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POPULAR SUPPORT FOR PROGRESSIVE TAXATION IN THE PRESENCE OF INTERDEPENDENT PREFERENCES[1,2]

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Abstract: We show that a marginal rate progressive tax always defeats a marginal rate regressive tax under pairwise majority voting (so long as the latter collects at least as much revenue as the former one) irrespective of whether the voters care at all about their relative incomes or not.

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1. *Introduction*

(Statutory) income tax schedules of most of the industrial societies (and certainly all OECD countries; cf. OECD, 1986, and Snyder and Kramer, 1988) are marginal rate progressive; that is, in such countries, the tax rate increases with income. Despite numerous attempts by public economists and political scientists, it appears that a convincing explanation of this observation is yet to be discovered.

A promising strand of literature that has focused on this issue starts from the presumption that modelling income taxation as a direct outcome of a voting mechanism "mirrors" the actual public choices made in designing tax systems (Roberts, 1977). Unfortunately, this literature is largely inconclusive; it seems that the related analyses are confined to either linear or quadratic tax functions for technical reasons, and hence, they are of limited descriptive content (cf. Kramer, 1983, and Cukierman and Meltzer, 1991).

The main reason why this literature was not able to obtain definitive results about the popular support of progressive taxes is that the problem of voting over a large set of tax functions is a multidimensional problem, and that the conditions which are necessary for the existence of a stable outcome in spatial voting problems are extremely restrictive. However, there is an alternative, and in fact, more realistic way of looking at the problem of voting over income taxes. One can model the basic problem such that individuals choose between only two tax schemes, one being interpreted as the *status quo* scheme and the other as the *alternative* (or *reform*). Clearly, modelling the problem this way retains the basic flavor of the notion of "voting over income taxes in direct democracies." Moreover, this model takes away the difficulties that are usually encountered in multidimensional problems, and therefore, enables one to obtain some insightful results about the popular support of progressive taxation. Indeed, it is recently shown by Marhuenda and Ortuño-Ortín (1995) that any marginal rate progressive tax would always have the majority support over any marginal rate regressive tax (in the absence of negative taxation) for all realistic pre-tax income distributions with median income below the mean. We believe that this is an important finding, and may well prove to be a first step towards a political economic theory which is capable of explaining why all industrial democracies choose to implement marginal rate progressive income tax schedules.

However, this basic "popular support theorem" is obtained in a setting where individual voting behavior is modelled in a disconcertingly simple manner, where individuals are assumed to vote for the tax schedule that taxes them less. Apart from neglecting the disincentive effects of income taxation, this model ignores the potentially important reflection of the "relative standing" concerns of the agents on their voting behavior. Indeed, one of the central messages of the theory of preference formation is that individuals' well-being depend on their "status" in the society as well as on their material consumption. In the present framework, this leads us to the highly plausible contention that the welfare of an individual depends on her *relative* as well as her *absolute* level of income.[3] In fact, the relevance of such *interdependent* preferences to the theory of progressive taxation is well recognized by authors like Boskin and Sheshinki (1978), Oswald (1983) and Tuomala (1990), who studied the implications of the various forms of "the relative income hypothesis" with regard to the optimal income tax schedule.[4] Surprisingly, however, the progressivity implications of "interdependent preferences" within the standard models of voting over income taxes do not seem to have received any attention in the literature.

In this paper, therefore, we examine the issue of majority demand for progressive taxation in endowment economies where the voting behavior of the citizens is modelled in a very general way. The only assumption we use here is that an individual will vote for a tax function over another whenever the former treats her better than the latter with respect to her both absolute and relative income. Individuals are allowed to have any preference relation

[3] As Persson (1995, p. 572) puts it, "if a man's income suddenly increases to make him the richest person in his community, his sense of well-being will increase dramatically. But if everyone else's income also rises in proportion, so that our man retains his initial position in the society, his happiness would not increase at all as much as it otherwise would have done." This presumption is usually called *the relative income hypothesis* (or the phenomenon of *keeping up with the Joneses*), and is attributed to Duesenberry (1949). Abundant evidence in support of this hypothesis is provided in the literature; see Easterlin (1974), Layard (1980), Frank (1985a,b), Pollak (1976), Van de Stadt, et al. (1985), Clark and Oswald (1996), and references cited therein.

