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DO DETAILS MATTER?
AN ANALYSIS OF ITALIAN PERSONAL INCOME TAX

by Martino Tasso*

Abstract

Do the details of the structure of the tax code matter? Which of the elementary components of a modern and complex tax code is most important for households? This paper explores these issues within the framework of an overlapping generation model with heterogeneous agents and with specific reference to the case of Italy. Risk averse agents in the model are exposed to lifespan uncertainty, borrowing constraints, and uninsurable wage shocks. In this framework, the tax code plays an important role as a source of publicly-provided insurance against unlucky realizations of incomes. In particular, while many features of the tax code are instrumental in shaping its ability to redistribute income across agents, this paper finds that a new-born agent would attach a significant welfare value to the existing tax credit for employees' earned income. This provision of Italian personal income tax significantly lowers the tax burdens on agents hit by negative productivity shocks and thus plays a crucial role in limiting the dispersion of realized net incomes and consumption.

JEL Classification: H21, H24, H31.
Keywords: personal income tax, overlapping generations.
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1 Introduction [1]

Over the last few years concerns about income and wealth distribution in advanced economies have gained increased attention. Because of this, many started questioning the proper design of the tax code as one of main tools in the hands of Governments to address inequality (e.g. IMF (2013), IMF (2017)). Indeed widening differences among individuals' well-being pose a challenge for tax authorities, and even more so when public finances in many countries are under some strain because of both the consequences of the last recessions and of the prospect of an ageing population. Against this background, in the public debate some argue in favor of more progressive forms of taxation, other claim that over time tax codes have became extremely complex and a simplification is nowadays long overdue.

While high tax levels discourage work, they are needed to finance re-distributive policies in favour of the poor. As recognized by a strand of literature, if agents are risk averse and exposed to some source of idiosyncratic risk to their hourly wages, they value the implicit insurance guaranteed by a progressive tax code. Do the details through which progressive tax codes are implemented in practice matter for macroeconomic performance and agents' well-being? In particular, which parts of the code do agents value the most? How do these specific tax provisions affect the distribution of net income and consumption? This paper aims at answering these questions with the help of a heterogeneous agents overlapping generations model calibrated on Italy. This modelling framework is well suited for the task of analyzing the heterogeneous impact of different policies, while taking into account of behavioral responses (in terms of labor supply and asset accumulation) and of possible general equilibrium effects.

Even though personal income tax codes in many advanced economies share many features, Italy is interesting in itself for a series of reasons. First of all, in an international comparison Italy stands out as a country with a quite high overall tax burden and, in particular, with a very high tax wedge on labor. The OECD computes that in 2019 the tax wedge for an average representative employee in Italy stood at 48.0% of labor costs, 12 percentage points more than the average figure across all of the organization's member states (OECD 2020).[2] This notwithstanding, the redistributive

[1] The views expressed in this study are the author's only and do not necessarily reflect those of Banca d'Italia. While part of this paper is based on data from Eurostat (EU-SILC 2007-2014), the responsibility for all conclusions drawn from the data lies entirely with the author and results and conclusions should not be interpreted as those of Eurostat or the European Commission. Martino Tasso acknowledges the very kind hospitality of the UCL economics department, where part of this work was conducted. He thanks Salvatore Lo Bello, Margherita Borella, Giacomo Caracciolo, Maria Cristina De Nardi, Laurence Kotlikoff, Valentina Michelangeli, Elisabetta Olivieri, William B. Peterman, Katja Schmidt, Paolo Sestito, Pietro Tommasino, Gianluca Violante, Stefania Zotteri and many participants to the 21st Bank of Italy's public finance workshop for discussions on early versions of this work and for a series of useful suggestions. All remaining errors are the author's only. Comments are very welcome.

[2] Even restricting the comparison to the average across OECD members within the European Union, a significant

capacity of its personal income tax, in terms of its ability of reducing the dispersion observed in pre-tax incomes has been somewhat questioned (Verbist & Figari 2014).[3] Moreover, like in other countries, the complexity of the tax provisions in Italy has increased over time, with many special treatments added to the original tax design. It is not surprising, therefore, that some have called for an overall reform of the "tax expenditures" embedded in the Italian code (Tyson 2014).

Many features of the Italian tax code contribute to its ability to redistribute income across agents. Both the use of rising marginal tax rates and the existence of an earned-income credit for employees are clearly crucial in this respect. To the extent that they are used differently by taxpayers across the earnings distributions, also other characteristics of the code, such as the exclusion of some items from the tax itself and the tax credits allowed in case of specific expenditures, are instrumental in shaping the overall degree of progressivity of the Italian personal income tax (PIT).

The basic idea of this study is to "switch off" each of these characteristic of the Italian PIT one at a time to gauge its long-run effects on the economy and on welfare. This is attained by simulating alternative economies in which each of these provisions for employees is replaced, in a budget-neutral way, by a proportional transfer to all working-age agents. The welfare value of each existing tax provision is then computed as the consumption-equivalent variation of a new born agent, under a *veil of ignorance* about the future realizations of the earning shocks.

The paper finds that the way progressivity is implemented indeed matters. In particular, a tax code which trades the existing earnings-related tax credit for low and middle income workers for lower effective marginal rates in a revenue neutral fashion would increase the dispersion of realized net incomes and consumption in the economy. Such an alternative tax code would also be detrimental for long-run welfare, even in presence of macroeconomic gains in terms of consumption, capital accumulation, and production. According to the model, the welfare benefit of the existing earning tax credit for a new born agent is roughly equal to 1.5 percent of steady state consumption.

The direct macroeconomic effects of the existing tax benefits in terms of exclusions from the tax base and of tax credits for specific expenditures are relatively minor. On the contrary, the rising marginal tax rates have first-order effects on the economy. On the one hand, they are found to play a role in restricting both capital accumulation and labor supply for above-average earners. On the other hand, they dramatically reduce the variability of net income and consumption.

Similarly to descriptive studies on the distributive properties of the Italian PIT in terms of reduction of inequality of net incomes for a given distribution of pre-tax earnings (Barbetta et al.

difference (of about 6 percentage points) remains.

[3] Admittedly comparing the progressivity features and the redistributive capabilities of tax systems across countries is a difficult task. Nevertheless, the existing evidence indicates that the Italian personal income tax likely features about an "average" schedule, if compared to taxes in other advanced economies (see, for example, Joumard et al. (2013), Holter et al. (2019)).

(2018), Di Caro (2019)), this paper finds that both the differential rates and the earned-income credit play crucial roles for the progressivity of the tax code. Nevertheless, this evidence is complemented by an analysis of whether individual components of the code are desirable in terms of long run macroeconomic performance and welfare.

The paper is structured as follows. Sections 2 and 3 illustrate respectively the main related work in the literature and some basic fact about the Italian PIT. Section 4 explains the characteristics of the model. Sections 5 and 6 are devoted to the calibration and the outcome of the model in the benchmark steady state. Sections 7 and 8 illustrate the computational experiments. Section 9 concludes and suggests possible avenues for future research.

2 Related studies

In terms of modelling strategy, this paper relates to two connected strands of the literature. On the one hand, because of its very structure, the model used here clearly relates to public economic studies conducted using computational general equilibrium overlapping generations models, in the spirit of Auerbach & Kotlikoff (1987) and Altig et al. (2001). However, because of the role played in this paper by idiosyncratic income shocks, this model also relates to the literature on heterogeneous agents macroeconomic models (Heathcote et al. 2009). In the absence of a full insurance mechanism against income shocks, these models generate some heterogeneity among agents within cohorts. Indeed, to avoid to be too exposed to possible swings in consumption, agents try to self-insure adjusting their individual choices over labor supply and consumption. This is the basic intuition of a large strand of literature, whose roots lie in the seminal works by Huggett (1993) and Aiyagari (1994). More recently, these models have been used to study several fiscal policies issues (Heathcote 2005), with a particular emphasis on the role of tax progressivity (Heathcote et al. 2017). Combining the modelling features of the overlapping generations framework with heterogeneous agents has become, since the work of İmrohoroglu et al. (1995) on social security, a workhorse for many public economic applications. Indeed, these kinds of models are increasingly being used also by institutions and research centers to analyze fiscal policy proposals (e.g. Nishiyama (2003), Penn Wharton Budget Model (2018)).

In terms of the focus of the study, even though this is not a piece of research on optimal tax design, this paper clearly relates to earlier work on the progressivity of the tax code. Nishiyama & Smetters (2005) shows that the presence of uninsurable wage shocks makes a switch from a progressive income tax to a flat tax on consumption inefficient. This result, which is in contrast with the previous literature on the topic, mostly based on deterministic models, is driven by the loss of risk sharing provided for by a progressive tax code. Conesa & Krueger (2006) compute the optimal degree of progressivity for the US tax code, finding that a flat tax with a sizable fixed deduction maximizes long-run welfare in the economy. They also find that a pure proportional tax would imply some welfare loss because of the diminished insurance properties of the system, notwithstanding increased production levels. Krueger & Ludwig (2013), allowing also for endogenous human capital formation, show that the optimal degree of progressivity for the US tax code is significantly higher than the current one.

