Optimal Inheritance Taxation: Should the Rich pay more?

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ABSTRACT

This paper uses the theoretical framework of Piketty and Saez (2013) to compute optimal inheritance tax rates for Italy. Using realistic parameters and survey data, we find evidence for positive optimal inheritance tax rates in the top 12% of the distribution of bequests received. We further investigate the theoretical interpretation for the welfare effects summarised in the optimal tax formula and the role of government in this economy. Then, we argue that tax rates are positive at the top of the bequest distribution because the benefits of redistribution outbalance the direct and indirect costs of inheritance taxation. Given diminishing marginal utility of consumption, bequests received seem to play a key role in our findings due to their polarisation at the top of the distribution. Finally, we discuss policy implications for Italy in view of the current inheritance tax law.

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1. INTRODUCTION

The debate on inequality is largely focused on income polarisation. However, wealth inequality is even more striking and makes us wonder if Thomas Piketty is right to assert that developed countries are heading towards a new *Belle Epoque*, with both income and wealth being highly concentrated in the top percentiles of the population (Piketty, 2014). Although it is not clear in which way inheritances affect wealth inequality (Boserup, Kopczuk & Kreiner, 2016), it is certainly true that intergenerational transfers are key components of wealth accumulation and concentration. Interestingly, some recent studies show how bequests increase absolute wealth inequality, while relative inequality may decrease (Boserup, Kopczuk & Kreiner, 2016; Elinder, Erixson, & Waldenström, 2018). The institutional context is also of prime importance: inheritance laws, as well as family structure, can make the difference between equalising or un-equalising intergenerational transfers and inheritance taxation (Elinder, Erixson & Waldenström, 2018). Moreover, although inheritance taxation raises little revenue – for instance, forming only 0.13 per cent of government revenues in Italy in 2018 – it may have an important effect in the long-run by reducing the equilibrium level of wealth inequality (Cowell, Van de gaer & He, 2017).

It is also important to underline the difference between inheritance and bequest taxation: the former targets only heirs while the latter involves both donors and receivers, which suggests that bequest taxation is less desirable than inheritance taxation from an efficiency perspective (Piketty & Saez, 2013).

This paper calibrates the key formula of Piketty and Saez (2013) using micro-data (Survey on Household Income and Wealth 2014 (SHIW), Bank of Italy) to compute optimal inheritance tax rates and to discuss the policy implications for Italy. Moreover, we attempt to explain why, in contrast to Piketty
and Saez (2013), optimal tax rates are positive, as well as very large, at the top of the bequest distribution through the concept of diminishing marginal utility.

1.1 Literature Review

The literature providing grounds for positive optimal capital tax has been particularly prolific. The celebrated Chamley-Judd result (Chamley, 1986; Judd, 1985), consisting of zero-optimal capital tax in the long-run steady state of the economy, has been recently reconsidered and reverted. For example, Straub and Werning (2014) argue that the zero-tax result obtained by Judd (1985) is directly implied by the strong assumptions he uses. Two assumptions are crucial for the zero-tax result to hold: (a) allocation converging to an interior steady state; (b) convergence of multipliers. Straub and Werning (2014) provide several cases in which either (a) holds but (b) does not, or both do not hold such that the optimal capital tax cannot be zero. Interestingly, they argue that the optimal tax rate may decrease in the case of limited commitment. Conversely, Park (2014) argues that a Ramsey government would set higher capital tax rates compared to the basic Ramsey problem in a limited commitment economy.

As in Straub and Werning (2014), Biljanovska and Vardoulakis (2017) retain Judd’s structure of the economy and check if the zero-tax result holds in the case of heterogeneity in time-discount factors among agents and credit frictions. Finite elasticities of intertemporal substitution lead to positive optimal tax rates which have two main roles: financing government expenditures and alleviating frictions in the financial market. Furthermore, building on the R&D-based growth model in Jones and Williams (2000), Chen, Chu and Lai (2019) add elastic labour-supply and factor income (labour and capital) taxes to show how the Chamley-Judd result breaks down.
Some recent papers derived optimal inheritance tax formulas in terms of sufficient statistics, useful for calibration with actual micro-data. Piketty and Saez (2013), for instance, derived an optimal inheritance tax formula in a labour-augmenting growth model and calibrated it with data for the US and France. Due to efficiency effects, they obtained large and positive tax rates for zero-inheritors while negative tax rates for large bequest receivers. Saez and Stantcheva (2018) published another study that aims to shorten the gap between economic theory and policy-making on this topic. It provides a calibration on US data for both labour and capital income tax rates. Interestingly, Piketty and Saez’s (2013) approach may be considered broader than Saez and Stantcheva (2018), as both savings (bequest flows) and their returns are taxed (Piketty and Saez, 2013). Moreover, Piketty and Saez (ibid.) consider the bi-dimensional nature of inequality, concerning both earnings and bequests, which is not investigated in other dynastic models. For instance, in Farhi and Werning (2010), each dynasty lives for two periods: parents work and leave bequests to (non-working) children, such that each generation experiences only one type of inequality.

