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THE POLITICAL ECONOMY OF TAX COMPLEXITY

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The political economy of tax complexity

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Abstract

In democratic countries tax systems are complex and elaborated. The issue of tax complexity is a crucial one in the policy debate about tax design and reforms. A recent trend towards simplification has emerged, at least in developed countries. We argue that tax complexity is the result of the interplay between economic and political factors, and we assess the observed trends and the main features of tax complexity under this perspective. Italy represents an interesting case: changes in the structure of the personal income tax in the period 1974-2005 are meant to reduce tax complexity. Data on the the Italian personal income tax suggest the existence of a trade-off in the determination of tax complexity: on one side more complexity is beneficial for a heterogeneous population, since it allows a design closer to individuals' preferences, while on the other side it is costly.

We explore the emergence of this trade-off in a voting model. Median voter models are not able to appropriately capture the multidimensional nature of the determination of tax complexity. A simple probabilistic voting model instead delivers interesting results. We find that, when grouping individuals with different income levels in the same income bracket, on one side the political support by individuals, who necessarily will pay a tax rate different from their preferred one, is reduced, while on the other side the administrative costs of taxation is also reduced.

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1 Introduction

The issue of tax complexity is a crucial one in the policy debate about tax design and reforms. A recent trend towards simplification has emerged, at least in developed countries. The United States which last simplified its tax code in 1986 and which spent the next two decades to unsimplifying it may soon be coming to a point of renewed fiscal simplification. Other industrialized countries such as Spain, Germany, The United Kingdom and Italy may not be so far behind. Between 2000 and 2005 most of the OECD countries cut the number of brackets with the exception of Canada, Portugal and the U.S. that all added one.

The experiment of a simplified tax code started in Estonia, the first country in Europe to introduce in 1994 a flat tax on personal and corporate income at a single uniform rate of 26%. Others followed: first Latvia in 1995 and Lithuania in 1994 with a tax rate of respectively 25% and 33%, Russia in 2001 with a rate of 13% on personal income; three years later Slovakia imposed a uniform 19% rate on personal and corporate income and Ukraine a 13% tax rate. Finally in 2005 Georgia and Romania introduced a flat tax rate of 12% and 16%.

Lawyers, economists and accountants have addressed the issue of complexity at length, but in a qualitative way. As Slemrod (2005) emphasize "Many argue that much of the complexity arises from the use of the income tax system as a vehicle for numerous social policies that are unrelated to raising revenue but that piggyback on the income tax system as an administratively or politically convenient way to deliver these policies. Many say that is is the constant change in the tax law, rather than the state of the law at any one time, that breeds complexity. Finally some argue that spelling out the tax ramifications of as many as possible situations reduces uncertainty and therefore complexity, with others taking the opposite positions" (p.281).

Much criticism of the income tax involves administration and compliance costs. There have been no quantitative analyses concerning what engenders tax complexity even though the complexity of the tax system has been debated for years in the European countries (see Bernardi and Profeta, 2004). Equity is the chief reason why most countries impose multiple rates of income tax. What are the advantages of a simple tax code? Fewer brackets are simpler to administer. Estimates for the United States whose tax regime is by no means the world's most burdensome, put the costs of compliance, administration and enforcement between 10% and 20% of revenue collected (The Economist, April 16, 2005). Once tax codes have degenerated to the extent they have in most industrialized countries, laden with so many breaks, deductions, allowances and tax expenditures that substantially changed their original shape, even the pretence of any interior logic disappears.

We observe a general common declared intention of increasing simplicity of the income tax, mainly through a reduction of the number of brackets. However, de facto the implemented changes do not really seem to lead to this objective of simplicity, since deductions, exemptions, special cases multiply. Italy represents an interesting case. In recent years the issue of tax complexity has been a crucial one in the policy debate about tax design and a trend towards simplification has emerged. There is a wide, although not unanimous, consensus that the Italian income tax is very complex and that such complexity is not simply justified by its economic feasibility, but there is no widely accepted story about it and certainly no empirical evidence concerning why the income tax system is so complex (Slemrod, 2005). Changes in the structure of the personal income tax in the period 1974-2005 are meant to reduce tax complexity, mainly through the reduction of the number of brackets. However, deductions, special cases etc. have increased. A simple regression exercise on Italian data in the period 1974-2005 suggests the existence of a trade-off in the determination of the number of tax brackets: on one side they positively depend on the degree of heterogeneity of individuals' income, while on the other side they negatively depend on the cost of having more cases. In other words, a more complex tax structure is required by a more heterogeneous population to meet individuals' preferences, while it may be costly.