[4] The main conclusion of this literature is that while the optimal taxation exercise with interdependent preferences do not in general lead to marginal rate progressivity, it certainly produces 'more progressive' results than it does with independent preferences.

(which need not be identical across voters) so long as they abide by this weak restriction.

The main result of the paper basically demonstrates that there is indeed a majority demand for marginal rate progressive taxation in the presence of virtually *any* sort of well-being interdependence. Informally put, we show that a marginal rate progressive tax always defeats a marginal rate regressive tax under pairwise majority voting (as long as the latter collects at least as much revenue as the former one) irrespective of whether the voters care about their relative incomes or not. This result considerably generalizes the corresponding finding of Marhuenda and Ortuño-Ortín (1995) in a number of dimensions, and is somewhat surprising in view of the fact that the literature provides numerous examples of economic models the results of which are dramatically altered upon the introduction of at least some form of the relative income hypothesis. Moreover, our popular support theorem is obtained for a very general class of individual preference relations, and thus allows for fairly sophisticated voting behavior. We believe that this, in turn, testifies for the robustness of the basic message of the approach that we follow here towards a positive theory of progressive taxation.

2. *Preliminaries*

The framework we employ in the present note is essentially standard. Each individual is identified by her income x in $[0,1]$. The pre-tax income distribution of the economy is described by a continuous and increasing distribution function, $F:[0,1]\to[0,1]$ with $F(0)=0$ and $F(1)=1$.[5] We assume throughout that the *mean* of F, μ_F, is greater than the *median* of it, m_F:

$$\mu_F \equiv \int_0^1 y dF(y) \geq F^{-1}(1/2) \equiv m_F.^6 \tag{1}$$

A *tax function* is a continuous and increasing function $t:\mathbf{R}_+ \to \mathbf{R}_+$ such that $0 \leq t(x) \leq x$ for all $x \in [0,1]$ and

$$R(t) := \int_0^1 t(y) dF \geq R, \tag{2}$$

[5]The economy that is studied here is thus an endowment economy; we simply assume away the incentive effects of income taxation in the present note. This is of course a very important limitation, but it is acceptable, we contend, at this rather preliminary stage of the theory.

[6]For brevity, we shall abbreviate the notation $dF(y)$ as dF throughout the paper.

where $R \in (0, \mu_F)$ is the minimum amount of tax revenue that must be raised; R is exogenously given. (Notice that $R(t)$ denotes the total tax revenue that tax t raises.)

Our formulation of tax functions departs from the usual in two aspects. First, redistribution of income is not allowed in the present setting since $t(0) = 0$ holds true for all $t \in \mathcal{T}_R$. This assumption is, however, adopted here only for convenience, the main findings of the present paper would remain true if we have allowed for negative taxation and have confined attention to pairwise voting between concave and strictly convex taxes where the strictly convex tax treats the poorest agent no worse than the concave one (as is done in Marhuenda and Ortuño-Ortín, 1995). Second, as in Romer (1975) and Roberts (1977), the revenue constraint (2) appears as an inequality in the present setting, forcing a permissible tax function to collect *at least* a prespecified level of revenue (as opposed to raising *exactly* this preset amount); we allow for taxes which raise more revenue than R.[7]

We denote the class of all tax functions by $\mathcal{T}_R$. A tax function $t \in \mathcal{T}_R$ is called *marginal rate progressive* if it is strictly convex, and *marginal rate regressive* if it is concave.[8] Finally, a tax function $t \in \mathcal{T}_R$ is said to be *average rate progressive* if the mapping $x \mapsto t(x)/x$ is strictly increasing on $[0, 1]$, and *average rate regressive* if the mapping $x \mapsto t(x)/x$ decreasing.

