

## **POPULAR SUPPORT FOR PROGRESSIVE TAXATION\***

**Francisco Marhuenda and Ignacio Ortuño-Ortín\*\***

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# POPULAR SUPPORT FOR PROGRESSIVE TAXATION

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## ABSTRACT

The popular support obtained by two parties who propose two qualitatively different tax schemes is analyzed. We show that if the median voter is below the mean, then any progressive proposal always wins over a regressive one, provided it leaves the poorest agent at least as well off as the latter does.

KEYWORDS: Majority voting, progressivity.

JEL: D72



# 1 INTRODUCTION

The theory of income taxation has been a fundamental area of research in economics. An important question here refers to the fact that most democratic societies adopt income tax regimes with increasing average and marginal tax rates (Snyder and Kramer, 1988). This regularity in the type of progressive tax schemes across countries could be explained by assuming that the tax designer tries to maximize some utilitarian social welfare function.

An alternative approach is to consider the tax policies adopted in a democratic society as the outcome of a voting mechanism. In this case, it is usually assumed that political parties propose different tax schemes and agents, who are self-interested, vote for their most preferred one. This approach might be seen as unrealistic since in actual societies this kind of process rarely takes place. However, as (Roberts, 1977) notes, “the point is not whether choices in the public domain are made through a voting mechanism but whether choice procedures mirror some voting mechanism”.

The literature on this area is still very inconclusive on the connection between progressive taxation and voting. Foley (1967), Romer (1975,1977), and Roberts (1977) analyze the outcome of a majority-rule voting scheme in which the proposed tax policies must be *linear functions* of income. Snyder and Kramer (1988) study the existence of progressivity of income taxation as a voting equilibrium in an economy with two sectors “a legal, taxable sector, and an underground, untaxable sector”. But they only admit tax functions which are *individually optimal* for some voter. Cukierman and Meltzer (1991) analyze a model in which the tax functions are *quadratic* in income. They provide some sufficient conditions for the median voter most preferred tax function to be a Condorcet winner. They also show that under additional, rather strong conditions, such a tax function is progressive. Roemer (1993) provides simulated equilibria in a model with constituency-representing parties and uncertainty. But the admissible tax functions are also quadratic in income.

In [3] it is analyzed a model in which income levels are fixed -so incentive problems are left aside. The set of admissible tax schemes contains all the non-decreasing concave and convex functions (including linear functions) on income that raise just enough revenue to meet an exogenously given revenue target. The main result is that, for income distributions with median below the mean, any concave tax scheme obtains less popular support than any convex tax scheme provided that this one treats the poorest agent no worse than the concave tax scheme.

In this paper we extend the results in [3] in two important directions. First, we consider more general elections in which the winning majority is not necessarily 50%. Second, we say a tax function  $t_1$  is more progressive than  $t_2$  whenever  $t_1 - t_2$  is a convex function and the tax paid by the poorest agent under  $t_1$  is no greater than the tax paid with  $t_2$ . Our analysis establishes conditions on the income distribution which guarantee that if  $t_1$  is more progressive than  $t_2$  then it always obtains the appropriate majority of votes. Thus, even though we do not provide a complete positive model of progressive taxation - such a model cannot consist of just a majority rule mechanism and it should contain more realistic elements as, for example, uncertainty, ideological parties, voting on multidimensional issues, multiparty elections, etc.- our result may help to understand why most democracies have increasing average and marginal tax rates.

## 2 THE MODEL

The economy consists of a large number of agents who differ in their income. The income distribution is fixed and described by a non-atomic measure  $\alpha$  on the interval  $[0, 1]$ . We identify an agent with its income  $x \in [0, 1]$ .

We consider two political parties represented by  $i \in \{1, 2\}$  who propose two different income tax policies,  $t_1$  and  $t_2$ , designed to collect a given amount of revenue  $R < \mu$  from the taxpayers, where  $\mu = \int_0^1 x d\alpha$  denotes the mean income. Both political parties know the income distribution  $\alpha$  and their objective is to win the election.