Other approaches that are being used more often are part of the “New Dynamic Public Finance” (NDPF), which adopts non-linear tax schedules and considers new sources of heterogeneity in the economy. While the specification in Piketty and Saez (2013) accounts for differences in endowments and bequests, NDPF approaches also consider differences in wages driven by effort and workload along with unobservable skills (Kocherlakota, 2010). For instance, Golosov, Kocherlakota and Tsyvinski (2003), who generalise the previous results of Diamond and Mirrlees (1978; 1986), consider a wide range of economies where the role of the optimal capital tax comes exactly from idiosyncratic uncertainty about individual skills that evolve stochastically over time.

In view of NDPF, someone may argue that this set-up is quite simple. Nonetheless, the formula used in our calibration allows
a relatively straightforward interpretation of the forces driving the results.

1.2 Inheritance tax law in Italy

Before proceeding to the theoretical and empirical sections, we shall briefly describe the institutional context. Table 1 summarises inheritance tax rates and exemptions for some of the selected OECD countries analysed by the IFO Institute (Drometer, Frank, Hofbauer Pérez, Rhode, Schworm & Stitteneder, 2018). Italy is a relatively ideal country to receive an inheritance in as tax rates are quite low, ranging between four per cent and eight per cent, depending on the relationship between the beneficiary and deceased. Moreover, there is a generous personal exemption threshold for spouses and linear relatives set at one million euros. Other levies may be paid if bequests include real estate for a total of three per cent of the estate value (Mortgage and Cadastral taxes). The same regulation applies to gifts ante mortem so that there is no way to get around the law by bringing forward intergenerational transfers.
<table>
<thead>
<tr>
<th>Country</th>
<th>Capital Goods Exclusions</th>
<th>Plan A (min)</th>
<th>Plan B (max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
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<td></td>
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<tr>
<td>Spain</td>
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<tr>
<td>USA</td>
<td></td>
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</tbody>
</table>

Note: All currency conversions were conducted using the exchange rate as of the 16th of May 2018.

Source: Adapted from Drometer, M. et al. (2018).
<table>
<thead>
<tr>
<th>Country</th>
<th>Tax Regime</th>
<th>Personal Exemptions</th>
<th>Inheritance Taxation (Marginal Tax Rate in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>€ 50k</td>
</tr>
<tr>
<td>Germany</td>
<td>Double Progress</td>
<td>Spouse: €500,000; children and grandchildren: €200,000; others €100,000</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parents (gifts), step parents, siblings, nephews, step siblings, nieces, in-laws</td>
<td>30.0</td>
</tr>
<tr>
<td>France</td>
<td>Double Progress</td>
<td>Spouse: €500,000; children and grandchildren: €200,000; others: €100,000</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parents (gifts), step parents, siblings, nephews, step siblings, nieces, in-laws</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others</td>
<td>7.0</td>
</tr>
</tbody>
</table>

Table 1: Comparison of Inheritance Taxation in Selected OECD Countries
2. THEORETICAL FRAMEWORK

This research paper is based on the model developed by Piketty and Saez (2013). It is a standard labour augmenting economic growth model where all variables grow at rate $G$ in the steady-state. There is a discrete and finite number of generations, who live one period, with an initial distribution of bequests, $b_{0_j}$, exogenously given. Each agent from dynasty $i$, living in generation $t$, inherits $b_{it}$ from generation $t-1$ and earns $y_{it} = w_{it}l_{it}$. The exogeneous gross rate of return on bequests is $R$ while the economy grows at the rate $G$. Then, individuals choose how much to consume and bequeath to the next generation $(c_{ti}$ and $b_{t+1,i})$ given their actual resources (net-of-tax labour income, capitalised bequest received and transfers). The linear labour-income tax rate is defined as $\tau_{Li}$ while the linear tax on capitalised bequests is $\tau_{Bt}$. $E_t$ represents government transfers.

Individuals' preferences are drawn from an arbitrary ergodic distribution and are represented by $V^u(c, b, b, l) = \left(\frac{e^{\alpha c} - 1}{\alpha} \right)^{1-\gamma}$, increasing in consumption $c_i$, net-of-tax capitalised bequest left $b = Rb_{t+1,i}(1-\tau_{Bt+1,i})$ and decreasing in labour supply $l_i$. $U^t_i(c, b, b)$ is homogeneous of degree 1, but $\frac{\partial V^u}{\partial c} > 0$ & $\frac{\partial^2 V^u}{\partial c^2} < 0$. The maximisation problem follows two steps: (1) Given their resources, $y_{it}$, individuals choose $b_{t+1,i}$ (bequest left) and $c_{ti}$ (consumption); (2) choice of $h_{ti}(l)$ (labour supply).