The evidence of this trade-off motivates the rest of our analysis. We build a model which predicts the emergence of a trade-off in the determination of tax complexity and analyzes its main features.

Traditional theories of taxation are not able to explain the income tax structures that we observe and the trends of planned reforms (Hettich and Winer, 1999). The optimal taxation literature predicts that each individual should be taxed at a different rate, depending on its marginal utility and its weight in the social welfare function, which delivers the maximum complexity of the income tax. However regarding special provisions, the predictions are not clear: exceptions, deductions and tax credits are considered appropriate depending on the government's objectives, restrictions and the screening problems faced by policy makers. This explains only a part of what we observe, mainly the complexity, but cannot account for the fact that countries are currently planning to introduce more simplicity as an objective of their reforms. The equitable taxation approach instead does not care about the vertical complexity of the income tax structure (the number of brackets as an instrument to reach vertical equity), while it argues strongly against the existence of special provisions. It thus cannot explain why we observe so many special provisions. The fiscal exchange approach argues for complexity of the tax structure, also in terms of special provisions, to limit tax discrimination exerted by the Leviathan.

Following a political economy approach, we argue that economic and political considerations are interrelated in explaining the complexity of the income tax that we observe in most democratic countries and the trend towards a simplified structure, with an important role for special provisions. In a democracy the political competition requires complexity, i.e. many tax rates which allow to carefully discriminate among heterogeneous voters (Warskett, Winer and Hettich, 1998) and thus to maximize the support that each party expects to receive in the next election. In the limit each person should be taxed with a different tax rate, to better respond to his preferences. However, when the system becomes well developed, public expenditures and taxation raise and this requires an increase of complexity of regimes and raises the administration costs, which make such a complicated tax structure too expensive, and force to reduce complexity and to group the individuals together[1].

Thus, the government decides to create rate brackets to group individuals. Then, it has to decide how to establish the politically optimal number of brackets, how to assign individuals to these brackets in a manner consistent with its political objectives and how to choose the rate of taxation applied to each group.

This choice is intrinsically multidimensional. A standard median voter approach is not appropriate to deal with it, since, as it is well known, Nash equilibria of a majoritarian voting game may fail to exist when the issue space is multidimensional (Persson and Tabellini, 2000). We therefore introduce a simple probabilistic voting model. The model delivers the existence of a trade-off in the choice of the number of brackets: on one side decreasing the number of brackets imply a larger loss in expected support, since it is no longer possible to equalize marginal political costs or oppositions to taxation across individuals. This loss is larger the larger the political power of the individuals which are affected by the grouping. On the other side decreasing the number of brackets implies lower administration costs, and thus higher revenue and the possibility

[1] Complicated rules generate also imperfect enforcement since taxpayers are uncertain as to eligibility when taking a deduction or credit and controls by the financial administration become more difficult (Krause, 2000).

to spend more on public goods, which can be converted into additional support[2].

Our model delivers interesting predictions for the evolution of tax complexity. In particular, a well-developed system may be at a point where the costs are so high that the need to simplify is predominant. At this point, special provisions arise as a way to reintroduce differentiation, as required by political optimality, in a broadly defined simplified tax structure. This prediction is consistent with the recent experience of European countries. Three main features characterize the evolution of personal income tax complexity in European countries in the last decades. i) With high administrative and information costs the structure which emerges is less complex. In fact, the flat-rate or broad-based tax is becoming very popular (UK, Italy). ii) However, in a democracy, we need to combine a flat-tax rate (or broad-based) with special provisions (exemptions, deductions, exclusions) which are another way to differentiate, as necessary because of the political competition (see Italy and UK). iii) The political influence of the poor increases the degree of complexity, because the rich oppose less to an increase of the tax rate on them, as required by the poor, if there is more differentiation. Therefore, governments which take more into account the interests of the poor tend to increase the number of brackets, special regimes and complexity in general.

The paper is organized as follows. Next section provides evidence on the Italian personal income tax which motivates our analysis. Section 3 develops a probabilistic voting model of tax complexity. Section 4 concludes.

[2] Also, in presence of administration costs, information costs may induce an even stronger simplification, if taxpayers self select and choose to earn a reduced income in order to be eligible for a lower tax rate (if their increase in leisure more than compensate the loss in after-tax earnings).