Turning to the case of the interest for this specific economy, Bucciol et al. (2017) use a heterogeneous agents overlapping generations model to run a series of policy experiments for Italy, France, and Sweden. Nevertheless, to the best of my knowledge, this is the first paper to apply these methodologies to the study of the structure of the Italian tax code.

Tax policy analysis in heterogeneous agents models typically relies – mostly for computational reasons – on smooth approximations of the tax schedule (Guner et al. 2014), rather than on the exact replication of each provision in the law. Given the focus of this piece of research on the details of the tax structure, this work also relates to other very recent studies on the importance of the way revenues are modelled in these kinds of models (Moore & Pecoraro 2019).

3 The Italian personal income tax

The Italian personal income tax (PIT; formally known as *Irpef*) is a progressive tax on most personal incomes of taxpayers (Pellegrino & Panteghini 2020, Curci et al. 2020). The unit of taxation is the individual, rather than the family (as customary in other countries).[4] Mostly because of the exclusion of the majority of capital incomes, employment and pension earnings constitute the bulk of the tax base of the Italian PIT levied on households (more than 80% in 2018).

The computation of the amount due is rather standard. Indeed, the PIT due is computed applying a set of marginal tax rates (Table 1) to a taxable income, which is in turn given by the gross earnings minus some deductions, the most important of which being that for social security contributions. Each taxpayer is then given a non-refundable tax credit (which decreases the amount of net tax due) as a function of the source and the amount of her income. For an employee the maximum amount of the this benefit is slightly less than 2,000 euro, in the case of an overall income below 8,000 euro. Below this income threshold the tax credit brings the total tax due to zero. Above it, though, the credit is phased out at a relatively high rate (especially for lower incomes).

The progressivity of the Italian personal income tax thus depends on both the rising marginal rates and, in particular, on earnings-related non-refundable tax credits (Di Caro 2017). Indeed, the existence of the tax credit plays a major role in shaping the concavity of the profile of the average effective tax rate. As a result, for low incomes average rates are kept at a relatively low level, even

[4]Nevertheless, the Italian tax code accounts for family-related burdens through a set of tax credits or welfare benefits (such as those related to the number of children in the household).

Income bracket	Statutory marginal tax rate
Up to 15,000 euro	23%
15,000 – 28,000 euro	27%
28,000 – 55,000 euro	38%
55,000 – 75,000 euro	41%
Above 75,000 euro	43%

Table 1: Marginal tax rates

though with a quite steep increase. Figure 1 shows the effective average (top panel) and marginal tax rates (middle panel) for a single taxpayer without any family-related fiscal burdens; the bottom panel plots the monetary value of the non-refundable earnings-related tax credit.

Some distributional facts about the *Irpef* can be useful at this point: according to the Italian tax authorities, in 2018 (the last year for which statistics on tax returns are currently publicly available) the average taxable income for people whose prevailing source of income was labor stood at about 22,300 euro (about 19,400 euro for retirees); for taxpayers with income as employees, the average net tax due was worth about 5,300 euro (about 4,400 for retirees).

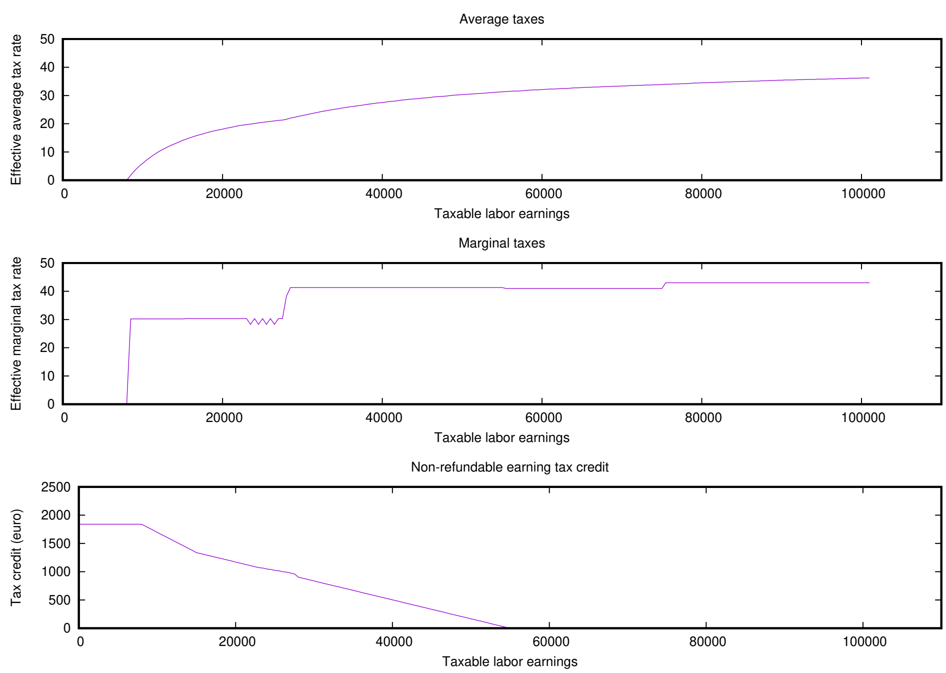

Figure 1: Main features of the Italian personal income tax in the model

Many studies have dealt with the effects of some of the characteristics of the Italian PIT. Colombino & Del Boca (1990) and Colonna & Marcassa (2015) evaluate labor supply consequences in a static framework, Marino et al. (2016) – where the focus is on the potential tax disincentives for the labor supply of married women – in a dynamic one. All these studies, though, are conducted in a partial equilibrium setting. Overall, as also highlighted by a series of reports by international organizations, there is some consensus that the high burden of taxation on labor in Italy could have detrimental effects, in particular for some categories of taxpayers.

4 The model

The economy consists of a large number of overlapping-generations of households, a perfectly competitive and representative firm, and a government. Time is discrete and one period in the model is equal to one year. In steady state the model is assumed to be on a balanced growth path, with population growing at rate n_p. The basic setup of the model and its solution method are similar to those in Conesa & Krueger (2006) and Nishiyama & Smetters (2014).

4.1 The households

Households enter the model in period 1 and live, at most, until period J^T. They all retire from work, at the latest in period J^R. Households are heterogeneous with respect to age (j), assets (a), historical average gross earnings (ea), and labor productivity (z). During working ages, as in Conesa et al. (2009), labor productivity at each age j, is assumed to follow:

$$log(z_j) = log(\kappa) + log(e_j) + log(\eta_j) \tag{1}$$

First, households draw a permanent "productivity type" (κ) at birth: with some probability p they have a high component, with probability (1 - p) they have a low one[5]. Second, as households age, their average productivity evolves according to a deterministic life-cycle component (e_j). Finally, at the beginning of each period agents draw an idiosyncratic wage shock, which follows a Markov process:

$$\eta_j = \rho\eta_{j-1} + \epsilon_j, \qquad \epsilon_j \sim N(0, \sigma_\epsilon^2) \tag{2}$$

Different realizations of the stochastic component of the hourly wages generate cross-sectional variability in incomes, consumption, and, accumulated assets.[6] As in Conesa & Krueger (2006), this feature of the model economy gives a role to a progressive tax system as an insurance mechanism.

In each period of their working life, households choose how to split their time endowment between work and leisure, subject to a budget constraints affected by the tax code. Moreover,

[5] I consider two ability types with the same population mass.

[6] As each agent is assumed to draw a different realization of the wage shock in each period, this model is silent about issues of involuntary unemployment.

households are borrowing constrained. In the model during the retirement period (i.e. after period J^R) each household collects a public pension, in an amount proportional to the average annual income earned over its working-age career (ea). In the calibration, this proportion (and, thus, the generosity of the pension payments) is set so that, in equilibrium, the average earnings of retirees as a ratio of pre-retirement income matches the Italian Treasury's estimates of the pension gross replacement rate.

The per-period utility function is defined over consumption (c) and leisure (l) and is given by:

$$U(c,l) = \frac{c^{1-\gamma}}{1-\gamma} + \chi\frac{l^{1-\phi}}{1-\phi} \tag{3}$$

The lifespan of each agent is uncertain (i.e. they all face a positive probability of dying at each age). As in many studies in this literature, assets of deceased agents are unintended bequests and are transferred, lump-sum, to all working-age households.