The government maximises steady-state social welfare through a utilitarian social welfare function, where individual utilities are weighted by Pareto weights $\omega_{it} \geq 0$.

$$W = \max_{\tau_{B},\tau_{L}} \int \omega_{it}V^u(Rb_{it}(1-\tau_{B}) + w_{it}l_{it}(1-\tau_{L}) + E - h_{t+1,i}, Rb_{t+1,i}(1-\tau_{B}), l_{it}).$$
subject to the following (balanced) budget constraint: \( E = R\tau_B b_t + \tau_L y_{Lt} \).

Social welfare is constant in equilibrium. Fixing \( E \) and \( \tau_L \), the optimal inheritance tax \( \tau_B \) will depend on the distributional parameters (bequests and earnings) and behavioural responses to taxation (elasticity of labour supply and bequest flow). Recalling the key equity-efficiency trade-off, the optimal inheritance tax rate will be the one that maximises steady-state social welfare, balancing the gains from a more equal distribution of bequests and the losses due to efficiency costs, \textit{ceteris paribus}.

The long-run elasticity parameters of bequest flow and labour supply are

\[
e_B = \left. \frac{1 - \tau_B}{b_t} \frac{db_t}{d(1 - \tau_B)} \right|_E,
\]

\[
e_L = \left. \frac{1 - \tau_L}{y_{Lt}} \frac{dy_{Lt}}{d(1 - \tau_L)} \right|_E.
\]

According to Piketty and Saez (2013), “Those elasticities are policy elasticities that capture responses to a joint and budget-neutral change \((\tau_B, \tau_L)\)” (Hendren, 2016; ibid. p. 1855).

Next, we consider the distributional parameters as a weighted average of individuals’ parameters over population averages:

\[
\bar{b}^{\text{received}} = \frac{\int g_t b_t}{b_t}, \quad \bar{b}^{\text{left}} = \frac{\int g_t b_{t+1}}{b_{t+1}}, \quad y_L = \frac{\int g_t y_{Lt}}{y_{Lt}},
\]

where the weights are the social marginal welfare weights \( g_{ti} \) with \( g_{ti} = \omega_{ti} V_c^{ni} / \int \omega_{ti} V_c^{ni} \), with \( \sum g_{ti} = 1 \). They measure the social value of a marginal increase in consumption of individual \( ti \) relative to distributing the same amount equally across all individuals (Piketty & Saez, 2013). Typically, the social marginal welfare weight decreases as we move to the top of the distribution of earnings and/or bequests. The actual values of \( g_{ti} \) along the distribution reveal the intensity of preferences for redistribution in a certain society. Hence, the larger the \( g_{ti} \)-gap is among the
well-off and the worse-off, the stronger the preferences for redistribution in this economy will be.

2.1 The optimal tax rate formula

The following optimal tax rate formula is derived using a perturbation argument assuming a policy change \( d\tau_B > 0 \). As we aim to balance the government budget, \( \tau_L \) will decrease such that

\[
Rb_t \, d\tau_B + \tau_B R \, db_t + y_{lt} \, d\tau_{lt} + \tau_{lt} \, dy_{lt} = 0.
\]

Through several manipulations (see Appendix-A.1) Piketty and Saez (2013) derived an expression which identifies three separated effects of the tax reform on social welfare:

\[
dW = \frac{1 - e_{pB} / (1 - \tau_B)}{1 - e_{pL} / (1 - \tau_L)} \bar{y}_L - \nu \frac{G^{\text{left}}}{R(1 - \tau_B)} - \bar{b}^{\text{received}} (1 + \delta_B) = 0.
\]

The first term captures the positive effect of \( d\tau_B > 0 \) due to the lower \( \tau_L \) needed to meet the budget constraint; the second term represents the negative effect on bequest leavers; while the last one is the negative effect for bequest receives, which takes into account both the direct effect of \( d\tau_B > 0 \) and dynamic effects (lower pre-tax bequests) (Piketty and Saez, 2013). Then, we can isolate \( \tau_B \).

For a given \( \tau_L \), the optimal inheritance tax rate is

\[
\tau_B^{\text{optimal}} = \frac{1 - \left[1 - \frac{e_{pT_b}}{1 - \tau_L}\right] b^{\text{received}} (1 + \delta_B) + \nu \frac{y^{\text{left}}}{R(1 - \tau_B)} \bar{y}_L}{1 + e_{p} - \left[1 - \frac{e_{pT_b}}{1 - \tau_L}\right] b^{\text{received}} (1 + \delta_B) \bar{y}_L}.
\]

where \( \delta_B \) is the population-weighted average of individual bequest elasticities using social marginal welfare weights and individual bequests, \( e_{pL} \) is the aggregate elasticity of earnings with respect to the net-of-tax rate \( 1 - \tau_L \) defined in (4), \( b^{\text{received}} \) and \( b^{\text{left}} \) and \( \bar{y}_L \) are the distributional parameters defined in
Formula (7a) represents the trade-off between equity and efficiency, where the former is guaranteed by using social welfare weights when computing the distributional parameters.