2 Tax complexity: the case of Italy

This section provides evidence on the existence of a trade-off between benefits and costs of the Italian personal income tax complexity from 1974, year of a radical reform, to 2005: a more complex structure is beneficial for a heterogeneous population, while it is administratively costly.

The personal income tax (IRPEF) represents about one fourth of total Italian fiscal revenue and more than one third of tax revenue (see Gastaldi and Liberati, 2004). It can be considered the main instrument to achieve redistribution, in the form of vertical equity, through its progressive scheme and in the form of horizontal equity, through the qualitative discrimination of incomes and detractions schemes. The structure of the personal income taxation has been modified several times in the last decades (1974-2006) to deal with both revenue and equity goals. A series of changes of different magnitude has characterized the last decades, such as the variation of tax brackets, number of tax rates and the increase of detractions for type of income and for family charges. These changes have been motivated both by efficiency and equity reasons, with different weights given to the two goals by different governments. Moreover, the need of simplifying the tax code has constantly represented an important issue. The level of complexity of IRPEF has significantly evolved over time towards a reduction of the number of tax rates (see Bosi and Guerra, 2007): from 32 tax rates in the period 1973-82, to 9 in the period 1983-88, 7 in the period 1989-97, 5 in the period 1989-2004 e 4 in 2005. The number of deductions and detractions instead has been more stable during our sample period ranging from a maximum of 4 in 2004 to 3 in the periods 1973-76, 1980, 1986, 1993-98 and 2004-05; 2 in the period 1977-79, 1981-85, 1988-91 and 2000-02, 1 in 1987 and 1999, to 0 in 1992.

We focus on the relation between the number of the tax rates and respectively, the income distribution (as the benefit-side of a potential trade-off) and the enforcement cost (as the cost-side). We look for appropriate measures of these two variables.

There are however inherent difficulties of measurement that may be at the origin of the lack of empirical investigations in the literature. The cost of tax complexity is represented by the total resources for collecting taxes, which is the sum of the tax collection administration's budget, the value of the time and money spent by taxpayers and any costs incurred by third parties to the collection process (Slemrod, 2005). This measure has the advantage of being quantifiable, even though data on the cost of collecting taxes are not available for Italy in any of these components. In order to overcome this problem, we resort to a conceptually less rigorous but more easily measurable indicators of the cost of income tax complexity: the number of lines in the income tax forms and, alternatively, the number of boxes to be fulfilled by the taxpayer from 1974 on. To make the line-based cost measure comparable through the years, we always include in the numbered count of lines and boxes the name, address and calculations of exemptions and marital status. These measures represent visible aspects of the income tax system that are likely to be correlated with the compliance and enforcement costs of the tax (see on this point Moody, 2002; Slemrod, 2005) even though they are imperfect measures. For example, not all lines on a tax form have similar implications in terms of complexity; some may apply to only a small fraction of the taxpayers. Also, some income tax forms contain lines regarding non-income tax programs such as homestead credits for property tax. But, in spite of these shortcomings, these measures are worthy to be used to capture the cost dimension of the personal income tax.

The benefit side of the income tax complexity is measured by the Gini income inequality index to capture the idea that the higher the degree of income differentiation the higher the income tax complexity.

Simple correlations confirm that, using our measures of costs and benefits, there exists a trade-off: the correlation between the number of tax rates and the number of lines of the tax form is -0.37, while the correlation between the number of tax rates and the Gini index is + 0.32.

We then turn to econometric analysis and we regress the number of tax rates on both the cost and benefit variables and on a set of economic and political control variables. This set includes:

■ The ideology of governments. The political influence of the poor increases the degree of complexity, because the rich oppose less to an increase of the tax rate on them, as required by the poor, if there is more differentiation. Therefore, leftist governments which take more into account the interests of the poor tends to increase the number of brackets, special regimes and complexity in general. We measure the partisan element of government coalitions ideology with a dummy variable (LEFT) that takes the value 1 if there is a left-wing domination in both government and parliament and if left-wing or centre parties make up between 33.3% and 66% of the government; 0 otherwise. A positive sign is expected on the coefficient of LEFT. We also use an interactive variable (Gini*LEFT) that captures the impact that the polarization of individuals (groups) preferences in terms of income and ideology have on the number of tax rates. The expected sign is positive: the political influence of the low- and middle-income groups together with the left-wing governments increases the degree of progressivity of the personal income tax and then of its complexity;

■ The degree of political competition among individuals (groups) measured by a government fragmentation index, i.e. the power dispersion in the government coalitions. This variable (FRAG) takes the value of 1 in the presence of a coalition government, 0 otherwise, i.e. in the presence of a single-party majoritarian government and a minority government, as in Roubini and Sachs (1989). More competition among parties in the government might result in higher complexity;

■ The number of detraction and deductions (NDETR). This is a control variable, since, as we have already discussed, tax complexity does not only depends on the number of tax brackets but also on the number of detractions, deductions etc.