More formally, the household's problem is the following:

$$V_j(X) = \max_{c,l}\{U(c,l) + \beta s_{j+1}E[V_{j+1}(X^+)]\} \tag{4}$$

$$s.t.$$

$$a_{j+1} + (1+\tau_c)c_j = (1-(1-\tau_k)r_t)a_j + f(w_t z_j(1-l_t)) + f(pen_j(ea))$$

$$a_{j+1} \geq 0, \quad (1-l_j) \geq 0, \quad pen_j(ea) = 0 \quad \text{if} \quad j < J^R$$

where s_{j+1} is the survival probability until next period, $X = \{j, \kappa, \eta, a, ea\}$ is the set of the state variables at the individual level (i.e. age, permanent productivity type, persistent productivity shock, asset level at the beginning of the period, historical working life average labor incomes) and $f(.)$ is a function which approximates the structure of both the social security contributions and of the PIT. As will be better explained in section 4.3, τ_c and τ_k are the proportional tax rates respectively on consumption and capital income. Finally, $pen(ea)$ is the public pension (gross of taxes) accruing to an household with historical average earnings of ea.

4.2 The representative firm

The firm hires capital K_t and labor L_t on perfectly-competitive factors' markets to produce a single output good Y_t using a Cobb-Douglas technology:

$$Y_t = \Omega K_t^{\alpha} L_t^{1-\alpha} \tag{5}$$

Capital depreciates at rate δ. Thus, the capital stock evolves according:

$$(1+n_p)K_{t+1} = (1-\delta)K_t + I_t \tag{6}$$

where I_t is the stream of investment in period t. The resulting prices for the two factors of production are therefore:

$$r_t = \alpha\Omega(\frac{L_t}{K_t})^{1-\alpha} - \delta, \qquad w_t = (1-\alpha)\Omega(\frac{K_t}{L_t})^{\alpha}$$

4.3 The government

In this model the government issues public debt (of which the stock level in year t is B_t) and runs a balanced budget. On the one hand, the Government raises its revenue from taxes on labor income (PIT_t), consumption ($\tau_c C_t$), capital income ($\tau_k r_t A_t$), as well as from social security contributions (SSC_t); it also issues new debt $(1+n_p)B_t$. On the other, it finances pension outlays (P_t), a stream of exogenous consumption G_t and repays interest on its debt ($(1+r_t)B_t$). The pension system is pay-as-you-go, with no accumulation of dedicated funds.

Overall, the Government's budget constraints reads:

$$(1+n_p)B_{t+1} + \tau_t^c C_t + PIT_t + \tau_t^k r_t A_t + SSC_t = G_t + (1+r_t)B_t + P_t \tag{7}$$

Social security contributions are levied on gross labor incomes almost proportionally, up to a maximum threshold, set by the law.[7] Labor and pension income, net of social security contributions, is taxed according to the structure of the Italian PIT, i.e. in a progressive fashion mainly due to both increasing marginal tax rates and decreasing tax credits; in the model I replicate exactly the basic features of the tax scheme in place in 2007-2013 (i.e. the rates, increasing by income, and the tax credits for employees and retirees of different ages), while I approximate some other characteristics of the PIT, such as the amount of exemptions, tax credits for expenses and the local surcharges (see Appendix A for implementation details).

4.4 The equilibrium

The economy studied here features the markets for capital and labor inputs in production and the goods one. The equilibrium in the factor markets is guaranteed by prices r_t and w_t. In the capital market the assets accumulated by the households are used both for firm's production and to finance public expenditures, through government debt:

$$A_t = K_t + B_t \tag{8}$$

In a closed economy, all privately produced output must be either consumed by households or by the government, or saved as investment. Therefore, the aggregate resource constraint reads:

$$Y_t = C_t + G_t + I_t \tag{9}$$

[7] Employee social security contributions are worth 9.49% of earnings up to 46,123 euro, and 10.49% between this threshold and 100,324 euro; a fixed amount is due for higher earnings. Employer contributions are worth 31.58% of earnings up to 100,324 euro and a fixed amount above that threshold (OECD 2018).

Parameter		Value	Source
Consumption tax rate (%)	τ_c	17.6	European Commission (2018) 2005-2017
Capital income tax rate (%)	τ_k	29.1	European Commission (2018) 2000-2017
Government debt / GDP	B/Y	117.8	Average 1999-2018
Growth rate of population (% per year)	n_p	0.3	Average 2002-2018
Persistence of earning shocks	ρ	0.98	Increasing variance of log earnings over ages
Risk aversion	γ	2.0	Conesa et al. (2009)
Curvature of disutility for labor	ϕ	4.0	Frisch elasticity = 0.5
Capital share	α	0.36	Torrini (2015)
Retirement age	J^R	62	OECD

Table 2: Exogenously set parameters

More formally, given a path for government policies in terms of revenues, expenditures, and debt, a recursive competitive equilibrium is a set of household's policy functions for labor supply and consumption, prices, and firm's input such that:

- aggregate variables are equal to the sum of individual ones;
- households solve their dynamic optimization problem in 4;
- the firm solves its profit maximization problem in 4.2;
- the government's budget in 7 is balanced;
- the goods market clears, as specified in 9.

In the long run the equilibrium path just described is such that prices, tax rates, and all individual variables are constant over time, while all aggregate variables grow at the same rate of the population (n_p).

5 Calibration

In this section I briefly describe the assumptions made about model parameters, either exogenously set (Table 2) or calibrated to match some relevant statistics in the data (Table 3).

Agents enter the economy at age 25 (model age 1), retire at age 62 (model age 38) and die with certainty at age 101 (model age 76). As explained above, lifespan is uncertain: survival probabilities are taken from males figures computed by the Italian national institute of statistics for 2017. Population grows at a rate of about 0.3% per year, the average value for the last fifteen available years. As a result of these two choices, the model delivers roughly the same ratio of

Parameter		Value	Target
Discount factor	β	1.00	$K/GDP = 3.30$
Depreciation rate	δ	0.06	$I/GDP = 0.20$
Distaste for work	χ	3.47	Average worked hours = 0.33
Scale factor	Ω	0.87	Wage rate = 1.00
Variance of productivity types	σ^2_κ	0.25	$Var(logincomes_{25}) = 0.20$
Variance of persistent shocks	σ^2_η	0.01	$Var(logincomes_{64}) = 0.43$
Pension / historical earnings		0.50	Gross replacement = 0.71

Table 3: Calibrated parameters

working-age over total population as in the data (about 68% in both the data and the model). The choice for the retirement age J^R allows to mimic recent OECD estimates of effective age at retirement for men in Italy.[8]

The curvature of the utility function for consumption (η) is set to be equal to 2, as in Conesa et al. (2009). The discount factor, β, is calibrated so that the capital-output ratio of the baseline economy in steady state is close to the observed figure for the 1999-2018 period, that is slightly above 3. The weight attached on average to leisure is chosen, as customary in this literature, so that in the baseline households work about one third of the time. Moreover, the model is calibrated in such a way to deliver a Frisch elasticity of labor supply in the baseline steady state of 0.5, which is in line with most of microeconometric evidence of responsiveness of labor supply by prime age males (Peterman 2016).

While the technology level (Ω) is set to obtain an unitary wage rate in equilibrium, the depreciation rate of capital (δ) is chosen to match an investment-to-GDP ratio of about 20%, the average figure for 1999-2018.

The calibration of the earning process plays a very important role in the analysis. There is abundant evidence, at least for the US, that the variance of log of labor earnings increases over the life-cycle, starting with the study of Storesletten et al. (2004). For Italy Aktasa (2017) and Bingley & Cappellari (2018) find evidence of a qualitatively analogous phenomenon. For this paper, I use data from the Italian section of the European Union Statistics on Income and Living Conditions (EU-SILC) for the years 2006-2013 to calibrate the earning profile. In line with a standard procedure in this literature, I set the variance of the permanent component of earning shocks to 0.2 to approximate the variance of log labor income in the initial phases of the working lives. The persistence and the dispersion of the transitory shocks are chosen to match an increasing

[8]According to the OECD, in 2017 the effective retirement age for men – computed as the average age at the time of the exit from the labor force observed in the data over a five-year window – stood at 62.4 years; the average figure since 1999 is equal to 61.3 years.

	Mean	SD	CV
Gross labor income – data	41,022	23,763	0.58
Gross labor income – model	41,022	24,244	0.59
Net labor income – data	22,496	11,001	0.49
Net labor income – model	21,350	10,546	0.49

Table 4: Descriptive statistics on incomes: data and model

profile for the variance of log incomes by age, with a terminal value before retirement slightly above 0.4 (see Appendix B for details).

In the spirit of Nishiyama & Smetters (2014) or Nishiyama (2019), the deterministic age profile of productivity is set fitting a cubic polynomial through age-specific mean wages observed in the data.

6 Characteristics of the baseline economy

The model economy matches rather well the average level of gross labor incomes for workers (including all social security contributions paid by both the employer and the employee) and its dispersion (See Figure 2). Both in the model and in the data, the average gross labor income is hump-shaped over the working life. While correct on average, the model tends to slightly over-predict average incomes in the earlier part of the working life and under-predict them later on; moreover, the peak in average gross incomes in the model takes places slightly earlier than recorded in the data. The model correctly replicates a rising profile of dispersion of incomes over the working life and broadly matches its magnitude.

