shows the effect of the IRPEF on its bounds. In practice, thirty-four reference individuals does not cover the income distribution sufficiently to show what happen around 8,000 euro and between 24,400 and 26,600.

For dependent family members tax credits, as previously stated, the variable reported includes four different tax rules for different types of dependent family members. The dataset lacks in the number of relatives on average in each income class, and those parameters are relevant to compute the monetary value of the credit (and boundaries as well for dependent children).

To work around the problem, I assumed that the implicit impact of the credits on marginal tax rate of one income class, for a really small increase in income, is equal to the implicit impact on marginal tax rate of passing from one income class to the next one. Specifically, I defined $L(w_i)$ as the lag in mean incomes w_i between income classes i and $i-1$. Furthermore, I defined $L(tc_i)$ as the lag in average value of the credit between income classes i and $i-1$, and $\Delta w_i = kw_i$ as the nominal increase in average income, with $k = 0{,}03$. Furthermore, I define the effect of a k variation in income on the value of the credit as Δtc_i. Thus, given the previous assumption:

$$L(w_i) : L(tc_i) = \Delta w_i : \Delta tc_i \rightarrow \frac{\Delta tc_i}{\Delta w_i} = \frac{L(tc_i)}{L(w_i)} \rightarrow \Delta tc_i = \frac{\Delta w_i * L(tc_i)}{L(w_i)} \qquad 11.4$$

I added the variation computed with this equation to the average value of the credit and multiplied it by the frequency to obtain the aggregate value of the tax credit for a given marginal increase in income. This strategy should help to simulate sudden changes in the aggregate value when some individuals lose rights on the credit, in part or completely. Also, it should emulates smooth changes with income, related to the formulation of the credit.

This strategy have been implemented to simulate marginal changes for both the IRPEF Bonus and the credits for dependent family members.

The welfare transfer has been constructed artificially. Consequently, the model simply re-calculate the value for a given income increase.

The model uses all mutated values of income, deduction and tax credits as new input to calculate the effective tax debt for each income class. Then, it computes the nominal difference between original and increased values, for both income and taxes. The ratio between these two values is the mean Effective Marginal Tax Rate (EMTR) associated with a specific income class.

11.1.3 DECOMPOSITION EATR AND EMTR

To evaluate the implicit impact of deductions and tax credits on marginal and average tax rates, I considered the definition of effective marginal tax rate:

$$EMTR = \frac{\Delta NT(z)}{\Delta z}, \qquad 11.5$$

where $\Delta NT(z)$ is the variation of the net tax for an income increase Δz. Given the definition of net tax, then:

$$EMTR = \frac{\Delta NT(z)}{\Delta z} = \frac{\Delta GT(z_{tax})}{\Delta z} - \frac{\Delta TC(z)}{\Delta z}, \qquad 11.6$$

where $\Delta GT(z_{tax})$ is the variation in gross tax debt, z_{tax} is equal to the taxable income and $\Delta TC(z)$ is the variation in tax credits. Since the taxable income is defined as $z_{tax} = z - D(z)$, with $D(z)$ equal to the total value of deductions, we can further decompose the EMTR function as follow:

$$EMTR = \frac{\Delta GT(z_{tax})}{\Delta z_{tax}} \frac{\Delta z_{tax}}{\Delta z} - \frac{\Delta TC(z)}{\Delta z} = \frac{\Delta GT(z_{tax})}{\Delta z_{tax}} \left(\frac{\Delta z}{\Delta z} - \frac{\Delta D(z)}{\Delta z} \right) - \frac{\Delta TC(z)}{\Delta z} \qquad 11.7$$

$$EMTR = \frac{\Delta GT(z_{tax})}{\Delta z_{tax}} - \frac{\Delta GT(z_{tax})}{\Delta z_{tax}} \frac{\Delta D(z)}{\Delta z} - \frac{\Delta TC(z)}{\Delta z} \qquad 11.8$$

The first component on the right-hand side of the equation represents the implicit impact of the statutory schedule. The second component represents the effect of deductions. The third component measure the impact of tax credits.

Another condition is required for a precise calculation. Since most tax credits in the model are non-refundable, when the total value of non-refundable tax credits is bigger than the gross tax, an individual cannot use the difference in future tax declarations. In other words, in this case, the effective value of total non-refundable tax credits is equal to the value of the gross tax debt[45]:

$$TC(z) = GT(z_{tax}) \qquad if\ TC(z) > GT(z_{tax}) \qquad 11.9$$

Drawing on this assumption, it is possible to separate the effects of the IRPEF bonus and of the welfare transfer from non-refundable tax credits, but it is not possible to separate non-refundable tax credits, as in my decomposition their impact must be considered all together to be meaningful. For a given marginal income increase, if the sum of all other non-refundable tax credits is still above the gross tax debt, a specific non-refundable tax credit would not have an impact on marginal tax rates even when it changes with income.