The term $R/G$ has an important role as a higher $R/G$, leading to a higher concentration of inherited wealth, implies smaller $\bar{b}_{received}^{individuals}$ and $\bar{b}_{left}^{individuals}$ for individuals in the bottom of the distribution and, therefore, a higher (Piketty, 2011).

Then, we can highlight the classical efficiency argument. For higher values of the elasticity of bequests, $\tau_B^{optimal}$ will decrease, ceteris paribus. On the contrary, a higher elasticity of earnings will push $\tau_B^{optimal}$ up since, in this case, $\tau_B$ is the alternative tax instrument that helps meet the budget constraint while reducing the inefficiency caused by larger behavioural responses to $\tau_L$. Piketty and Saez (2013) also claim that $\tau_B^{optimal}$ goes down when bequests received increases. However, in our study, we will see how that is only partially true.

Having gone through the theoretical framework given by Piketty and Saez (2013), we will now provide additional manipulations and interpretation of the terms in expression (6) which will be helpful to explain our empirical results.

### 2.2 Separating welfare effects

Manipulate expression (6) to provide some additional insights for the welfare effects caused by a tax reform $d\tau_B > 0$:

$$
\begin{align*}
0 &= \left(1 - \frac{e_B \tau_B}{1 - \tau_B}\right) \bar{y}_B - \tau_B \left(1 - \frac{e_B \tau_B}{1 - \tau_B}\right) \bar{y}_L + \tau_B \left(1 - \frac{e_B \tau_L}{1 - \tau_L}\right) \bar{b}_{received}^{individuals} (1 + e_B) \\
&\quad \left(1 - \frac{e_B \tau_L}{1 - \tau_L}\right) \bar{b}_{received}^{individuals} (1 + e_B) - \left(1 - \frac{e_L \tau_L}{1 - \tau_L}\right) \bar{V}^{left}^{individuals} R \\
\end{align*}
$$

Expression (8) is just another way of expressing the condition $dW=0$ that is necessary to derive $\tau_B^{optimal}$ in the perturbation
argument. The terms are identified by Roman numerals: I, II, III, IV, V.

The first two terms (I, II) represent the positive effect on social welfare given by the lower tax burden on earnings and the negative effect due to lower revenues from income tax respectively. Then, III may be interpreted as a positive effect for individuals since higher revenues allow the government to relax the agents’ budget constraint. Nonetheless, higher bequest taxation will generate welfare losses for bequest receivers (IV) and for donors (V). Indeed, on the one hand, \( d\tau_B > 0 \) hits the agents’ budget constraint through lower endowments. On the other, it leads to behavioural responses due to the change of relative prices between consumption and the bequest left. As individuals get utility only from net-of-tax capitalised bequests left, \( d\tau_B > 0 \) makes consumption relatively more rewarding – in terms of utility per single euro allocated – than bequests left. In other words, a higher bequest tax rate will make utility from the bequest left relatively costlier as it would be necessary to bequeath a larger sum to the next generation to enjoy the same level of utility as before the tax change, ceteris paribus.

The advantage of this formulation is that it allows us to visualise all effects of higher bequest taxation, other than the conflicting interests between the richest heirs (and donors) and zero-receivers, as in (6).

If we add I and II, collect IV and V, and isolate \( \tau_B \), we get the optimal tax formula:

\[
\tau_B^{optimal} = \frac{IV + V}{III} = \frac{\bar{y}_L - \left[1 - \frac{e_B \tau_L}{1 - \tau_L}\right] \left[\frac{b_{received}}{(1 + e_B)} + \frac{v_b^{left}}{R/G}\right]}{(1 + e_B)\bar{y}_L - \left[1 - \frac{e_B \tau_L}{1 - \tau_L}\right] b_{received} \left(1 + e_B\right)}.
\]
The negative effects of bequest taxation on bequest receivers and leavers, represented by (IV+V), may drive the numerator and $t_B^{optimal}$ to negative values, provided that the denominator is positive, such that a bequest-subsidy (negative bequest tax rate) would become optimal. We will refer to this as a “subsidy effect”.

However, the denominator may be pushed towards negative values too if $\Pi > (1 + e_B)\overline{y}$. In other terms, if benefits from bequest taxation (III) were sufficiently large, the optimal tax rate would be positive, provided the numerator is negative. We will refer to this as “redistribution effect”. $b^{received}$ and $\overline{y}$ will determine at which percentile the two effects will take place as they are part of both the numerator and denominator of the optimal tax formula.