The overall coefficient of variation (i.e. the standard deviation scaled by the mean value) for gross wages (including social security contributions) is 0.58 in the data and 0.59 in the model; the corresponding figures for net incomes are equal to 0.49 in both cases (Table 4). In the model, as a result of the accumulation of shocks, the variance of gross incomes over the working life of agents increases by about 0.23 log points. Because of the progressive nature of personal income taxation, the working-life increase in the variance of net incomes is much smaller (about 0.15 log points). Finally, thanks to the ability of the agents to smooth consumption and self-insure through their savings, the variance of consumption rises only by about 0.07 log points from age 25 until retirement.

In terms of the composition of the government's budget, the model generates a weight of personal income tax over GDP of almost 14 percent. This figure is slightly higher than the long-term average for *Irpef* (inclusive of local surcharges), which is around 10 percent.

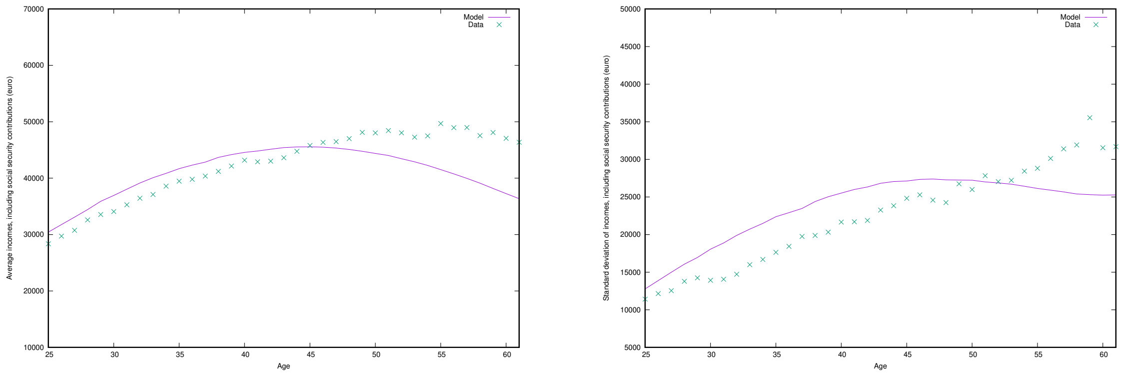

Figure 2: Mean and standard deviation of gross earnings by age

Finally, the model delivers an equilibrium real interest rate of 5.36%, which is close to the estimate of the rate of return on wealth computed by Jordà et al. (2019) for Italy since 1980 (i.e. 5.01%).

7 An evaluation of the personal income tax characteristics

In this section, the major components of the Italian personal income tax are switched off, one at a time, in order to assess their individual long run macroeconomic and welfare effects. The analysis aims at understanding the consequences of the design of the PIT, rather than at simulating hypothetical reforms. Thus, the focus is on the long run (steady state) outcomes, without explicitly considering the effects of the transition from one tax system to another. While comparing the alternative economies with the baseline, the level of government debt (in nominal terms) is kept constant. Any windfall/shortfall in the government budget constraint generated to changes to the structure of the PIT is closed by a transfer/tax on all working age agents in the model which is proportional to their taxable income. Thus, this procedure is tantamount to shifting, in a parallel fashion, all statutory marginal tax rates. In what follows, I consider in turn the effects of removing these major characteristics of the PIT: i) the exclusions of some items from its taxable base, ii) the credits for specific expenditures, iii) the differential marginal rates for lower incomes, and iv) the credit for labor income.[9] The focus is on the main macroeconomic variables and on welfare, computed as the expected utility of a newborn, under the so-called *veil of ignorance*, that is before knowing the realization of the permanent and transitory shocks. Welfare across experiments is compared using the concept of the consumption equivalent variation (CEV), that is the percentage change in consumption across all possible states which would make agents indifferent between

[9]To make all the scenarios comparable, all changes to the tax code described here are applied only to working-age individuals.

being born in the baseline economy and an alternative world characterized by a different tax code; a positive (negative) value indicates that the analyzed change in the tax code improves (worsens) welfare.

More formally, the CEV satisfies the following relation for each individual i:

$$E[\sum_{j=1}^{J^T} \beta^j s_{j+1} U((1+CEV)c^b_{ij}, l^b_{ij})] = E[\sum_{j=1}^{J^T} \beta^j s_{j+1} U(c^a_{ij}, l^a_{ij})]$$

where b denotes the baseline steady state and a any alternative economy.

7.1 A tax code without exemptions

In this exercise the base of the PIT is broadened (by disallowing the existing allowances[10]); at the same time, as explained above, all statutory rates are reduced to keep the overall amount of taxes fixed at the level of the baseline economy. Given the relatively small importance of tax exemptions for employees, the steady state of this economy is remarkably similar to the baseline one. While the existing allowances benefits mainly higher-income taxpayers, in the alternative simulation the same amount of resources is *de facto* shared more equally across all income groups, through the proportional rebate. This explains why the dispersion of income (and consumption) is found to slightly decrease.

7.2 A tax code without expenditure-related tax credits

In this model the removal of non-labor-related tax credits[11] and their replacement with lower marginal tax rates has mild macroeconomic and welfare implications. Under the current setting of the tax code, these tax credits as a whole are enjoyed almost proportionally by all income groups. From the distributional standpoint, their replacement with a proportional rebate has only minor consequences. The long-run macroeconomic impact is found to be almost nil. It must be recognized, though, that, by construction, this exercise cannot take into account any possible spillover effect on the markets (e.g. mortgages, housing renovations, charitable giving) which benefit from these specific preferential tax treatments. Moreover, as these tax breaks are here modelled as a function of income only, this analysis is silent about their possible horizontal-equity properties.[12]

[10] *Oneri deducibili* in Italian; see Appendix A for details.

[11] *Detrazioni per oneri* in Italian; see Appendix A for details.

[12] In particular, it should be noticed that some tax credits are meant to contribute to specific out-of-pocket medical expenditures. As such, they might play some insurance role. Nevertheless, the direct public provision of medical services is predominant in Italy. Moreover, the weight of the medical expenditures tax credits over PIT receipts is limited.

	Actual tax code	No allowances	No expenditure related credits	One rate	No earned income credit
r	5.36	0.11	-0.02	-1.72	-1.75
w	1.00	-0.03	0.00	0.48	0.49
GDP	–	-0.16	0.02	2.45	2.31
Consumption	–	-0.16	0.02	2.53	2.34
Capital	–	-0.21	0.03	3.32	3.20
Hours worked (H)	0.33	-0.08	0.00	1.45	3.13
H poor	0.35	-0.01	-0.02	0.62	4.53
H rich	0.31	-0.19	0.04	2.76	0.90
PIT/GDP	13.99	0.17	0.60	6.86	1.54
Tr/GDP	0.00	0.15	0.61	7.19	1.86
Tr/INC	0.00	0.24	0.95	11.24	2.91
CV gross income	59.10	-0.03	0.06	0.69	-2.12
CV net income	49.40	-0.39	0.13	7.00	2.84
CV consumption	44.76	-0.20	0.05	3.28	1.31
CEV (%)	0.00	0.04	0.02	-0.66	-1.46

Notes: results for the model representation of the actual tax code and percent deviations from this baseline (simple differences for ratios, coefficient of variations and CEV) under different hypothetical tax codes. A proportional rebate (denoted by Tr in the table) to all working-age households guarantees the invariance of overall PIT revenue (in nominal terms) across simulations. INC stands for average gross income. *Poor* and *rich* indicate respectively below and above average values for selected statistics. CV stands for coefficient of variation, i.e. the standard deviation of a variable divided by its mean.

Table 5: Main results

7.3 A tax code without differential statutory tax rates

One important way to achieve progressivity in modern economies PIT schemes is to apply increasing statutory tax rates as income grows. In this exercise, I compare the features of the current setting to an alternative, which features a single tax rate. Removing the current "preferential" treatment of lower incomes in this economy generates additional revenue, which is rebated proportionally to all taxpayers, by lowering the (unique) tax rate. It is important to stress that in this environment all other characteristics of the current PIT setup are kept unchanged. Most notably, this applies to the labor earning tax credit; thus the tax system in this alternative case still features increasing effective average tax rates and is therefore be quite different from a pure proportional tax on earnings. In any case, this system shifts the burden of the PIT to below-average income earners, who generate almost 29 percent of overall PIT revenue, as opposed to about 24 percent in the baseline.