■ The ratio of revenue raised through the income tax over total revenue[3]or, alternatively, the total fiscal revenue over the GDP to control for the business cycle.

The political data come from Woldendorp et al. (1993), "Special Issue: Political Data 1945-1990: Party Government in 20 Democracies", and updates published in the European Journal of Political Research and from Roubini and Sachs (1989).

The data on GINI index are based on data that come The Bank of Italy (various years). Fiscal data come from the Relazione Generale sulla Situazione Economica del Paese (various years).

Our estimates (see table 1) provide some interesting results: i) the coefficient on our measure of the cost variable turns out to be negative and significant; ii) The coefficient on Gini*LFT is positive and significant while both the GINI index and the ideological variables taken separately show the expected sign but are not significant; iii) the higher the fragmentation of the governments, the higher the complexity of the income tax; coalition governments tend to meet the support of the voters by giving more weight to the benefits of increasing the number of tax rates and neglecting the administrative costs, iv) The number of deductions and detractions is insignificant being uncorrelated with the number of tax rates.

[3]Data on income tax revenue are available only from 1982; from 1974 we have aggregate data on revenue raised through all the direct taxes. In the regression this variables is multicollinear with our measure of the cost of complexity, therefore – and because of data shortcomings - we preferred to drop it from the final estimate.

The emergence of a quantifiable trade-off in the determination of the number of tax rates in this simple exercise for the Italian case motivates the rest of the paper. In next section we build a voting model that captures and characterizes the trade-off.

3 A probabilistic voting model

In this section we introduce a probabilistic voting model to analyse the personal income tax complexity. Probabilistic voting is used to overcome a typical problem of median voter models, which are not able to appropriately capture the multidimensional nature of the determination of tax complexity. Probabilistic voting is particularly useful in our context since it allows to deal with an ideological component, which characterizes the political power of different groups in a society and may be relevant to determine the structure of taxation.

3.1 General features

The society is composed of H groups of voters of different income, denoted by $h = 1, ...H$. Each group has different size, n^h is the number of individuals in group h. Individuals in each group are homogeneous and they have the same utility function, defined by[4]:

$$U^h = \ln y^h(1 - t^h) + G \tag{1}$$

where y^h is the before-tax income of each individual in group h, t^h is the average tax rate that he has to pay on income, and G is the level of a public good[5].

The government collects taxes to finance the public good G. However, collecting taxes involves a cost which depends on the number of tax rates used

[4] Quasi-linearity simplifies the model, since the income effects only show up in the linear component, i.e. the public good. It is a common assumption in this kind of redistribution models, see Persson and Tabellini (2000).

[5] For simplicity, and to better focus on the aim of the paper, we do not specify the economic maximization process behind this utility function, differently from what is usually done in other papers with a similar framework (see Profeta, 2004).

by the government. More precisely, the government faces the following budget constraint:

$$G = \sum_{h=1}^{H} t^h y^h - C \tag{2}$$

i.e. the level of public good is equal to total revenues minus the administrative cost, and

$$C = \alpha T^2 \tag{3}$$

where α is the unitary cost associated to each tax rate and T is the number of tax rates used by the government. More tax rates imply a larger administrative cost at an increasing rate.

The government has to decide upon a public policy vector q, which is multidimensional, and it is defined by the level of tax rates for all brackets and the number of tax rates to apply. This means that we have two extreme cases and several intermediate possible cases for the policy platform:

case1 a single tax rate for each income group: $T = H$, $q = (t^1, t^2, ...t^H)$

case2 a unique tax rate for all income groups: $T = 1$, $q = t = t^1 = t^2 = ...t^H$

case3 a combination of a number $I \geq 1$ of brackets, indexed by $i = 1, ...I$, each containing I_i groups of individuals ($h \in I_i$) and a number of $S \geq 1$ tax rates applied to a specific group of individuals ($h \notin I_i$, for all $i = 1, ...I$): $T = I + S$, $q = (t^i, t^h)$ where $i = 1, ...I$, $h \notin I_i$. In this case, T is larger than 1, because, to be different from the extreme cases, in this case there exist at least one bracket and one group which is taxed with its specific tax rate, and smaller than H, because there exists at least one bracket where more than one group of individuals are taxed with the same tax rate.