3. CALIBRATION STUDY

3.1 Data source and parameter choice

We use formula (7a) to compute linear optimal inheritance tax rates using the actual distributions of bequests and earnings for Italy (Survey on Household Income and Wealth 2014 (SHIW), Bank of Italy). SHIW contains data on income, wealth and savings, as well as demographic information either at the household or individual level from a representative sample of the Italian population. We focus on those individuals who are at least 70 years old such that everyone has already received bequests. Firstly, the distributional parameters $\overline{b}^{received}$, $\overline{b}^{left}$, $\overline{y}_L$, are computed as outlined in (5) and represent, respectively, the average values of the bequest received, the bequest left and earnings, relative to population averages, for each percentile of the bequest distribution. SHIW provides data on inheritances at the household level such that individual $b_{hi}$ is obtained by splitting the inheritance equally between the two spouses in the household. We also follow this procedure to compute individual wealth, which will be our proxy for bequests left ($b_{i}$) as in

\[ t_B^{optimal} = \frac{\Pi > (1 + e_B)\overline{y}}{b^{received} + e_B\overline{y}} \]

As $\Pi > (1 + e_B)\overline{y}$, which turns the denominator negative, is a stricter condition than $\Pi > (1 + e_B)\overline{y}$ which makes the numerator negative, it must be that the numerator is always negative if the denominator is negative.

8. Observations are ordered by the value of the bequest received.

9. Now it is more evident how this framework is about taxing singular bequests, that is why we used the expression “bequest tax” with the same meaning as “Inheritance tax”. Although they are conceptually different, we may still consider each individual as if it were a representative household such that they coincide.

10. SHIW does indeed contain data only on bequest received as the Survey covers individuals that have not bequeathed to their heirs yet.
Piketty and Saez (2013). Secondly, we use data on wage, self-employment and pension payments to compute earnings ($y_{Lti}$).

The resulting distribution of bequests received reveals an evident concentration of inherited wealth at the top (graphs for all distributional parameters are shown in the Appendix – A.2). Indeed, bequests received are zero for the bottom 80 per cent of the distribution while they skyrocket in the top 10 per cent. On the contrary, bequests left and earnings float steadily around their corresponding population averages for the bottom 80 per cent of bequest receivers. While both increase in the top of the distribution, bequests left grow more quickly than earnings. The other parameters we use for the baseline scenario are: $v = 0.7$, $e_L = 0.2$, $e_B = e_b0.2$, $R/G = e^{(r-g)H} = 1.8$ with $r - g = 2\%$ and $H=30$. We also set $\tau_L=0.3$ which means that $\tau_B$ is the only tax instrument through which optimality (steady-state social welfare maximisation) is pursued. Assuming that individuals in the same percentile of the bequest distribution have the same social welfare weight, we do not need to specify them such that our analysis is neutral in terms of social preferences over fairness.
3.2 Results

The optimal tax rates for the baseline scenario are shown in Figure 1. The optimal inheritance tax rate is between 40 per cent and 70 per cent for the bottom 80 per cent of the population. Then, after decreasing quite quickly, it reaches confiscatory rates in the top 12 per cent of the bequest distribution. The results of the sensitivity tests are shown in Table 2. Each panel shows the estimates of $\tau^\text{optimal}_B$ for a particular value of $e_B$. We consider the following cases: $e_B = 0, 0.5, 1$ along with the benchmark value, $e_B = 0.2$. For each panel, we show how estimates change when bequest motives, R/G and earnings elasticity vary one at a time. The optimal inheritance tax rate decreases when the bequest 

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11. See Appendix A.3 for additional graphs regarding sensitivity tests.

12. We chose these benchmark values to be consistent with Piketty and Saez (2013). Kopczuk and Slemrod (2001) found bequest elasticity around 0.1–0.2. Jappelli, Padula and Pica (2014) suggests a similar parameter for Italy.
elasticity is higher, as taxing earnings becomes relatively less distortionary than bequests, *ceteris paribus*\(^{13}\).

Conversely, the optimal tax rate clearly increases when the earnings elasticity goes up, as taxing bequests is now relatively less distortionary than earnings, *ceteris paribus*.

Then, the optimal bequest tax rate is increasing in \(r - g\): it is, for instance, 45 per cent when \(r - g = 1\%\) and close to 77 per cent when \(r - g = 3\%\) in panel 1, *ceteris paribus*.

Lastly, bequest motives are relevant too: if all inheritances are motivated by bequest motives (\(v = 1\)) the optimal tax rate is lower than in the baseline scenario (\(v = 0.7\)). Conversely, will be much higher if individuals’ bequests are non-deliberate (\(v = 0\)), *ceteris paribus*. The intuition is simple: if inheritances are accidental, it is optimal to have high inheritance taxes as there are no efficiency losses due to behavioural response to taxation.