This scenario is characterized by higher long-run GDP and consumption levels (by more than 2 percent with respect to the baseline steady state). This is due to both a higher overall labor supply and to higher capital levels. In particular, the labor supply of above-average earners increases by about 3%, while the response of lower-income taxpayers, who face higher average tax rates, is quite subdued (albeit positive). Notwithstanding an higher number of worked hours, consumption of below-average earners is actually lower than in the baseline (by slightly less than 1%). On the contrary, the rest of the population enjoys a much higher consumption level than under the current tax code (by more than 5%). In turns out that the ability of the tax system to provide insurance against shocks to income is lower than in the baseline, as indicated by the higher dispersion of net incomes and consumption. Welfare is lower than in the baseline, even though the differences are limited. Indeed, in this scenario, reduced insurance properties of the tax code and higher efficiency tend to almost balance each other. Nevertheless, as also noted above, the distributional consequences are strikingly different.

7.4 A tax code without earning tax credit

In the current setup, the earning tax credit[13] allows excluding the lower tail of the earnings distribution from the payment of almost any PIT. In the alternative economy studied here, this tax credit is removed and replaced by lower statutory marginal tax rates across the board. On one hand, such an alternative tax code is characterized by overall lower marginal statutory and effective tax rates on the current taxpayers (the statutory ones are decreased by design; the effective ones are also reduced by the abrogation of the phase-out region of the tax credit). On the other hand, effective average taxes on low income earners are much higher. As in the case of the code with a unique rate, in steady state this economy features higher levels of GDP, consumption and capital with respect to the baseline. Labor supply is higher too. Nevertheless, unlike in the previous case, the difference comes mainly from young and low-income earners who, in this economy, are forced to self-insure against negative contingencies by accumulating assets. Moreover, while this alternative tax code features much higher marginal tax rates on the very poorest (those who, under the current setting do not pay any income tax), it also lowers marginal effective tax rates on the *taxpayers* whose income are below average, by removing the phase-out region of the tax credit. This encourages them to supply more hours of work. On the other hand, the labor supply response of taxpayers earning above-average incomes is less pronounced. Unlike in the case of the switch to single rate system, this has the interesting consequences of reducing the dispersion of realized *gross* incomes. This notwithstanding, the dispersion of *net* incomes increases. As the tax code resembles in many ways a proportional tax for all income levels, it loses part of its ability to smooth out negative

[13] *Detrazione per redditi da lavoro dipendente* in Italian.

shocks. Indeed, a tax code without some form of safeguard for very low income realizations loses its most relevant insurance property. As it turns out, notwithstanding increased income levels, this economy is characterized by a significantly lower welfare level (by about 1.5 percent of steady state consumption).

8 Robustness

In this section, the main experiments discussed above are run again under different modelling assumptions to check for robustness. Each new run of the exercises implies the re-calibration of the baseline steady state: Table 6 shows how the key parameters of interest change in different cases.

	Baseline	Small open economy	Higher elasticity	Lower risk aversion
ϕ	4.00	4.00	3.00	4.00
η	2.00	2.00	2.00	1.50
β	1.00	1.00	1.00	1.00
δ	0.06	0.06	0.06	0.06
χ	3.47	3.47	5.56	1.47
Ω	0.87	0.87	0.87	0.87
σ_κ^2	0.01	0.01	0.01	0.01
σ_η^2	0.25	0.25	0.25	0.25
pension parameter	0.50	0.50	0.47	0.53

Table 6: Calibrated parameters for the robustness analysis

All in all, these robustness checks confirm the previous main findings. Nevertheless, some observations could be of interest and, in what follows, I will point out some of them. Table 7 shows the main macroeconomic variables of interest in various cases (the upper panel reports the main results from the baseline simulations just for the ease of the comparison).

The second panel shows the results when assuming a small open economy setting, in such a way that comparison between alternative economies and the baseline one would not be confounded by any changes in factor prices. To this aim, as customary in the literature, I assume that international capital flows would clear the capital market in the model (Nishiyama & Smetters 2014). While in the baseline simulations the wage rate increases when switching to systems characterized by a single rate or when removing the earning tax credit, thus fostering labor supply, here this channel is completely shut down. Indeed, in this case the changes in labor supply are sightly less pronounced.

	Actual tax code	No exemptions	No expenditure related credits	One rate	No earned income credit
			Baseline		
GDP	–	-0.16	0.02	2.45	2.31
Consumption	–	-0.16	0.02	2.53	2.34
Capital	–	-0.21	0.03	3.32	3.20
Hours worked	0.33	-0.08	0.00	1.45	3.13
CV net income	49.40	-0.39	0.13	7.00	2.84
CEV (%)	0.00	0.04	0.02	-0.66	-1.46
			Fixed r and w		
GDP	–	-0.12	0.01	1.68	1.57
Consumption	–	-0.16	0.02	2.57	2.40
Capital	–	-0.12	0.00	1.68	1.57
Hours worked	0.33	-0.07	-0.00	1.16	2.88
CV net income	49.40	-0.38	0.12	7.01	2.84
CEV (%)	0.00	0.03	0.02	-0.51	-1.35
			Higher labor supply elasticity ($\phi = 3.0$)		
GDP	–	-0.17	0.03	2.78	2.58
Consumption	–	-0.17	0.03	2.82	2.64
Capital	–	-0.23	0.05	3.86	3.47
Hours worked	0.33	-0.09	-0.00	1.54	3.31
CV net income	47.59	-0.40	0.15	7.26	2.70
CEV (%)	0.00	0.02	0.02	-0.39	-1.12
			Lower risk aversion ($\eta = 1.5$)		
GDP	–	-0.18	0.04	2.29	2.06
Consumption	–	-0.20	0.04	2.61	2.28
Capital	–	-0.22	0.05	2.61	2.38
Hours worked	0.33	-0.10	-0.00	1.22	2.83
CV net income	50.52	-0.42	0.16	7.46	3.30
CEV (%)	0.00	-0.01	0.02	-0.34	-1.13

Notes: results for the model representation of the actual tax code and percent deviations from this baseline (simple differences for ratios, coefficient of variations and CEV) under different hypothetical tax codes. A proportional rebate to all working-age households guarantees the invariance of overall PIT revenue (in nominal terms) across simulations. CV stands for coefficient of variation, i.e. the standard deviation of a variable divided by its mean.

Table 7: Robustness analysis

This translates into smaller effects on long-run product.

While in the baseline simulations I assumed a Frisch elasticity of 1/2, the third panel shows the results of the same policy experiments in the case of a more responsive labor supply (that is, when the Frisch elasticity in the initial steady state is set to 2/3). In this case, the simulation for which the alternative tax code would imply a significant lowering of marginal tax rates show larger effects on hours worked and output. Consequently, the welfare costs of these alternative simpler tax codes are somewhat reduced.

In the fourth and last panel I show the effects of making agents less risk averse (the coefficient η goes from 2 in the baseline to 1.5). While the most of the structural estimates of this parameter in life-cycle models would point to higher (or much higher) values[14], this exercise means to check whether the qualitative results still hold under a more conservative calibration. A relative risk aversion around 1.5 is similar to values chosen to calibrate other heterogeneous agents model such as Nishiyama & Smetters (2005), Fehr & Kindermann (2015), and Blundell et al. (2016). As it turns out, the earning tax credit provides a welfare benefit also in this case. As expected, though, now the agents in the economy value less the insurance properties of the progressive PIT. As a consequence, the cost of simplifying the tax code is slightly lower than in the baseline results.[15]

9 Conclusion

Do the details of the structure of the tax code matter? Which elementary component of the PIT is the most valuable for households' welfare? This paper explores these issues within the framework of an heterogeneous agents overlapping generation model and with specific reference to the case of Italy. Agents in the model are exposed to lifespan uncertainty and to uninsurable wage shocks. As already pointed out by some of the existing literature, the tax code plays an important role as a source of publicly-provided insurance against unlucky realizations of incomes. In the case of Italy, both the differential rates and the earned income credit have sizeable effects of capital accumulation, labor supply, and output. While both provisions reduce the volatility of incomes, from the welfare viewpoint the earned income credit is shown to be the most beneficial for a newborn agent, under the veil of ignorance about its productivity.

Under the model's assumptions, the role of both allowances and tax credits for specific expenditures is relatively minor in terms of both their impact on steady state macroeconomic variables and welfare. It must be recognized, though, that, by construction, this analysis cannot take into account any possible spillover effect on the markets (e.g. mortgages, housing renovations, charita-

[14] Cagetti (2003) finds values between about 2 and 8, French (2005) between 2 and 5, De Nardi et al. (2010) almost 4.

[15] Results for the case of an higher risk aversion ($\eta = 3.0$) is presented in Appendix C.

ble giving) which benefit from these specific preferential tax treatments. Moreover, as these tax breaks are here modelled as a function of income only, this analysis is silent about their possible horizontal-equity properties. Switching to some of the alternative tax code described here would likely involve the adoption of some sort of transitional relief (e.g. in the case of tax breaks for multi-annual expenses). These are potential important avenues for future research.