The decomposition of the effective average tax rate follows a similar procedure:

$$EATR = \frac{NT(z)}{z} = \frac{GT(z_{tax})}{z} - \frac{TC(z)}{z} = \frac{GT(z_{tax})}{z_{tax}} - \frac{GT(z_{tax})}{z_{tax}} \frac{D(z)}{z} - \frac{TC(z)}{z} \qquad 11.10$$

The above equation is true if:

$$\frac{GT(z_{tax})}{z} = \frac{GT(z_{tax})}{z_{tax}} - \frac{GT(z_{tax})}{z_{tax}} \frac{D(z)}{z} \qquad 11.11$$

By simplification, it is easy to see that this function is equivalent to:

$$z_{tax} = z - D(z)\,, \qquad 11.12$$

[45] This assumption holds also for deductions, but in my model the case never appear.

which is true by construction.

11.2 DISTORTIONARY EFFECTS

Drawing on the example of Saez & Zucman (2019), when a reform is applied, the model consider the distortionary impact of changes in marginal taxation on the labour supply. In order to do so, I followed a simpler discrete version of the maximization of utility problem for an individual. We define utility as in Bourguignon & Spadaro (2012), where, for an individual (or tax base) i, is equal to:

$$u_i = c_i - \gamma_i \frac{{z_i}^{1+\frac{1}{\varepsilon}}}{1+\frac{1}{\varepsilon}} \qquad 11.13$$

In equation (11.13), c_i represents consumption, z_i indicates total gross income, γ_i is an individual constant and ε measures the elasticity of taxable income, and it is assumed to be equal for the entire population. When maximizing utility, the individual i is subject to a budget constraint:

$$c_i = (1-\tau)z_i + R_i \qquad 11.14$$

In equation (11.14), τ measures the marginal tax rate in the current system, and R_i is the consumer virtual income, as defined in Section 3. By constructing the Lagrangian function and taking first derivatives with respect to income and consumption equal to zero, we obtain:

$$-\gamma_i {z_i}^{\frac{1}{\varepsilon}} + (1-\tau) = 0 \rightarrow z_i = \left(\frac{1}{\gamma_i}\right)^{\varepsilon} (1-\tau)^{\varepsilon} \rightarrow$$

$$z_i = z_{0,i}(1-\tau)^{\varepsilon} \qquad where\ z_{0,i} = \left(\frac{1}{\gamma_i}\right)^{\varepsilon} \qquad 11.15$$

For a given elasticity, the value of $z_{0,i}$ remains constant, independently from any marginal changes in the tax schedule. The model uses previously calculated marginal tax rates, the ETI and the gross income to derive the constant $z_{0,i}$. This values is then fixed, to remain equal when the tax schedule changes. When a reform is applied, the MSM calculate the new marginal tax rates and uses it in combination with the constant value $z_{0,i}$ to compute the new level of aggregate income for each income class. The model uses this new reported income as input to

compute the effective tax debt and the EATRs after the reform. The difference between aggregate income before and after a reform represents the increased (or decreased) earning supply distortions predicted in neo-classical models of optimal taxation, as well as encapsulates the change in reported income due to practices of tax avoidance and tax evasion.

11.3 MARGINAL EXCESS BURDEN

Taxation drives a wedge between social and private rewards of any economic activity, distorting the economic choices of an individual. The excess burden represents a measurement of this distortion. It is the cost in terms of social welfare determined by the tax distortion. That is, the difference between private cost and social benefit of taxes. In particular, the marginal excess burden (MEB) is the excess burden on a marginal income increase. When a reform is applied, variations in the MEB allows to compare the distortions generated by different systems.

To compute the MEB, the model employs a discrete version of the function derived by Jacobs (2019) from optimal taxation theory:

$$MEB = \frac{\sum_i \frac{\tau_i}{1-\tau_i} z_i ETI}{\sum_i z_i} \qquad 11.16$$

Thus, the MEB is the income-weighted average of $\frac{\tau_i}{1-\tau_i} ETI$.

11.4 THE GINI COEFFICIENT

As measure of redistribution, the model calculates the GINI coefficient before and after taxes, and computes the difference between these two values, previously defined as the RS index. To calculate the GINI coefficient, the model uses a simple equation for discrete population to derive the approximate area below the Lorentz curve. Specifically, defining as $X_i$the cumulative density for each income class i, and as Y_i the cumulative share of income, the GINI coefficient is given by the following equation:

$$GINI = 1 - \sum_i (X_i - X_{i-1})(Y_i + Y_{i-1}) \qquad 11.17$$

It should be noted that the GINI coefficient is an imperfect measurement of inequality in this case. Firstly, calculating the GINI with aggregated data leads to a bias in the measurement. The GINI in such case would not account for the inequality within each income class, which might lead to either a under- or over-estimation of the real level of inequality. Moreover, the IRPEF is not the only form of taxation in Italy. Consequently, we might expect after-tax GINI to be lower compared to the one estimated. Nevertheless, the variation in the RS index upon reforms is still a valuable tool to evaluate the power of redistribution of each item included in the model. As a robustness check for inequality, the model also calculates the variation in income share before and after tax for the top 1% and top 5% of the income distribution[46].