The striking results of this paper are the positive estimates of \(\tau_B^{optimal}\) for the top 12 per cent of the bequest distribution, which we investigate further in the next paragraph.
TABLE 2 OPTIMAL INHERITANCE TAX RATE CALIBRATIONS

<table>
<thead>
<tr>
<th>Elasticity $q_k=0$</th>
<th>Elasticity $q_k=0.2$</th>
<th>Elasticity $q_k=0.5$</th>
<th>Elasticity $q_k=1$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Basic Specification: optimal tax rate for groups by percentile of bequests received, $r_{G}=2%$ ($R/G=1.82$), $v=70%$, $e_{L}=0.2$, linear tax $t_{L}$</td>
<td>$68%$</td>
<td>$56%$</td>
<td>$45%$</td>
</tr>
<tr>
<td>$P&lt;80$</td>
<td>$40%$</td>
<td>$17%$</td>
<td>$-6%$</td>
</tr>
<tr>
<td>$P81-88$</td>
<td>$139%$</td>
<td>$147%$</td>
<td>$156%$</td>
</tr>
</tbody>
</table>

1. Sensitivity to capitalization factor $R/G=e^{1.82}\%$
2. Sensitivity to bequests motives $v$
   - $v=1$ (100% bequest motives): $63\%$
   - $v=0$ (no bequest motives): $100\%$

3. Sensitivity to labor income elasticity $e_{L}$
   - $e_{L}=0$: $66\%$
   - $e_{L}=0.5$: $93\%$

Source: Author’s own calculations.
Note: This table shows simulations of the optimal inheritance tax $e$, using formula (7a) for Italy. The distributed parameters as well as labour-earnings are obtained from the survey data (Survey on Household Income and Wealth-SHW, Bank of Italy).

4. UNDERSTANDING OUR EMPIRICAL FINDINGS

As this calibration uses $b_{it} \cdot b_{t+1}, y_{Lt}$, optimal tax rates are computed as if agents have already chosen future bequests left and labour supply ($b_{t+1}, y_{Lt}$). Therefore, if there were no government, agents’ levels of consumption would be the residual from the individual budget constraint, after choosing the bequest left. Thus, optimal inheritance taxation has a specific role in this economy: redistributing resources allows individuals’ consumption, $c_{it}$, to vary to maximise social welfare while minimising distortions. Thus, the level of consumption, which is feasible given the individual budget constraint, $c_{it} + b_{t+1} = Rb_{it} (1−\tau_{B}) + w_{it} l_{it} (1−\tau_{L}) + E_{it}$, and $b_{t+1}$, is key to understand the meaning of the magnitude and sign of our optimal tax rates.

In view of expression (8), two factors must be recalled. As $b_{received}$ and $b_{left}$ grow, bequest taxation has: (a) increasing
distortionary costs due to the substitution effect between bequests left and consumption; and (b) a negative impact on the budget constraint which implies lower consumption and corresponding higher marginal utility $\frac{\partial v_t}{\partial c}$. While (a) is always increasing in the value of bequests, the effect of (b) depends on the total resources each individual is endowed with. If small inheritors also have relatively low earnings but plan to leave bequests to the next generation, it may be the case that the implicit level of consumption is low and the effect of (b) is considerably large. Therefore, a negative tax rate (subsidy) is optimal as it allows those who have high marginal utility (subsidy effect) to increase consumption, $c_t$. That is exactly what happens between the 83rd to 88th percentile when the numerator of expression (7b) turns negative\textsuperscript{14} because of (a) and (b)\textsuperscript{15}.

We can argue the opposite for large inheritors: given individuals’ decisions on bequests left, large endowments already allow high levels of consumption, which makes $\frac{\partial v_t}{\partial c}$ plummet. Then, it is efficient to tax large inheritors to transfer resources to those who value them more\textsuperscript{16} as the negative effect of taxation for rich inheritors, highlighted by (b), may be much lower than the benefits small inheritors get by increasing consumption (via redistribution of tax revenues). In other terms, the marginal utility of consumption is much higher for small inheritors than for large inheritors\textsuperscript{17}. That is why despite distortionary costs, $\tau_B^{optimal}$ turns positive from the 89th percentile onward, with the denominator of expression (11) becoming negative too and the “redistribution effect” prevailing over the “subsidy effect”.

Note that, consistently with our interpretation, the condition for the “redistribution effect” $\text{III} > (1 + e_2)\overline{y}$ is much stricter than the subsidy effect $(\text{IV} + V > \overline{y}_L)$. The former can take place only if, for instance, bequests received are very unequally distributed among the top 20 per cent of bequest receivers such that $\tau_B^{optimal}$ – which is expressed in relative terms to the population average – is very high at the top of the bequest distribution.

\textsuperscript{14}. See Appendix A.4 for the values of the numerator and denominator of formula (11).

\textsuperscript{15}. (a) and (b) would correspond to (IV+V) in the optimal tax formula (7b).