This paper focuses on long-run equilibria of economies characterized by different tax codes. In other words, it studies the case of a hypothetical alternative between two different worlds. In practice, though, moving away from the existing structure of tax-and-benefits might imply – as recognized by the previous literature in this field – very different welfare conclusions. Also the macroeconomic effects might be different over shorter horizons, especially if one would consider the possibility of concealing some of the increased labor supply to tax authorities. As some time would be needed to accumulate the higher capital stocks shown in the steady states of many alternatives, it is likely that the transition would imply some costs. Therefore the results of this paper should not be read as suggesting any possible reform recipe, but as a way to quantify the steady-state properties of the existing tax provisions. Studying the transition paths between two different tax code environments is a very interesting topic, but is not the focus of the current paper and is thus left for future research.

This study analyzes the main features of the taxes on employees, and, in the late stage of the life cycle, on retirees. As argued above, earnings from paid employment and pensions constitute the vast majority of the overall taxable income subjected to the Italian PIT. Moreover, taxes on the self-employed share some of the structure applied to employees (e.g. the scheme of the rising marginal tax rates). On the other hand, properly taking into account the tax burdens on self-employed would require the consideration of the characteristics of a series of special regimes, not available to employees. Most importantly, a model featuring two different forms of taxation would have to deal with the occupational choices of the agents. While such a model would hardly be the most appropriate one for the study of the individual characteristics of the PIT, it could be useful to assess the possible tax incentives to select in one particular occupation. This is intentionally left for future inquiry.

While this paper has a specific focus on Italy and on its tax structure, it could offer some more general lessons. While the quantitative effects of specific details of the tax structure depend crucially on the country-specific characteristics of both the earnings distribution and of the tax law, at least two conclusions could probably be generalized to other contexts. First, increasing marginal tax rates serve the purpose of raising revenue while limiting the burden on the less fortunate. As such, they represent both a disincentive on the supply of labor of the most productive agents and a mechanism to reduce the extent of the variability of net-of-taxes incomes. Second, shielding the most vulnerable (i.e. those hit by the most severe productivity shocks) from the burden of taxation – a role played by the earned income tax credit in the Italian setting – provides a highly valuable benefit to a new born, risk averse, agent.

A Approximations of specific parts of the tax code

As explained in the main text, the most important parts of the Italian PIT code (i.e. the structure of the rates and the tax credit for earned and pension incomes) are directly embedded in the code, trying to replicate the law as closely as possible. The Italian PIT, though, allows for an additional array of different special treatments based on specific behaviors of the individual taxpayers. Almost by definition, accounting for all of these characteristics of the tax code into a dynamic model is not feasible. On the other hand, as argued above, these treatments as a whole play a role in shaping the tax burdens faced by taxpayers at different income levels. Even though data on the utilization of these special tax breaks at the disaggregated level are not publicly available in Italy, the Ministry of Finance regularly releases statistics by brackets of income, on the basis of the annual tax returns. I therefore approximate both the amount of tax exemptions and expenditure-related tax credits fitting a polynomial of taxable income through their mean levels at each income bracket (on the basis of the 2014 tax returns, on 2013 revenues). As far as tax exemptions are concerned, I consider all *oneri deducibili*, which, for my population of interest mainly pertain to contributions to private pension plans. In the case of expenditure-related tax credits, I account for those which allow tax breaks because of housing-maintenance costs (*Sez. III A Quadro RP*, *Sez. IV Quadro RP*, *arredo immobili*), rents (*Sez. V Quadro RP*), and those for other specific expenditures which are mainly related to mortgages, health costs, insurances, and charitable giving (*Sez. I Quadro RP*). I disregard other minor tax credits because of their limited importance and because of their different nature. It turns out that almost half of all expenditure-related tax credits for employees, as considered here, are related, to various extent, to housing-maintenance costs; tax breaks related to out-of-pocket medical expenditures are thus much less relevant from a quantitative point of view. Importantly, this paper does not deal with family-related tax benefits. I follow the same methodology to approximate local tax surcharges by income.

B Construction of life-cycle profiles

As explained in the main text, I use data from the Italian section of the European Union Statistics on Income and Living Conditions survey (EU-SILC) to calibrate several parameters of the wage equation. The EU-SILC survey contains information about both demographic characteristics and incomes with an adequate sample size and, therefore, it is well suited for my objective. In what follows, I use the 2007-2014 waves of the survey, which refer to incomes earned respectively in 2006-2013. I do not use previous waves because of a change in the survey design and I do not use the most recent waves because of the concern that some policy measures adopted in 2014 may have an impact on the cross-year comparability of the observations. I use information only on males between the ages of 25 and 61 in the reference period; my starting sample, obtained pooling waves together, is thus composed by almost 63 thousand observation of individuals with non-negative labor incomes. Nevertheless, I keep observations only if they respect all of the following conditions: i) having no self-employment income; ii) earning a yearly gross labor earnings which is neither too low or too high (that is, below 4,000 euros and above 400,000 euros). These sample restrictions serve the purpose of allowing the model to mimic a *normal* employee, dropping outliers and observations of individuals with only sporadic stints as employees. Table 8 shows how many observation are lost at each of these steps.

Condition/Resulting sample	Number of observations
Initial sample	62,704
No self-employment income	-6,649
Gross earnings above 4,000 euros	-2,510
Gross earnings below 400,000 euros	-5
Final sample	53,540

Table 8: Construction of the sample

The main variable of interest (total gross labor income) is built as the sum of gross-of-taxes employee's labor income and social security contributions from both employees and employers. Social security contributions are computed on the basis of the parameters for employees in 2017 (OECD 2018). All nominal values are deflated to 2017 euros. Table 9 reports some descriptive statistics computed over the resulting sample: the resulting average gross wage earnings in my data is close to the average reference figure considered in OECD (2018) with reference to 2017 (31,262 versus 30,838 euros).

Variable	Average value
Gross labor income	41,022
Social security contributions by employers	9,759
Gross wage earnings	31,262
Social security contributions by employees	2,955
Taxable labor income	28,307
Net-of-tax labor income	22,496
Age (years)	42.75

Table 9: Descriptive statistics (2017 euro, if not otherwise indicated)

In order to build life-cycle profiles for both average gross labor incomes and the variance of log labor incomes, I broadly follow the procedure in Kaplan (2012). That is, I first run a regression of the variable of interest (either total gross labor income or its variance) on a full set of age and year dummies; I then use the estimated coefficients on the age dummies to build mean values by age. I use residuals from this regression to generate my measure of dispersion for the study of the variance of log income over the life-cycle. In order to obtain a measure of efficiency wage by age for my model, following Nishiyama & Smetters (2014), I fit a cubic polynomial in age through mean values. I then use predicted values by age, scaled by their average value, as indices of efficiency by age. Figure 3 shows the fit of the polynomial over mean gross incomes by wages; figure 4 the increasing pattern of the variance of log incomes over ages.