3.2 The political institution

The political game is described according to the following probabilistic voting framework (as in Lindbeck and Weibull 1987, which in turn build on probabilistic voting models by Hinich et al. 1972, Coughlin and Nitzan 1981a, 1981b, Coughlin 1992. See also Persson and Tabellini 2000 and Profeta 2004, 2007). This framework has also the advantage to deliver solutions when the policy space is inherently multi-dimensional[6].

Consider two parties, or candidates, labeled A and B. Before the election takes place, the parties commit to a policy platform, q^A and q^B. They act simultaneously and do not cooperate. Each party chooses the platform which maximizes its expected number of votes[7]. Platforms are chosen when the election outcome is still uncertain. The two parties differ along some other dimension relevant to the voters than the announced policy, which may reflect ideological elements. Voters are heterogenous with respect to their ideological preferences.

Voter j in group h votes for party A if

$$U^h(q^A) - U^h(q^B) + \delta + \sigma^j > 0 \tag{4}$$

where $U^h(q^A)$ is the utility (Eq. 1) of voters in group h under government policy q^A, $U^h(q^B)$ is the utility of voters in group h under government policy q^A, and the term $(\delta + \sigma^j) \gtrless 0$ reflects voter j's ideological preferences for party A. This term includes two components: δ, which is common to all voters, and σ^j, which is idiosyncratic. The first component, δ, reflects the general popularity of party A. We assume that this is a random variable uniformly distributed on $(-\frac{1}{2d}, \frac{1}{2d})$, with expected value equal to 0 and denstity d. This component

[6] In a multidimensional issue space, the simple majoritarian voting model with a median voter equilibrium cannot be applied, since a Nash equilibrium of a majoritarian voting game may fail to exist. Probabilistic voting is a possible alternative framework (See Hettich and Winer, 1999 and Persson and Tabellini, 2000).

[7] This approach is standard in the literature. Alternatively, the objective of the party can be to maximize the probability of winning, which would leave the results unaffected.

represents the source of electoral uncertainty, since it is realized between the announcement of the party platforms and the election. The second component, σ^j, reflects the individual ideology of voter j. Voters are distributed within each group according to a uniform distribution on $(-\frac{1}{2s^h}, \frac{1}{2s^h})$, where the density is s^h, specific to each income group, and the mean is zero[8].

Each group has neutral voters, called "swing voters", who are indifferent between party A and B. The identity of the swing voters is crucial when a party considers whether to deviate from a common policy announcement, $q^A = q^B$, or not. Suppose party A decides to decrease taxes of group 1 financed by a budget-balanced increase of taxes to group 2. Party A expects a gain of votes from group 1 equal to the number of swing voters in group 1, and a loss of votes from group 2 equal to the number of swing voters in group 2. If group 1 has a higher number of swing voters than group 2, this will lead to a net gain of votes. As a consequence, each party tries to attract the more mobile voters. Formally, the swing voter in group h is identified by $\sigma^{s.v.}$ where

$$\sigma^{s.v.} = U^i(q^B) - U^i(q^A) - \delta \tag{5}$$

Voters with σ^h lower than $\sigma^{s.v.}$ vote for party B and voters with σ^h higher than $\sigma^{s.v.}$vote for party A.

Therefore, the vote share of party A in group h can be expressed by

$$\pi^{A,h} = s^h \left(U^h(q^A) - U^h(q^B) + \delta \right) + \frac{1}{2} \tag{6}$$

Each party maximizes the expected total number of votes from all groups. Given the definition of $\pi^{A,h}$, the objective function of party A can be expressed as follows:

$$\max E \left(\sum_{h=1}^{H} n^h \pi^{A,h} \right) \tag{7}$$

[8] In general, both δ and σ^j may have expected values different from zero, reflecting the across groups difference in average ideology.

Substituting the expression for $\pi^{A,h}$ and given the previous assumptions about the distribution functions, party A will choose q^A such as to maximize the following objective function:

$$\sum_{h=1}^{H} n^h s^h \left(U^h(q^A) - U^h(q^B) \right) \tag{8}$$

where $U^h(q)$ is defined at Eq. 1.