**Assumption 2.1** *The tax policy put forward by each party must satisfy the following requirements.*

1. For each  $x \in [0, 1]$ ,  $t(x) \leq x$ .
2. The tax policy  $t(x)$  is continuous and nondecreasing in  $x$ .
- 3.

$$\int_0^1 t(x) d\alpha = R$$

Condition (1) says that tax liabilities cannot exceed income. Observe that we do not require  $t(x) \geq 0$  allowing, thus, for possible redistribution of

income. The second requirement seems a very natural restriction. Note that we do not require  $t$  to be differentiable at all points. Condition (3) requires that the total tax collected must meet the target  $R$ .

Given the two proposals,  $t_i$ ,  $i \in \{1, 2\}$ , made by the parties, agent  $x$  will vote for the one which minimizes his tax payment. Thus given  $t_1$  and  $t_2$  the voting is given by the function  $\varphi_{t_1, t_2} : [0, 1] \rightarrow \{1, 2\}$

$$\varphi_{t_1, t_2}(x) = \begin{cases} 1 & \text{if } t_1(x) < t_2(x) \\ 2 & \text{if } t_1(x) \geq t_2(x) \end{cases}$$

For simplicity we have assumed that if an agent is indifferent between the two alternatives  $t_1$  and  $t_2$ , he will vote for  $t_2$ . In our model this will play no role since the set of indifferent agents will have measure zero. Given  $\varphi_{t_1, t_2}$  the votes obtained by party 1 is

$$N(t_1, t_2) = \alpha(\varphi_{t_1, t_2}^{-1}(1))$$

We study conditions under which a party can obtain a given percentage  $\sigma \in (0, 1)$  of the electoral votes. Thus, we say that party 1 wins a  $\sigma$ -majority election if  $N(t_1, t_2) > \sigma$  and loses it whenever  $N(t_1, t_2) < \sigma$ . In case  $N(t_1, t_2) = \sigma$ , then party 1 wins with probability  $1/2$ . Again, in Proposition 2.4 below, this last possibility will not be relevant. The implemented tax policy will be the one proposed by the winning party.

**Definition 2.2** *The  $\sigma$  voter is the agent with income  $x_\sigma$  such that*

$$\int_0^{x_\sigma} d\alpha = \sigma$$

**Definition 2.3** *Given two proposals for tax policies,  $t_1$  and  $t_2$ , we will say that policy  $t_1$  is more progressive than  $t_2$  whenever  $t_1(0) \leq t_2(0)$  and  $t_1 - t_2$  is convex.*

Suppose  $t_1$  and  $t_2$  are differentiable. Then, assuming that  $t_1(0) \leq t_2(0)$  we see that  $t_1$  is more progressive than  $t_2$  provided  $t'_1 - t'_2$  is an increasing function. It follows that the marginal tax rate the agents have to pay increases faster with the policy  $t_1$  than with  $t_2$ .

**Proposition 2.4** *Suppose  $x_\sigma < \mu$  and let  $t_1 \neq t_2$  be two tax policies satisfying the assumptions 2.1 with  $t_1$  more progressive than  $t_2$ . Then  $N(t_1, t_2) > \sigma$ .*

## Proof

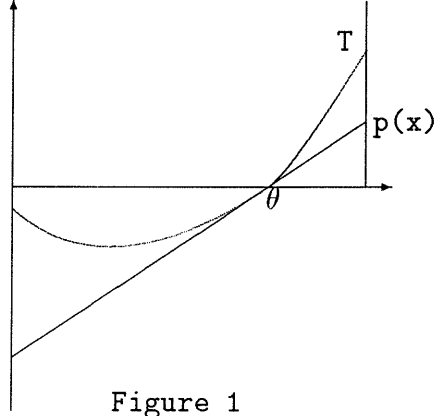


Figure 1

Let  $T$  be defined on  $[0, 1]$  by

$$T(x) = t_1(x) - t_2(x)$$

Then,  $T$  is a convex function satisfying  $T(0) = t_1(0) - t_2(0) \leq 0$  and