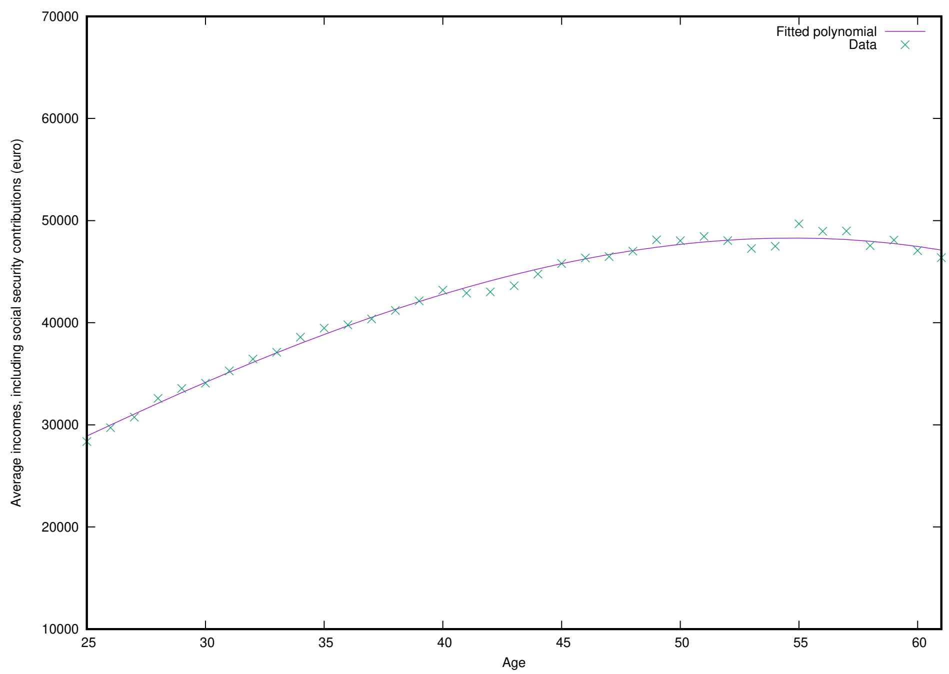

Figure 3: Efficiency by age

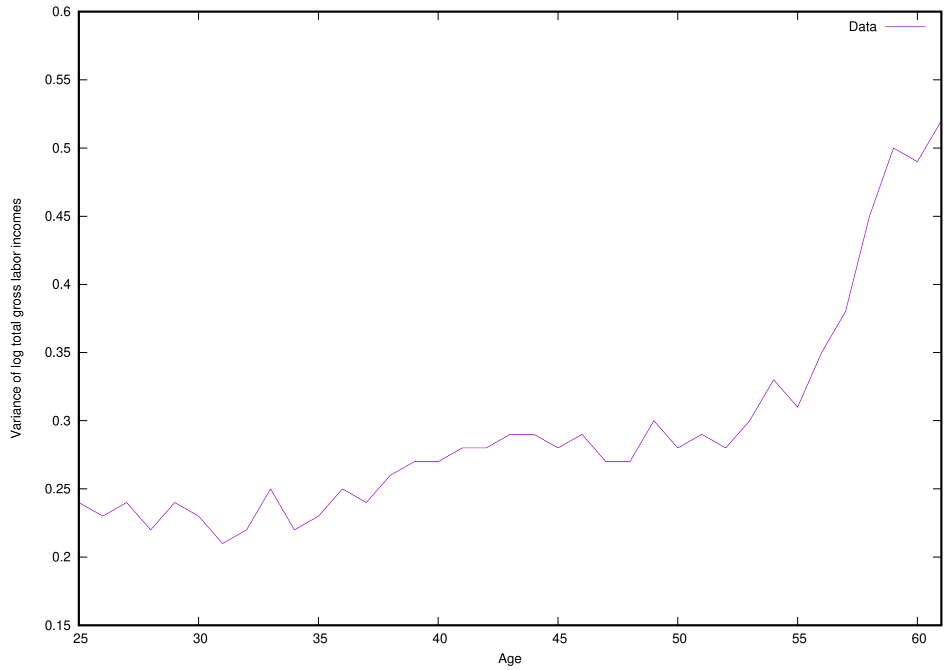

Figure 4: Variance of log of total gross income by age

C Additional results

In this section I report the result of an additional robustness exercise in which the coefficient of relative risk aversion is set to 3.0 (it is 2.0 in the baseline). Unsurprisingly, under this alternative parametrization, agents value the insurance properties of the progressive PIT much more. They would demand an increase of about 1.3 and 2.3 percent of lifetime consumption to give up the multiple tax rates and the tax credit for earnings, respectively.

Table 10: Results with higher risk aversion ($\eta = 3.0$)

	Actual tax code	No exemptions	No expenditure related credits	One rate	No earned income credit
GDP	–	-0.12	0.02	2.42	2.04
Consumption	–	-0.10	0.02	2.06	1.80
Capital	–	-0.18	0.05	4.31	3.43
Hours worked	0.33	-0.09	-0.01	1.45	2.72
CV net income	47.81	-0.32	0.13	6.37	2.42
CEV (%)	0.00	0.09	0.02	-1.29	-2.29

Notes: results for the model representation of the actual tax code and percent deviations from this baseline (simple differences for ratios, coefficient of variations and CEV) under different hypothetical tax codes. A proportional rebate to all working-age households guarantees the invariance of overall PIT revenue (in nominal terms) across simulations. CV stands for coefficient of variation, i.e. the standard deviation of a variable divided by its mean.

D Numerical implementation

The solution technique follows closely that of OLG models with heterogeneous agents, a la Conesa et al. (2009). In particular, obtaining the steady state allocation involves iterating over the following steps until convergence:

1. guessing initial values for aggregate variables in steady state (or updating them);
2. solving the firm's profit maximization problem;
3. solving the dynamic programming problem of the household, through value function iteration and backward induction over the state space defined by innate ability, idiosyncratic shocks, savings, historical average earnings and age, with linear interpolation between grid points;
4. solving for the stationary distribution of households, iterating over the state space (Fehr & Kindermann 2018);
5. calculating aggregate variables, by integrating over individual decisions;
6. solving for the item which clears the government's budget;
7. checking whether the aggregate resource condition holds.

References

Aiyagari, S. R. (1994), 'Uninsured idiosyncratic risk and aggregate saving', *The Quarterly Journal of Economics* **109**(3), 659–684.

Aktasa, K. (2017), Characterizing Income Shocks over the Life-cycle, PhD thesis, PhD Dissertation, Università Cattolica Milano.

Altig, D., Auerbach, A. J., Koltikoff, L. J., Smetters, K. A. & Walliser, J. (2001), 'Simulating fundamental tax reform in the United States', *American Economic Review* **91**(3), 574–595.

Auerbach, A. J. & Kotlikoff, L. J. (1987), *Dynamic fiscal policy*, Cambridge University Press.

Barbetta, G. P., Pellegrino, S. & Turati, G. (2018), 'What explains the redistribution achieved by the Italian personal income tax? evidence from administrative data', *Public Finance Review* **46**(1), 7–28.

Bingley, P. & Cappellari, L. (2018), Workers, firms and life-cycle wage dynamics, IZA discussion papers, Institute of Labor Economics (IZA).

Blundell, R., Costa Dias, M., Meghir, C. & Shaw, J. (2016), 'Female labor supply, human capital, and welfare reform', *Econometrica* **84**(5), 1705–1753.

Bucciol, A., Cavalli, L., Fedotenkov, I., Pertile, P., Polin, V., Sartor, N. & Sommacal, A. (2017), 'A large scale OLG model for the analysis of the redistributive effects of policy reforms', *European Journal of Political Economy* **48**, 104–127.

Cagetti, M. (2003), 'Wealth accumulation over the life cycle and precautionary savings', *Journal of Business & Economic Statistics* **21**(3), 339–353.

Colombino, U. & Del Boca, D. (1990), 'The effect of taxes on labor supply in Italy', *Journal of Human Resources* pp. 390–414.

Colonna, F. & Marcassa, S. (2015), 'Taxation and female labor supply in Italy', *IZA Journal of Labor Policy* **4**(1), 5.

Conesa, J. C., Kitao, S. & Krueger, D. (2009), 'Taxing capital? not a bad idea after all!', *American Economic Review* **99**(1), 25–48.

Conesa, J. C. & Krueger, D. (2006), 'On the optimal progressivity of the income tax code', *Journal of Monetary Economics* **53**(7), 1425–1450.

Curci, N., Rizza, P., Romanelli, M. & Savegnago, M. (2020), Irpef: (Un)Fairness and (in)efficiency. A structural analysis based on the BIMic microsimulation model, Questioni di economia e finanza (occasional papers), Bank of Italy, Economic Research and International Relations Area.

De Nardi, M., French, E. & Jones, J. B. (2010), 'Why do the elderly save? the role of medical expenses', *Journal of political economy* **118**(1), 39–75.

Di Caro, P. (2017), 'Analisi distributiva dell'Irpef utilizzando i microdati di fonte fiscale', *Economia pubblica* .

Di Caro, P. (2019), 'Decomposing personal income tax redistribution with application to Italy', *The Journal of Economic Inequality* pp. 1–17.

European Commission (2018), Taxation trends in the European Union: 2018 edition, Technical report, Directorate General Taxation and Customs Union, European Commission.

Fehr, H. & Kindermann, F. (2015), 'Taxing capital along the transition—not a bad idea after all?', *Journal of Economic Dynamics and Control* **51**, 64–77.

Fehr, H. & Kindermann, F. (2018), *Introduction to computational economics using Fortran*, Oxford University Press.

French, E. (2005), 'The effects of health, wealth, and wages on labour supply and retirement behaviour', *The Review of Economic Studies* **72**(2), 395–427.

Guner, N., Kaygusuz, R. & Ventura, G. (2014), 'Income taxation of US households: Facts and parametric estimates', *Review of Economic Dynamics* **17**(4), 559–581.

Heathcote, J. (2005), 'Fiscal policy with heterogeneous agents and incomplete markets', *The Review of Economic Studies* **72**(1), 161–188.

Heathcote, J., Storesletten, K. & Violante, G. L. (2009), 'Quantitative macroeconomics with heterogeneous households', *Annu. Rev. Econ.* **1**(1), 319–354.

Heathcote, J., Storesletten, K. & Violante, G. L. (2017), 'Optimal tax progressivity: An analytical framework', *The Quarterly Journal of Economics* **132**(4), 1693–1754.

Holter, H. A., Krueger, D. & Stepanchuk, S. (2019), 'How do tax progressivity and household heterogeneity affect Laffer curves?', *Quantitative Economics* **10**(4), 1317–1356.

Huggett, M. (1993), 'The risk-free rate in heterogeneous-agent incomplete-insurance economies', *Journal of economic Dynamics and Control* **17**(5-6), 953–969.

IMF (2013), 'Fiscal monitor: Taxing times'.

IMF (2017), 'Fiscal monitor: Tackling inequality'.

İmrohoroglu, A., Imrohoroglu, S. & Joines, D. H. (1995), 'A life cycle analysis of social security', *Economic theory* **6**(1), 83–114.