11.5 MODEL WORKSHEETS DESCRIPTION

There are roughly three types of worksheets available in the model: the interface and output, those containing data inputs, and those used for different underlying calculations.

The first two worksheets presented in the working file are the interface and the "Analysis and comparison". These two elements are the core part for the incidence analysis of the IRPEF. In the interface, it is possible to:

- Deactivate the "Cedolare Secca" regime or change its rates.
- Change statutory tax rates and boundaries.
- Deactivate all deductions and tax credits.
- Change the share to impute for individual expenditures under "Partial Individual Expenditure" worksheet.
- Deactivate the IRPEF Bonus.
- Deactivate the Welfare Transfer.
- Deactivate Behavioural Responses and change the Elasticity of Taxable Income (ETI).

Once a reform is applied, the "Analysis and comparison" worksheet will present, for each income class in both the actual and the reformed system, the main variables calculated in the model and some graphs useful for the analysis.

In particular, variables reported are: gross income, taxable income, effective tax liability, income after tax, effective average tax rates (EATR), effective marginal tax rates (EMTR) and the

[46] The top 1% includes all individuals with income above 100,000 euro. The top 5% includes those above 55,000 euro.

Marginal Excess Burden (MEB). The model also calculates the difference in reported gross income (due to behavioural responses) and the difference in tax revenues for a given reform. Moreover, the model aggregates some income classes in order to show the level of concentration of income before and after tax. In particular, the model computes the share of gross and net income for the top 1% and top 5% of the population of taxpayers[47]. Keeping in mind that these values do not encompass all the potential effects of a tax regime, the difference between gross and net shares of income could be used as a raw comparable measurement of progressivity of the system.

Graphs included in the "Analysis and Comparison" worksheets are the core for conducting an incidence analysis of the IRPEF. Effective average and marginal tax rates, behavioural responses and tax revenues changes are plotted against all income classes, in order to evaluate the effect of a given reform for each level of income considered in the classification of the MEF. Effective average tax rates are computed as the ratio between effective net tax debt, after the application of all tax rules, and the aggregate income before taxes. Effective marginal tax rates are the ratio between a variation in tax debt for a marginal income increase against the marginal variation in income itself. Table 11.5 below provides a summary of all worksheets included in the excel file, with a description of their purpose.

Table 11.5 Worksheets description

Worksheet Name	*Function*
Gross Tax Debt Calculator Net Tax Debt Calculator GTD increase NTD increase Gross Tax Debt reform Net Tax Debt reform	Use inputs from the rest of the file to compute respectively: gross and net tax debts, gross and net tax debts for a marginal increase in income, gross and net tax debts when a reform is applied.
Decomposition MTR Decomposition ATR	Compute and plot the implicit impact of different fiscal expenditures on average and marginal tax rates.
Marginal Tax rate Calculator	Compute the marginal tax rates for each income class.
Bh responses	Compute the variation in reported aggregate income for a given change in EMTRs.

[47] For the top 1%, the model considers the share of gross and net income of all income classes above 100.000 euro, which add up to exactly 1% in terms of population of taxpayers. For the top 5%, the model considers shares of income classes above 55.000 euro. Taxpayers of these income classes add up to about 4,5% of total taxpayers, so this measure underestimates the real share of income for the Top 5%.

Calculator	
MEB MEB reform	Compute the Marginal Excess Burden for each income class before and after reform.
Welfare Transfer	Compute the artificial welfare transfer.
Income + IRPEF Bonus Cedolare Secca Deductible Expenditures Credits (except. P. Ind. Exp.) Partial Individual Expenditures P. Ind. Expendit. At 19%	Contains all respective input data.
P. Ind. Expenditure Increase IRPEF Bonus Increase T.C. Family Members Increase dep emp and pension Increase Welfare Transfer Increase	Compute values of the respective fiscal expenditure for a given income increase.
Distortion vs Redistribution Dist. vs Red. % variation	Compute the calculation required for Figure 8.1
Reforms analysis Proposed reforms	Present the rules and the analysis of all proposed reforms
SWW Comparison SWW density calibration density cal increased	Compute the density, the density's first derivative and uses them to calculate the implicit social welfare weights and the simulated SWWs
GINI	Computes the GINI coefficient before and after tax