Eq. 8 makes clear that parties seek to please the more mobile voters. If the number of swing voters is the same in all groups, the groups get equal weight in the candidate's decision, which turns out to be maximizing the average voter's utility. However, if the groups are different in how easily their votes can be swayed, the group which contains more swing voters is more responsive to policy and gets a higher weight in the party's objective. Thus, the density is a measure of the "political power" of the group.

Party B solves a symmetric problem. Parties act simultaneously, taking the choice of the other party as given, and do not cooperate. Thus, taking q^B as given, party A solves the problem at Eq.8 subject to the following budget constraint:

$$G^A = \sum_{h=1}^{H} t^{hA} y^h - \alpha T^2 \tag{9}$$

3.3 The probabilistic voting equilibrium

We solve the problem of party A at Eq. 8 subject to the budget constraint at Eq. 9, given q^B, under the three possible cases of specification of q^A.

We aim at comparing the total number of votes that party A can obtain in the different politico-economic equilibrium that arise under the three possible cases, which depend on the number of tax rates used. We do not analyze what of the three cases is optimal[9].

[9] This would be very interesting, but a much more complicated theoretical task, and is out of the scope of this model.

We define $\overline{s} = \sum_{h=1}^{H} n^h s^h$ the aggregate average density and $\overline{y} = \sum_{h=1}^{H} y^h$ the aggregate income.

The following proposition summarizes the results on the tax rates.

Proposition 1 *The equilibrium tax rates are the following:*

case1 A tax rate for each income group:

$$t^h = 1 - \frac{n^h s^h}{\overline{s} y^h} \ (h = 1, ...H) \tag{10}$$

case2 A unique tax rate for all income groups:

$$t = 1 - \frac{1}{\overline{y}} \tag{11}$$

case3 I tax rates for each income bracket and S tax rates specific for income groups not in any bracket

$$\begin{aligned} t^i &= 1 - \frac{\sum_{i \in I_i} n_i s_i}{\overline{s} \sum_{i \in I_i} y_i} (i = 1, ...I) \\ t^h &= 1 - \frac{n^h s^h}{\overline{s} y^h} \ (h \notin I_i) \end{aligned} \tag{12}$$

Proof. Directly from the maximization problem. ■

The proposition shows some interesting results. For a given $\overline{s}$, the optimal tax rate applied to a group of income (or to different groups) depends negatively on the size and on the political power of the group (or groups) of income to which this tax rate is applied, and positively on its (their) income. In other words, more numerous or more politically powerful groups will pay a lower tax rate, as predicted by standard political economy models. Also, richer groups will pay a higher average tax rate, i.e. the personal income tax will be progressive, as predicted by standard models of optimal taxation.

However, in this paper we are mainly interested in comparing the three equilibrium arising in the different cases. To this respect, it is easy to show that the corresponding optimal levels of public good are:

case1 $G = \overline{y} - 1 - H^2\alpha$

case2 $G = \overline{y} - 1 - \alpha$

case3 $G = \overline{y} - 1 - (I+S)^2\alpha$

By combining the above results, the total number of votes collected by party A are expressed as follows:

case1
$$\sum_{h=1}^{H} n^h s^h \left(\ln \frac{n^h s^h}{\overline{s}} + \overline{y} - 1 - H^2\alpha - U^h(q^B) \right) \tag{13}$$

case2
$$\sum_{h=1}^{H} n^h s^h \left(\ln \frac{y^h}{\overline{y}} + \overline{y} - 1 - H^2\alpha - U^h(q^B) \right) \tag{14}$$

case3
$$\sum_{i=1}^{I} \sum_{h \in I_i} n^h s^h \left(\ln \frac{y^h \sum\limits_{h \in I_i} n^h s^h}{\overline{s} \sum\limits_{h \in I_i} y^h} + \overline{y} - 1 - (I+S)^2\alpha - U^h(q^B) \right) \tag{15}$$
$$+ \sum_{h \notin I_i} n^h s^h \left(\ln \frac{n^h s^h}{\overline{s}} + \overline{y} - 1 - (I+S)^2\alpha - U^h(q^B) \right)$$

3.4 The trade-off

By comparing the total number of votes that party A obtains using a different number of brackets, a trade-off emerges: on one hand a smaller number of tax rates or more brackets imply less administrative costs, which allow a higher level of public good, and thus of the utility of all individuals. On the other hand it also implies a loss in the political support that the party can obtain. In fact, when the party can apply to each income group a specific tax rate, it can apply the tax rate that maximizes the political support from each income group. When, on the contrary, the party decides to apply the same tax rate to different income groups, this tax rate necessarily cannot maximize the political support by all income groups involved.