Imagine now that there are two political parties, and the ith one proposes the tax policy $t_i \in \mathcal{T}_R$. Which tax policy would the agent $x \in (0, 1]$ vote for? Clearly, the answer to this question depends on the preferences of the agent over the tax functions (or more generally, over the post-tax income distributions). We model the preference relation of agent x over tax functions by means of the partial ordering $\succ^x$ on $\mathcal{T}_R$ such that

$$t_1 \succ^x t_2 \quad \text{if and only if} \quad \left(x - t_1(x), \frac{x - t_1(x)}{\mu_F - R(t_1)}\right) > \left(x - t_2(x), \frac{x - t_2(x)}{\mu_F - R(t_2)}\right).^9 \qquad (3)$$

We assume throughout that $\succ^x$ is a monotonically increasing relation which is strictly in-

[7]This is a crucial point. A voting exercise between two taxes that collect precisely the same revenue is insensitive to the introduction of interdependent preferences. The problem becomes non-trivial, therefore, only when the revenue constraint is generalized as in (2). Moreover, we believe that formulating (2) as an equality at the outset is unduly restrictive, for the tax design exercise is conducted without the knowledge of the actual income distribution in practice; see Ok (1995) for more on this issue.

[8]All of our results remain intact if one defines a marginal rate progressive tax function as a convex *non*-linear tax function.

[9]For any $a, b \in \mathbf{R}^2$, by $a > b$ we mean that $a \neq b$ and $a_i \geq b_i$, $i = 1, 2$.

creasing in at least one of its arguments, and refer the agent x who votes for t_1 over t_2 whenever $t_1 \succ^x t_2$ as *an agent with interdependent preferences.*

The basic idea behind this preference specification is that one's well-being need not depend only on her absolute level of income but on her *relative* income as well. Clearly, agent x would prefer t_1 over t_2 if and only if $x - t_1(x) > x - t_2(x)$, provided that she has *independent* preferences. Therefore, the specification of *independent* preferences reflects the standard case where an individual does not care about her relative position in the society; her well-being is determined *only* on the basis of her absolute income. *Relative* preferences, on the other hand, constitute the other extreme in which the agent x prefers a tax function t_1 to t_2 if, and only if, her relative income in the post-tax income distribution induced by t_1 is higher than that of t_2, that is, if and only if $\frac{x - t_1(x)}{\mu_F - R(t_1)} > \frac{x - t_2(x)}{\mu_F - R(t_2)}$.

Clearly, independent and relative preferences are rather extreme specifications. While an individual may care about her relative income in the society, it is unlikely that she will care *only* about her relative income irrespective of how much money she makes in the post-tax distribution. As advanced by Frank (1985b, pp. 32-33), "... the conclusion that absolute income does not matter at all appears just as spurious as the notion that absolute income is the *only* income concept that matters. Granted, ... people tend to feel dissatisfied in proportion to how far their incomes fail to match those of their peers. But that does not mean that people would be indifferent if everyone's income suddenly became twice what it is today. After all, people are in competition not only with one another but with the external environment as well." (See also Ok and Koçkesen, 1997, for a related discussion.)

Indeed, it is far more realistic to postulate that an individual's well-being would in fact depend on *both* her relative *and* absolute income. The way we have modelled the preferences of individuals reflect precisely this consideration. What is more, it is a very general way of introducing the relative income hypothesis to the preference relations. All (3) says is that the agent x prefers t_1 over t_2 if and only if t_1 leaves him with a higher absolute *and* relative income than t_2 does. The constraint imposed by (3) on agents' voting behavior is thus truly minimal: no agent prefers less relative (or absolute) income to more, other things being constant. In particular, the voting behavior entailed by both independent and relative preference relations are special cases of that implied by (3).

In addition, working with $\succ^x$ is obviously more general than using any sort of a utility function. After all, since $\succ^x$ is an incomplete ordering, it does not even have a utility representation. Put differently, nothing is said in our model about how an agent ranks two tax functions if one of them treats her better with respect to her absolute income whereas the other treats her better with respect to her relative income. That is, we make no assumption whatsoever in relation to the relative significance an individual assigns to her absolute income as opposed to her relative income.