11.6 CS REGIME: TAX REVENUES VARIATION PER CAPITA

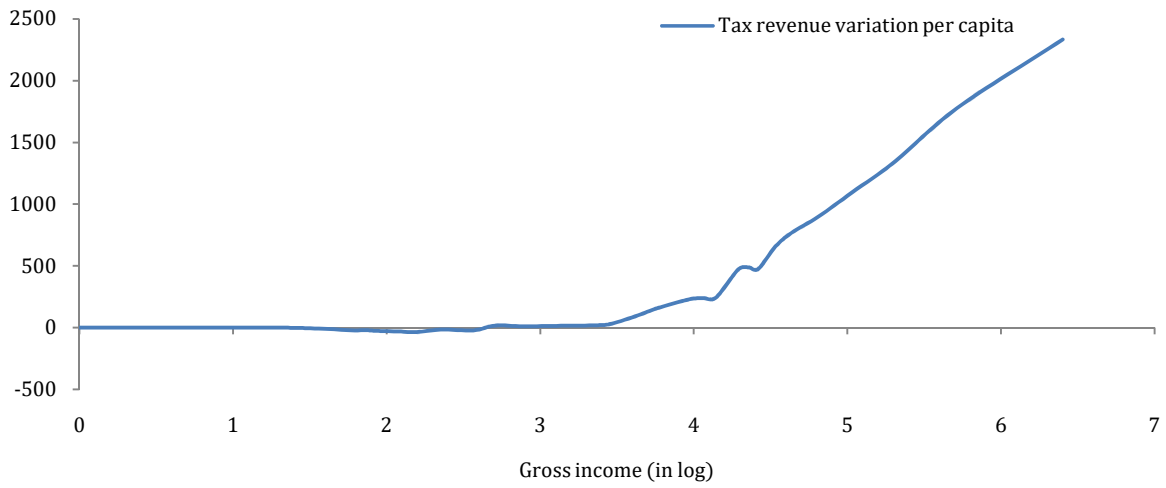

Figure 11.1 Tax revenues variation per capita without CS the regime
Source: Author calculation

11.7 POLICY EXPERIMENTS: REFORM DETAILS

Table 11.6 IRPEF proposed reforms statutory rates

Reform	*Statutory Rates*	*Lower Bound*	*Upper Bound*
No-tax credits	17%	0	15000
	25%	15000,01	28000
	38%	28000,01	55000
	41%	55000,01	73000
	44%	73000,01	
Strong	20%	0	15000
	26%	15000,01	28000
	37%	28000,01	55000
	42%	55000,01	75000
	46%	75000,01	
Soft with Bonus increased	23%	0	15000
	26%	15000,01	28000
	36%	28000,01	56000
	41%	56000,01	77000
	44%	77000,01	
Strong with bonus increased	21%	0	15000
	27%	15000,01	28000

	37%	28000,01	60000
	40%	60000,01	77000
	43%	77000,01	
	22%	0	15000
	27%	15000,01	28000
Soft	37%	28000,01	54000
	41%	54000,01	70000
	44%	70000,01	

Table 11.7 IRPEF proposed reforms fiscal expenditures

		Flat Rate	*No tax credits*	*Strong*	*Soft with bonus Increased*	*Strong with bonus increased*	*Soft*
Deductions	SSC	*X*	*X*	*X*	*X*	*X*	*X*
	Contribution for domestic and family services	*X*			*X*		*X*
	Donations to religious institutions	*X*			*X*		*X*
	Health Expenditure for Disability	*X*	*X*	*X*	*X*	*X*	*X*
	Divorce transfer	*X*	*X*	*X*	*X*	*X*	*X*
	Complementary SSC	*X*	*X*	*X*	*X*	*X*	*X*
	Other deductions	*X*			*X*		*X*
	Main residence Deduction	*X*					
Tax Credits	Dependent Family Members	*X*	*X*	*X*	*X*	*X*	*X*
	Dependent employment and pension	*X*	*X*	*X*	*X*	*X*	*X*
	Building Heritage renovations	*X*			*X*		*X*
	Energy-savings renovations	*X*			*X*		*X*
	Real estate and land leasing to young for main residence	*X*			*X*		*X*
	Expenditure for furniture and VAT on Main residence (at 50%)	*X*			*X*		*X*
	Investment in Start-up	*X*			*X*		*X*
	Others	*X*			*X*		*X*
	Credits imputed at 19% of the original value	*X*		*X*	*X*	*X*	*X*
	Credits imputed at 26% of the original value	*X*			*X*		*X*
	Credits imputed at 30% of the original value	*X*			*X*		*X*
	Credits imputed at 35% of the original value	*X*			*X*		*X*
	IRPEF Bonus	*X*		*X*	*X**	*X***	*X*
"Cedolare Secca" regime		*X*					

*Increased by 20%

**Increased by 50%