Jordà, Ò., Knoll, K., Kuvshinov, D., Schularick, M. & Taylor, A. M. (2019), 'The rate of return on everything, 1870–2015', *The Quarterly Journal of Economics* **134**(3), 1225–1298.

Joumard, I., Pisu, M. & Bloch, D. (2013), 'Tackling income inequality', *OECD Journal: Economic Studies* **2012**(1), 37–70.

Kaplan, G. (2012), 'Inequality and the life cycle', *Quantitative Economics* **3**(3), 471–525.

Krueger, D. & Ludwig, A. (2013), 'Optimal progressive labor income taxation and education subsidies when education decisions and intergenerational transfers are endogenous', *American Economic Review* **103**(3), 496–501.

Marino, M. R., Romanelli, M., Tasso, M. et al. (2016), Women at work: the impact of welfare and fiscal policies in a dynamic labor supply model, Temi di discussione (working papers), Bank of Italy, Economic Research and International Relations Area.

Moore, R. & Pecoraro, B. (2019), 'Macroeconomic implications of modeling the internal revenue code in a heterogeneous-agent framework', *Economic Modelling* .

Nishiyama, S. (2003), *Analyzing Tax Policy Changes Using a Stochastic OLG Model with Heterogeneous Households*, Congressional Budget Office.

Nishiyama, S. (2019), 'The joint labor supply decision of married couples and the U.S. social security pension system', *Review of Economic Dynamics* **31**, 277–304.

Nishiyama, S. & Smetters, K. (2005), 'Consumption taxes and economic efficiency with idiosyncratic wage shocks', *Journal of political Economy* **113**(5), 1088–1115.

Nishiyama, S. & Smetters, K. (2014), Analyzing fiscal policies in a heterogeneous-agent overlapping-generations economy, *in* 'Handbook of Computational Economics', Vol. 3, Elsevier, pp. 117–160.

OECD (2018), *Taxing Wages 2018*, 0rganization for Economic Co-operation and Development, Paris.

OECD (2020), *Taxing wages 2020*, 0rganization for Economic Co-operation and Development, Paris.

Pellegrino, S. & Panteghini, P. M. (2020), Le riforme dell'Irpef: uno sguardo attraverso 45 anni di storia, Working papers, Società Italiana di Economia Pubblica.

Penn Wharton Budget Model (2018), Penn wharton budget model: Dynamic OLG model, Technical report, Technical Report. http://budgetmodel. wharton. upenn. edu/dynamic-olg.

Peterman, W. B. (2016), 'Reconciling micro and macro estimates of the Frisch labor supply elasticity', *Economic inquiry* **54**(1), 100–120.

Storesletten, K., Telmer, C. I. & Yaron, A. (2004), 'Consumption and risk sharing over the life cycle', *Journal of monetary Economics* **51**(3), 609–633.

Torrini, R. (2015), 'Labour, profit and housing rent shares in Italian GDP: long-run trends and recent patterns', *Politica economica* **31**(3), 275–314.

Tyson, J. (2014), 'Reforming tax expenditures in Italy: What, why, and how?', *International Monetary Fund working paper* (14-17).

Verbist, G. & Figari, F. (2014), 'The redistributive effect and progressivity of taxes revisited: An international comparison across the European Union', *FinanzArchiv: Public Finance Analysis* **70**(3), 405–429.

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2018

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ADAMOPOULOU A. and E. KAYA, *Young adults living with their parents and the influence of peers,* Oxford Bulletin of Economics and Statistics,v. 80, pp. 689-713, **WP 1038 (November 2015).**

ANDINI M., E. CIANI, G. DE BLASIO, A. D'IGNAZIO and V. SILVESTRINI, *Targeting with machine learning: an application to a tax rebate program in Italy,* Journal of Economic Behavior & Organization, v. 156, pp. 86-102, **WP 1158 (December 2017).**

BARONE G., G. DE BLASIO and S. MOCETTI, *The real effects of credit crunch in the great recession: evidence from Italian provinces,* Regional Science and Urban Economics, v. 70, pp. 352-59, **WP 1057 (March 2016).**

BELOTTI F. and G. ILARDI *Consistent inference in fixed-effects stochastic frontier models,* Journal of Econometrics, v. 202, 2, pp. 161-177, **WP 1147 (October 2017).**

BERTON F., S. MOCETTI, A. PRESBITERO and M. RICHIARDI, *Banks, firms, and jobs,* Review of Financial Studies, v.31, 6, pp. 2113-2156, **WP 1097 (February 2017).**

BOFONDI M., L. CARPINELLI and E. SETTE, *Credit supply during a sovereign debt crisis,* Journal of the European Economic Association, v.16, 3, pp. 696-729, **WP 909 (April 2013).**

BOKAN N., A. GERALI, S. GOMES, P. JACQUINOT and M. PISANI, *EAGLE-FLI: a macroeconomic model of banking and financial interdependence in the euro area,* Economic Modelling, v. 69, C, pp. 249-280, **WP 1064 (April 2016).**

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CIANI E. and C. DEIANA, *No Free lunch, buddy: housing transfers and informal care later in life,* Review of Economics of the Household, v.16, 4, pp. 971-1001, **WP 1117 (June 2017).**

CIPRIANI M., A. GUARINO, G. GUAZZAROTTI, F. TAGLIATI and S. FISHER, *Informational contagion in the laboratory,* Review of Finance, v. 22, 3, pp. 877-904, **WP 1063 (April 2016).**

DE BLASIO G, S. DE MITRI, S. D'IGNAZIO, P. FINALDI RUSSO and L. STOPPANI, *Public guarantees to SME borrowing. A RDD evaluation,* Journal of Banking & Finance, v. 96, pp. 73-86, **WP 1111 (April 2017).**

GERALI A., A. LOCARNO, A. NOTARPIETRO and M. PISANI, *The sovereign crisis and Italy's potential output,* Journal of Policy Modeling, v. 40, 2, pp. 418-433, **WP 1010 (June 2015).**

LIBERATI D., *An estimated DSGE model with search and matching frictions in the credit market,* International Journal of Monetary Economics and Finance (IJMEF), v. 11, 6, pp. 567-617, **WP 986 (November 2014).**

LINARELLO A., *Direct and indirect effects of trade liberalization: evidence from Chile,* Journal of Development Economics, v. 134, pp. 160-175, **WP 994 (December 2014).**

NATOLI F. and L. SIGALOTTI, *Tail co-movement in inflation expectations as an indicator of anchoring,* International Journal of Central Banking, v. 14, 1, pp. 35-71, **WP 1025 (July 2015).**

NUCCI F. and M. RIGGI, *Labor force participation, wage rigidities, and inflation,* Journal of Macroeconomics, v. 55, 3 pp. 274-292, **WP 1054 (March 2016).**

RIGON M. and F. ZANETTI, *Optimal monetary policy and fiscal policy interaction in a non_ricardian economy,* International Journal of Central Banking, v. 14 3, pp. 389-436, **WP 1155 (December 2017).**

SEGURA A., *Why did sponsor banks rescue their SIVs?,* Review of Finance, v. 22, 2, pp. 661-697, **WP 1100 (February 2017).**

2019

ALBANESE G., M. CIOFFI and P. TOMMASINO, *Legislators' behaviour and electoral rules: evidence from an Italian reform,* European Journal of Political Economy, v. 59, pp. 423-444, **WP 1135 (September 2017).**

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CIAPANNA E. and M. TABOGA, *Bayesian analysis of coefficient instability in dynamic regressions,* Econometrics, MDPI, Open Access Journal, v. 7, 3, pp.1-32, **WP 836 (November 2011).**

COLETTA M., R. DE BONIS and S. PIERMATTEI, *Household debt in OECD countries: the role of supply-side and demand-side factors,* Social Indicators Research, v. 143, 3, pp. 1185–1217, **WP 989 (November 2014).**

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2020

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COVA P. and F. NATOLI, *The risk-taking channel of international financial flows,* Journal of International Money and Finance, v. 102, **WP 1152 (December 2017).**

D'IGNAZIO A. and C. MENON, *The causal effect of credit Guarantees for SMEs: evidence from Italy,* The Scandinavian Journal of Economics, v. 122, 1, pp. 191-218, **WP 900 (February 2013).**

ERCOLANI V. and F. NATOLI, *Forecasting US recessions: the role of economic uncertainty,* Economics Letters, v. 193, **WP 1299 (October 2020).**

MAKINEN T., L. SARNO and G. ZINNA, *Risky bank guarantees,* Journal of Financial Economics, v. 136, 2, pp. 490-522, **WP 1232 (July 2019).**

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SCHIANTARELLI F., M. STACCHINI and P. STRAHAN, *Bank Quality, judicial efficiency and loan repayment delays in Italy,* Journal of Finance , v. 75, 4, pp. 2139-2178, **WP 1072 (July 2016).**

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