3. *The Main Result*

As we have noted earlier, Marhuenda and Ortuño-Ortín (1995) have shown that a marginal rate progressive tax always defeats a marginal rate regressive tax (so long as they collect the same revenue) provided that all individuals have independent preferences. This is an interesting *popular support theorem* paving the way towards a political economic theory of "demand for marginal rate progressivity." We shall demonstrate in this section that this result is indeed quite far reaching, and somewhat unexpectedly, it is not at all altered when the interdependent preferences are introduced into the model.

We begin the analysis by demonstrating the following observation which provides a basic insight with regard to the tax progressivity implications of Duesenberry's relative income hypothesis.

Lemma 1. *Let $t_1, t_2 \in \mathcal{T}_R$. If t_1 is marginal rate progressive, and t_2 is marginal rate regressive, then there exists a $\theta > 0$ such that*

$$\frac{x - t_1(x)}{\mu_F - R(t_1)} > \frac{x - t_2(x)}{\mu_F - R(t_2)} \quad \textit{for all } x \in (0, \mu_F + \theta]. \tag{4}$$

Proof. Since t_1 is strictly convex, by using Jensen's inequality we obtain

$$t_1(\mu_F) = t_1\left(\int_0^1 y dF\right) < \int_0^1 t_1(y) dF = R(t_1). \tag{5}$$

But since $t_1(0) = 0$ and t_1 is strictly convex, the mapping $x \mapsto t_1(x)/x$ must be strictly increasing on $[0,1]$, and therefore, by (5), we have

$$\frac{t_1(x)}{x} < \frac{t_1(\mu_F)}{\mu_F} < \frac{R(t_1)}{\mu_F} \quad \text{for all } x \in (0, \mu_F]. \tag{6}$$

By using the concavity of t_2 and $t_2(0) = 0$, we similarly obtain

$$\frac{t_2(x)}{x} \geq \frac{t_2(\mu_F)}{\mu_F} \geq \frac{R(t_2)}{\mu_F} \quad \text{for all } x \in (0, \mu_F]. \tag{7}$$

By (6) and (7), we conclude that, for all $x \in (0, \mu_F]$,

$$\frac{x - t_1(x)}{\mu_F - R(t_1)} = \left(\frac{x}{\mu_F - R(t_1)}\right)\left(1 - \frac{t_1(x)}{x}\right) > \frac{x}{\mu_F - R(t_1)}\left(1 - \frac{R(t_1)}{\mu_F}\right) = \frac{x}{\mu_F}$$

and

$$\frac{x - t_2(x)}{\mu_F - R(t_2)} = \left(\frac{x}{\mu_F - R(t_2)}\right)\left(1 - \frac{t_2(x)}{x}\right) \leq \frac{x}{\mu_F}.$$

Therefore, $\frac{x - t_1(x)}{\mu_F - R(t_1)} > \frac{x - t_2(x)}{\mu_F - R(t_2)}$ holds for all $x \in (0, \mu_F]$, and the lemma follows by a straightforward continuity argument. □

We conclude that if the voters care *only* about their relative incomes, everyone whose pre-tax income is below the mean pre-tax income would vote for any marginal rate progressive tax over any marginal rate regressive tax. It is striking that this result is obtained without giving any reference to the tax revenues that are raised by the candidate tax functions.

We show next that a similar (but less general) result obtains if the individuals cared *only* about their absolute incomes. This observation generalizes the corresponding result of Marhuenda and Ortuño-Ortín (1995) (see their Corollary 2.5).