In particular, we can identify the trade-offs as follows:

- shifting from case 1) to case 2):

the cost of grouping depends on

$$\sum_{h=1}^{H} n^h s^h \left(\ln \frac{n^h s^h}{\overline{s}} - \ln \frac{y^h}{\overline{y}} \right) \tag{16}$$

the benefit of grouping depends on

$$\overline{s}\alpha(T^2 - 1) \tag{17}$$

- shifting from case 1) to case 3):

the cost of grouping depends on

$$\sum_{i=1}^{I} \sum_{h \in I_i} n^h s^h \left(\ln \frac{n^h s^h}{\overline{s}} - \ln \frac{y^h \sum\limits_{h \in I_i} n^h s^h}{\overline{s} \sum\limits_{h \in I_i} y^h} \right) \tag{18}$$

the benefit of grouping depends on

$$\overline{s}\alpha(T^2 - (I + S)^2) \tag{19}$$

- shifting from case 3) to case 2):

the cost of having only one group depends on

$$\sum_{i=1}^{I} \sum_{h \in I_i} n^h s^h \left(\ln \frac{y^h \sum\limits_{h \in I_i} n^h s^h}{\overline{s} \sum\limits_{h \in I_i} y^h} - \ln \frac{y^h}{\overline{y}} \right) + \sum_{h \notin I_i} n^h s^h \left(\ln \frac{n^h s^h}{\overline{s}} - \ln \frac{y^h}{\overline{y}} \right) \tag{20}$$

the benefit depends on

$$\overline{s}\alpha((I + S)^2 - 1) \tag{21}$$

Moreover, case 3 implies several alternative possibilities at the same cost, mainly targeting at the bottom versus targeting at the top. A general result is that it is better to target groups more numerous and/or containing more swing voters.

3.5 Into the trade-off: the case of H=3

To investigate the determinants of the trade-off, we focus on a simple case where there are only three income groups, low middle and high income: $y^1 < y^2 < y^3$.

Under this specification, the 3 cases become:

case1 $q = (t^1, t^2, t^3)$

case2 $q = t$

case3a $q = (t^1, t^3)$ where t^1 is applied to y^1 and y^2, t^3 to y^3

case3b $q = (t^1, t^2)$ where t^1 is applied to y^1 and t^2 is applied to y^2 and y^3

In this simple case, it is easy to show that the trade-offs can be identified as follows.

The number of votes in case 1 is larger than the number of votes in case 2 if

$$n^1 s^1 \left(\ln \frac{n^1 s^1}{\overline{s}} - \ln \frac{y^1}{\overline{y}} \right) + n^2 s^2 \left(\ln \frac{n^2 s^2}{\overline{s}} - \ln \frac{y^2}{\overline{y}} \right) + n^3 s^3 \left(\ln \frac{n^3 s^3}{\overline{s}} - \ln \frac{y^3}{\overline{y}} \right) > \overline{s}\alpha 8 \tag{22}$$

where the left-hand-side, if positive, is the cost of grouping and the right-hand-side is the benefit from grouping. Since we are comparing here the two extreme cases, the intuition is straightforward: when the groups which are included in the same bracket are more numerous (a higher n^1 or n^2 or n^3 in this case) ore more politically powerful (a higher s^1 or s^2 or s^3) or poorer (a lower y^1or y^2 or y^3) they would push for a higher differentiation, and thus the cost of grouping increases. The benefit of grouping depends instead on the reduction of costs associated with a smaller number of tax brackets.

Notice that the three terms of the left-hand-side cannot be all positive, since $\sum_{h=1}^{3} \frac{n^h s^h}{\overline{s}} = 1 = \sum_{h=1}^{3} \frac{y^h}{\overline{y}}$

The number of votes in 3a is larger than the number of votes in 1 if

$$n^1 s^1 \left(\ln \frac{n^1 s^1}{\overline{s}} - \ln \frac{y^1 (n^1 s^1 + n^2 s^2)}{\overline{s}(y^1 + y^2)} \right) + n^2 s^2 \left(\ln \frac{n^2 s^2}{\overline{s}} - \ln \frac{y^2 (n^1 s^1 + n^2 s^2)}{\overline{s}(y^1 + y^2)} \right) > 5\overline{s}\alpha \tag{23}$$

where the left-hand-side, if positive, is the cost of grouping and the right-hand-side is the benefit from grouping. A similar result applies when comparing 3b) with 1.