\textsuperscript{16}. If consumption and $y$, the inequality aversion parameter in $V$ (Cowell 1999), are sufficiently high, bequest taxation, which may lower consumption, will not make $\tau_B^{optimal}$ increase a lot for the richest inheritors.
That is exactly what allows the denominator of the formula (tax rate) to be negative (positive) from the 89th percentile onward in Figure 1. Conversely, a more equal distribution of bequests received, $b_i$, could potentially prevent the “redistribution effect”, ceteris paribus, such that $\tau_B^{optimal} < 0$ even at the top of the bequest distribution (See Appendix-A.5 for a simulation).

5. PUBLIC POLICY IMPLICATIONS

As suggested by Piketty and Saez (2013), we use our results from paragraph 3.1 to evaluate the current Italian tax law.

First, this paper provides no evidence in favour of abolishing tout court the inheritance tax in Italy for efficiency reasons. It should be recalled that the bottom 80 per cent of the sample does not receive any bequests and no bequest tax is paid. Moreover, our sample data suggest that small bequest receivers – those between the 81st and 88th percentile where the optimal tax rate is slightly positive or negative in Figure 1 – would be exempt from paying inheritance tax by the current tax law. For some of these individuals, the current study would rather predict bequest subsidies.

Second, our calibration study suggests that inheritance tax rates should be much higher in the top 12 per cent of the distribution of bequests received. It would be optimal to tax the richest inheritors more by making the tax system more progressive for redistribution purposes. Indeed, the Italian inheritance tax schedule is only slightly progressive regarding the relationship between heir and deceased, while there is no different tax treatment between large and small fortunes, except for the generous exemptions. While it is not reasonable to set 100 per cent inheritance tax rates, this paper suggests that more redistribution to the bottom end of the distribution via higher tax revenues would increase social welfare.
6. CONCLUSION

We performed a calibration of the optimal inheritance tax formula of Piketty and Saez (2013) with survey data from Italy. The key contribution is the theoretical and empirical evidence for, as well as interpretation of, positive optimal inheritance tax rates at the top of the bequest distribution.

On the one hand, inheritance taxation negatively affects bequest receivers via their budget constraints and bequest leavers\textsuperscript{18} via the change in relative prices between consumption and the bequest left (subsidy effect). On the other hand, inheritance taxation has a positive effect due to the lower income tax needed for a balanced government budget and redistribution of resources (through subsidies), which allows increased consumption (redistribution effect). In contrast to Piketty and Saez (2013), the “redistribution effect” seems to prevail over the “subsidy effect” in the top 12 per cent of the bequest distribution, such that positive bequest taxation becomes optimal. Bequests received are so large that the government may want to tax them more to reduce income taxation for zero-receivers and guarantee subsidies for small bequest receivers. Indeed, small inheritors cannot afford a social-welfare-maximising level of consumption, given their planned bequests and endowments, such that even society would benefit from subsidising these individuals. Then, the unequal distribution of bequests received (endowments) is key for the tax rate to be positive in this study.

Interestingly, a specific distribution of social welfare weights has not been specified and the entire calibration is independent of social preferences over fairness. Therefore, we should interpret our results only from an efficiency point of view with taxation and redistribution being the instruments for social-welfare maximisation in the presence of diminishing marginal utility.

\textsuperscript{18} In our calibration, only a fraction (v=0.7) of individuals has bequest motives. Hence, only a fraction of individuals is hit by the negative effect on bequest leavers.
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APPENDIX

A.1 Derivation of $\tau_B^{\text{optimal}}$

Following Piketty and Saez (2013), we present the analytical derivation of $\tau_B^{\text{optimal}}$ when $G > 0$, and assuming, without loss of generality, $\nu = 1$. In the presence of behavioural responses to taxation and balanced budget, $d\tau_B > 0$ requires:

$$Rb^*_t d\tau_B + \tau_B^* Rdb_t + y_{Lt} d\tau_L + \tau_L^* dy_{Lt} = 0.$$  \hspace{1cm} (1)

Substituting the elasticity parameters to (1):

$$Rb^*_t d\tau_B \left( 1 - e_B \frac{\tau_B}{1 - \tau_B} \right) = -d\tau_L y_{Lt} \left( 1 - e_L \frac{\tau_L}{1 - \tau_L} \right)$$  \hspace{1cm} (2)
Then, we know that $b_{i+1}$ and $l_i$ are chosen optimally and we may assume that they will not change if the tax variation is small enough (Envelope theorem). Therefore, policy changes, involving both $\tau_B$ and $\tau_L$, will have the following effect:

$$dW = \int \omega_i V^{ti}_c \cdot (Rdbt_i(1 - \tau_B) - Rbt_i - d\tau_By_{lti}) + \omega_i V^{ti}_b \cdot (-d\tau_Bb_{i+1}).$$

We can manipulate (3) with the first order condition $V^{ti}_c = R(1 - \tau_{Bt+1})V^{ti}_b$ when $b_{t+1} > 0$ expression (2) for $d\tau_L$ and $g_t = \omega_i V^{ti}_c / \int \omega_j V^{ti}_c$ to get:

$$\int g_{ti} \cdot (-d\tau_Bb_{ti}(1 + e_{Bti}) + \frac{1 - e_{Bti}}{1 - e_{Li}r_i/(1 - \tau_i)} Rb_{ti} \cdot d\tau_B - b_{i+1} \cdot \frac{1 - \tau_B}{1 - \tau_B})$$

$$= 0,$$

With $db_{ti}$ expressed in terms of the individual elasticity $e_{Bti} = \frac{1 - \tau_B}{b_{ti}} \frac{db_{ti}}{d(1 - \tau_B)} \frac{1}{d}. Moreover, we know that at the optimum tax rate, social welfare must be constant: $dW = 0$.