Lemma 2. *Let $t_1, t_2 \in \mathcal{T}_R$ such that $R(t_1) \leq R(t_2)$. If t_1 is marginal rate progressive, and t_2 is marginal rate regressive, then there exists a $\theta > 0$ such that*

$$x - t_1(x) > x - t_2(x) \quad \textit{for all } x \in (0, \mu_F + \theta].$$

Proof. By using (4) and the hypothesis that $R(t_1) \leq R(t_2)$, we obtain

$$x - t_1(x) > (\mu_F - R(t_1))\left(\frac{x - t_2(x)}{\mu_F - R(t_2)}\right) \geq x - t_2(x)$$

for all $x \in (0, \mu_F]$, and the lemma follows. □

It is interesting that the popular support result noted in Lemma 2 is nothing but an immediate corollary of Lemma 1, and is in fact less general than Lemma 1 in that it works only under a particular restriction about the tax revenues of the candidate tax functions. In this sense, one may argue that the driving force behind the main finding of the present paper is but the relative income hypothesis.

The following is our main result, and is a straightforward consequence of the above lemmata along with the definition of $\succ^x$ (recall (3)).

Theorem. *Let $t_1, t_2 \in \mathcal{T}_R$ such that $R(t_1) \leq R(t_2)$. If t_1 is marginal rate progressive, and t_2 is marginal rate regressive, then there exists a $\theta > 0$ such that $t_1 \succ^x t_2$ for all $x \in (0, \mu_F + \theta]$.*

By this theorem and (1), we have

Corollary. *(Popular Support Theorem) Let $R \leq R_1 \leq R_2$, and assume that all individuals have interdependent preferences. Any marginal rate progressive tax with revenue R_1 defeats any marginal rate regressive tax with revenue R_2 under pairwise majority voting.*[10]

Therefore, while we may not guarantee the existence of a majority rule equilibrium due to the multidimensionality of the associated voting problem, we may nevertheless conclude that if such an equilibrium exists, it cannot be a marginally regressive tax. It is in this sense we argue that this particular popular support theorem has a considerable predictive content. Moreover, since the postulated voting behavior behind it is quite general, this result shows that the contention that there would generally be a majority demand for marginal rate progressive taxation in endowment economies is well supported.

[10]It is important to note that the condition $R_2 \geq R_1$ makes this assertion non-trivial. After all, a voter with interdependent preferences may choose to vote for a tax function t^* which taxes her more than another tax function t, provided that t^* raises sufficiently more revenue than t so that the subject voter's relative post-tax income induced by t^* is sufficiently better than that induced by t.

In passing, we note that one cannot extend our popular support theorem (and either Lemma 1 or Lemma 2) to the case where one compares *average* rate progressive taxes with marginal rate regressive taxes. Indeed, there exists an average rate progressive tax with revenue R, say t_1, and a marginal rate regressive tax with R, say t_2, such that t_2 defeats t_1 under pairwise majority voting. (The proof of this claim is available from the authors upon request.) However, the way we have arrived at our popular support theorem makes it clear that the following generalization is true: *If $t_1, t_2 \in \mathcal{T}_R$ are such that $t_1(\mu_F) \leq R(t_1) \leq R(t_2) \leq t_2(\mu_F)$, and if t_1 is average rate progressive while t_2 is average rate regressive, then t_1 defeats t_2 under pairwise majority voting whenever all individuals have interdependent preferences.*

4. Conclusion

One of the central questions of public economics concerns the explanation of the observed marginal rate progressivity of income tax schedules. A natural way to approach this problem appears to model the practice of income tax design as an outcome of a political process. In this paper, we have showed in the context of endowment economies (considered as direct democracies) that this approach is indeed promising. Our main finding is that a marginal rate progressive tax would always have a majority support over any marginal rate regressive tax for a very general specification of voting behavior. Since this specification extends the standard one by incorporating the so-called "keeping up with the Joneses effect," which is forcefully advanced in the social psychology and the economics literature, there is reason to believe that the generalization considered here is a particularly relevant one. We therefore contend that the popular support theorem reported above brings us one step closer to explaining the empirically observed desire of democracies for progressive income taxation.

In conclusion, we should stress that the entirety of our analysis is conducted in the context of an endowment economy, thereby ignoring the potentially important disincentive effects of income taxation. The obvious next step is therefore to study the extensions of our findings in variable labor supply (Mirrleesian) economies. This important task is by no means trivial, and is left for future research.

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