$$\int_0^1 T d\alpha = \int_0^1 t_1 d\alpha - \int_0^1 t_2 d\alpha = 0$$

It follows that there is unique  $\theta \in (0, 1)$  such that  $T(\theta) = 0$ . Since  $T$  is convex, we may take  $p(x) = ax + b$  a straight line “tangent” to the graph of  $T$  at the point  $\theta$ , i.e.,  $p(\theta) = 0 = T(\theta)$  (so  $-b = a\theta$ ) and  $p(x) \leq T(x)$  for  $x \in [0, 1]$ . Consider

$$A = \int_\theta^1 T d\alpha, \quad B = \int_\theta^1 p d\alpha, \quad C = \int_0^\theta |p| d\alpha, \quad D = \int_0^\theta |T| d\alpha,$$

Then,  $D = A$  because  $\int_0^1 T d\alpha = 0$ ; and since  $T$  is convex, we also have that  $C \geq D = A \geq B$ , with some inequality strict (for  $t_1 \neq t_2$ ). Thus,

$$C = - \int_0^\theta (ax + b) d\alpha > \int_\theta^1 (ax + b) d\alpha = B$$

So

$$\int_0^1 (ax + b) d\alpha < 0$$

and it follows that

$$a\mu = a \int_0^1 x d\alpha < -b \int_0^1 d\alpha = -b = a\theta$$



so  $\theta > \mu > x_\sigma$  which finishes the proof.  $\square$

As a particular case, we obtain the following result. When  $\sigma = 1/2$ , this is Proposition 2.4 in [3].

**Corollary 2.5** *Suppose  $x_\sigma < \mu$  and let  $t_1 \neq t_2$  be two tax policies satisfying the assumptions 2.1 and such that  $t_1(0) \leq t_2(0)$ ,  $t_1$  is convex and  $t_2$  is concave. Then  $N(t_1, t_2) > \sigma$ .*

In case redistribution of income is not allowed, i.e. for each  $x \in [0, 1]$  the permissible tax policy,  $t(x)$  has to satisfy  $0 \leq t(x) \leq x$ , then a convex (concave) function is unambiguously progressive (regressive). That is both the marginal and average tax are increasing (decreasing). Hence, Corollary 2.5 implies that **any** convex tax policy wins over **any** concave one.

### 3 CONCLUSION

There is not yet a widely accepted theory of income redistribution and democracy. A possible explanation for this is that most elections are on multi-issues policies. Hence, just the redistributive aspects of the proposals made by the parties are not enough to explain the way agents vote.

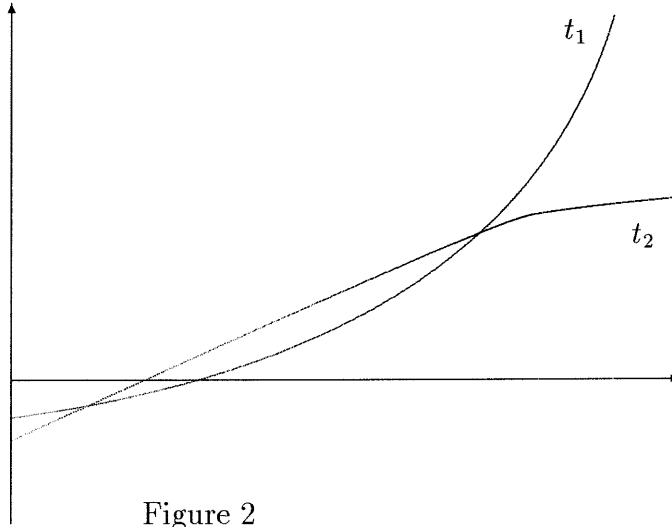


Figure 2

Consequently, our model does not attempt to provide a complete theory of voting and redistribution. Proposition 2.4 shows only some qualitative ideas of the relative support a progressive tax scheme, as compared with a regressive one, would obtain.

It is important to notice that our analysis provides the only circumstances under which a concave tax policy can beat a convex one. As explained in Figure 2, this can happen whenever the poorest segment of people is better off with the concave tax scheme. That is, a party proposing a concave tax policy which favors the very poor, can win an election when confronted with a convex tax plan.

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