Re-arranging (4), dividing by $-d\tau_Bb_{ti}$ and using the definitions of distributional parameters, we can identify three separated effects of the tax reform on social welfare in (5):

$$\frac{1 - e_{Bti}}{1 - e_{Li}r_i/(1 - \tau_i)} y_L \cdot G^{left}_b - \frac{1}{R(1 - \tau_B)} - b$$

$$(1 + \delta_B) = 0,$$
where bequests left refer to the next period, and therefore are bigger by a factor $G$, that is exactly the steady-state economic growth rate.

Then, we can isolate $\tau_b^*$:

$$\tau_b^{*\text{optimal}} = \frac{1 - \left[1 - \frac{b_{left}}{Y_L} \left(1 + \delta_b + \frac{1}{R/G} \frac{b_{left}}{Y_L} \right) \right]}{1 + \delta_b - \left[1 - \frac{b_{left}}{Y_L} \right]}$$

Formula (7a) – used in the numerical calibrations – is eventually obtained by replacing $b_{left}$ by $b_{left}$ with $v < 1$ to account for accidental bequests.

### A.2 Distributions of bequest received, left and earnings

![Graph showing the distribution of bequests received](image)

Source: Author’s own calculations.

Figure A.2a This graph shows bequests received relative to the population average for the whole distribution of bequests received; the population average is normalised to 1 on the y-axis.
Figure A.2b: This graph shows bequests left relative to the population average for the whole distribution of bequests received; the population average is normalised to 1 on the y-axis.

Figure A.2c: This graph shows earnings relative to the population average for the whole distribution of bequests received; the population average is normalised to 1 on the y-axis.
A.3 Sensitivity tests for $\tau_B^{optimal}$

Figure A.3a: This graph shows how the optimal tax schedule varies depending on the value of the elasticity of aggregate bequest flow (eb).

Source: Author’s own calculations.
Figure A.3b: This graph shows how the optimal tax schedule varies depending on the value of the elasticity of earnings to net of tax rate (el).

Figure A.3c: This graph shows how the optimal tax schedule varies depending on the value of the ratio between the gross rate of return, R, and the growth rate of the economy, G.
A.4 Numerator and denominator of $\tau_B^{optimal}$ formula

Figure A.4a: This graph shows the values of the numerator and denominator obtained by calibrating the optimal tax formula (7a) as described in paragraph 3. The numerator becomes negative at the 84th percentile, which makes the tax rate negative, while the denominator is negative from the 89th percentile onward, which is why the optimal tax rate is positive again.

A.5 A simple simulation

We calibrate the optimal tax formula (7a) with a different distribution of bequests received (Figure 5b) for the top 20 per cent of the bequest distribution. The idea is to check whether a more equal distribution of (smaller) bequests received prevents $\tau_B^{optimal} > 0$ for the top 12 per cent bequest receivers, is consistent with our interpretation\(^\text{19}\), or not. Figure 5a shows that it is the case. The “redistribution effect” never shows up and the optimal tax rates remain negative at the top of the bequest distribution.

\(^{19}\) It is important to make clear that this simulation is not a counterfactual analysis. This test is just about understanding how the tax schedule changes by varying one distributional parameter, namely bequest received, ceteris paribus.
Indeed, is not large enough to make the denominator of (7a) negative such that the subsidy effect prevails. In other words, the new distribution of (smaller) inheritances does not allow a social-welfare-maximising level of individual consumption, such that subsidies are optimal even for top receivers, ceteris paribus.

Figure 5a: This graph shows the optimal inheritance tax rates based on formula (7a). The parameters used are: $v = 0.7$, $e_L = 0.2$, $\hat{e}_B = e_B = 0.2$, $\tau_L = 0.3$, $R_G = 1.8$; we use a simulated distribution for $\bar{b}_{\text{received}}$ (Graph 5b); $\bar{B}_{\text{left}}$ and $\bar{Y}_L$ are estimated using micro-data (SHIW 2014, Bank of Italy). Lower bound has been set to -20% for readability.
Figure 5b: This graph shows our simulated distribution of bequest received for the 20% top bequest receivers used to calibrate formula (7a) for our simple comparative exercise. Optimal tax rates are shown in Figure 5a.