The number of votes in case 3a is larger than the number of votes in case 2 if

$$n^1 s^1 \left(\ln \frac{y^1 \left(n^1 s^1 + n^2 s^2\right)}{\overline{s}(y^1 + y^2)} - \ln \frac{y^1}{\overline{y}} \right) + n^2 s^2 \left(\ln \frac{y^2 (n^1 s^1 + n^2 s^2)}{\overline{s}(y^1 + y^2)} - \ln \frac{y^2}{\overline{y}} \right) > 3\overline{s}\alpha \tag{24}$$

Again, since the groups which are included in the same bracket are group one and group two (who will pay the same tax rate t^1) a higher $n^1 s^1$ or $n^2 s^2$ implies a higher cost of grouping, while the benefit from grouping increases with the number of tax rates.

The number of votes in 3a is larger than the number of votes in 3b if

$$\begin{aligned} & n^1 s^1 \left(\ln \frac{y^1 (n^1 s^1 + n^2 s^2)}{\overline{s}(y^1 + y^2)} - \ln \frac{n^1 s^1}{\overline{s}} \right) \\ & + n^2 s^2 \left(\ln \frac{y^2 (n^1 s^1 + n^2 s^2)}{\overline{s}(y^1 + y^2)} - \ln \frac{y^2 (n^2 s^2 + n^3 s^3)}{\overline{s}(y^2 + y^3)} \right) + \\ & n^3 s^3 \left(\ln \frac{n^3 s^3}{\overline{s}} - \ln \frac{y^3 (n^2 s^2 + n^3 s^3)}{\overline{s}(y^2 + y^3)} \right) \\ > \; & 0 \end{aligned} \tag{25}$$

In this case the cost is the same and we compare the relative total benefit.

Remark 2 *If the three groups have equal size, equal density and equal income, there is no loss from grouping while the benefit is positive, and it is therefore always optimal to apply a unique tax rate.*

Eq. from 23 to 25 makes clear what are the main determinants of the trade-off. The following proposition summarizes the results.

Proposition 3 *A more numerous, more politically powerful or poorer income group will push stronger for having its specific tax rate, and thus more differentiation. Thus, the loss from grouping depends positively on the numerosity and the political power of the income groups included in the same tax bracket and negatively on their income.The gain from grouping instead depends on the administrative costs which increase when the number of tax rates increases, i.e. for a more complex tax schedule.*

Proof. TO BE ADDED. ■

The proposition delivers intuitive results: the numerosity of different income groups, the distribution of income, the political power of different income groups and the size of the administrative costs shape the trade-off behind the choice of a complex personal income tax schedule. In particular, the benefit of tax complexity is larger for a more unequal income distribution and for a higher political power of the group which would take advantage from differentiation. But a more complex tax schedule is also more costly. The number of tax rates thus depends on how the political process balances costs and benefits of tax complexity.

4 Conclusions

We have addressed the issue of tax complexity in a political economy approach. After providing evidence for the Italian case of the existence of a trade-off in the determination of tax complexity, our probabilistic voting model shows that reducing the number of tax rates of the personal income tax schedule by grouping individuals of different income levels in the same tax bracket involves a trade-off: on one side it reduces the political support by individuals, who necessarily will pay a tax rate different from their preferred one, while on the other side it also reduces the administrative costs of taxation.

Our positive analysis is able to explain the evolution of tax complexity in modern societies and the recent trend towards simplification. We argue that this is mainly due to the fact that fiscal system have become so sophisticated that the costs are so high and simplification is required.

What is the optimal level of complexity of the personal income tax schedule? We have not addressed this issue, although the emergence of the trade-off that we have explained is a first step to understand which features would characterize the optimal design. A complete normative analysis is left to future studies.

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Table 1
Regression results (OLS) – Dependent variable: Tax rates

Variable	Coefficient	P-valus
Constant **	22.65340	0.0037
Cost*	-1.150883	0.0545
Gini x LFT**	28.82123	0.0057
Frag**	15.20256	0.0010
Ndetr	1.391061	0.4479
Adj-R2=0.57; S.E.=7.61; F= 10.95; N.obs. 31 ** significant at 10%, * significant at 5%		