On the Political Sustainability of Taxes

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Economic analysis of commodity taxation proceeds on the assumption that such taxes are set by a social planner who is empowered to maximize some social welfare function (SWF) subject to a predetermined budgetary requirement (see A. B. Atkinson and J. E. Stiglitz). In Western democracies, however, excise taxes are most often determined within a political process. Hence, it is important to inquire whether the commodity taxes that result from this political process differ from the constrained welfare-maximizing (Ramsey-optimal) taxes which would have been selected by the omnipotent social planner.[1]

To study this question we posit that social planners aim to minimize the excess burden of commodity taxes. This assumption allows us to abstract from equity considerations and provides us with a convenient benchmark vector of Ramsey-optimal commodity taxes t^*. We construct three different models of the political process. In the context of each of these models, we investigate whether a set of politicians who are competing for voters in a general election by proposing tax vectors, will find the Ramsey-optimal tax vector among the set of sustainable or equilibrium tax vectors. We demonstrate that, in general, for most economies and for a variety voting models, the *politically sustainable* tax vector t^{**} diverges from t^*, where a politically sustainable tax vector is defined as a tax vector which, if set by a politician, can either guarantee his election (if no two politicians can set the same tax vector) or characterize the equilibrium of the political race (if identical tax proposals are allowed).[2]

The reason for this divergence can be explained by the fact that whereas the Ramsey-optimal taxes reflect the intensity of consumers' preferences over tax vectors, as represented by the deadweight loss of the tax vector, politically sustainable tax vectors are determined primarily by the consumer-voters' ordinal preferences. This point emerges clearly in Section II where we study voting models which differ in the extent to which the intensity of preferences over the feasible tax vectors determines the outcome of elections. In the *pure democracy* voting model of Section IIA the only determinant of the election's outcome are the candidates tax proposals and the voters' ordinal preferences over these proposals. Here the winning tax vector is that which is preferred by the requisite majority of voters. In this model, we find that very restrictive and unrealistic assumptions on the source of voters' heterogeneity are needed to ensure the equivalence between Ramsey-optimal and politically sustainable taxes.

The pure democracy model is deficient, however, in that it fails to recognize that the outcome of an election depends also on the quality of the campaign that candidates run. This quality depends on the amount of campaign contributions that they receive. To capture this feature of elections, we formulate the *pure media* model of Section IIB where we assume that the winning candidate is the one who attracts the most in campaign contributions. We also make a plausible assumption that a voter's contribution to a candidate is a function of the dollar welfare loss that his tax platform im-

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[1]An earlier attempt at a similar problem was made by Schotter in the context of economic contraction.

[2]See William Baumol, Elizabeth Bailey, and Robert Willig for a complete discussion of sustainability and of conditions under which Ramsey-optimal prices are sustainable in a natural monopoly market.

poses on the voter in comparison to the loss inflicted by the other candidates. Hence, in the pure media model, politically sustainable tax vectors reflect the *intensity* of voter preferences over the feasible tax vectors. Surprisingly, we find that, in a two-candidate race, *only* the Ramsey-optimal taxes are politically sustainable. Unfortunately this result is quite sensitive to the number of competing candidates. For example, in a three-candidate race, there is no politically sustainable tax vector if candidates are allowed to choose identical platforms.

In Section IIC, we briefly discuss a model which incorporates the features of the two previous models. This model, called the *mixed-media* voting model, defines the outcomes of elections as a function of *both* the tax positions that candidates take as well as the amount of money they raise as a result of their platforms. Here, in a two-tax two-candidate race, if the median tax vector t^m is also (coincidentally) the Ramsey tax vector, then it is an equilibrium tax vector; otherwise, as is most likely, a politically sustainable tax vector, if it exists, is intermediate between t^m and t^{**}.

I. The Essential Model

In this section we provide a rudimentary review of optimal commodity taxation and develop those concepts which we shall utilize in the study of the voting models in the following sections.

Let us consider an economy which produces n final goods, $x_1,\ldots,x_n$, under conditions of constant returns to scale using labor l as the sole input. In such an economy, marginal cost pricing does not generate an overall budgetary surplus, hence governmental revenue requirements, if they exist, will necessitate an imposition of head taxes and distortionary taxes. In what follows we shall assume that income is untaxed leaving excise and head taxes as the only source of revenue.

Let us assume that consumers, indexed by $\alpha\in\Lambda$ where Λ is the index set of consumer-voters, have heterogeneous preferences, endowments of leisure time, and that they may differ in their productive efficiency. Let $y(\alpha)=p_0^\alpha T^\alpha+g$ be the full income of type α consumer, where T^α is his endowment of leisure time, p_0^α is his wage rate, and g is a lump sum transfer. Further if we let $p(\alpha)=(p_0^\alpha, p_1,\ldots,p_n)$ be the price vector facing that consumer, then $\mu^\alpha(p^0(\alpha)|p(\alpha), y(\alpha))$ is the Hurwicz-Uzawa income compensation function which gives the amount of income that a consumer of type α needs at some base prices, $p^0(\alpha)$, to make him as well off as he is at actual prices $p(\alpha)$ and full income $y(\alpha)$.[3]

The income-compensation function can be used to evaluate the welfare cost of a given tax and transfer program, and to define the maximum any voter would be willing to contribute to his favorite candidate. For instance, if we let $g=0$, c be the vector of producer prices, w^α be α's wage rate, and p be the vector of consumer prices, i.e., $p_i=c_i+t_i$, $i=1,\ldots,n$, then μ^α gives the amount of income that α requires at some base price to make him as well off as he is after an imposition of a commodity tax vector t. Clearly, the higher is the value of μ^α, the less onerous is a given tax vector. Now let politician j, $j=1,2$, propose a tax vector t^j, (yielding consumer prices $p^j=c+t^j$). Then

$$(1)\quad z^\alpha(t^1,t^2;p^0(\alpha)) = \mu^\alpha(p^0(\alpha)|p^1,\cdot)-\mu^\alpha(p^0(\alpha)|p^2,\cdot)$$

gives the *maximum* amount that α would be willing to pay to ensure that the society selects t^1 rather than t^2. (Of course, if $z^\alpha<0$ then α prefers t^2 to t^1 and would be willing to pay $|z^\alpha|$ to ensure the selection of t^2.)

We can state the social planner's problem as

$$(2)\quad \max_t \sum_{\alpha\in\Lambda}\mu^\alpha(p^0(\alpha)|c+t,w^\alpha,y(\alpha))$$

subject to the requirement that

$$(3)\qquad \phi(t)\equiv\sum_{i=1}^{n} t_iX_i(\cdot)\geq\bar{R}$$

where X_i is the aggregate market demand

[3]Willig suggested the use of the income compensation function to evaluate the efficiency costs of taxes.

for commodity i. The solution to the above program is the Ramsey-optimal tax vector t^*.

We now have all the necessary ingredients needed to study the various voting models defined above.

II. Politically Sustainable Tax Vectors

In this section we investigate whether politically sustainable tax vectors exist and when they do whether Ramsey-optimal tax vectors are politically sustainable. We show that the answers to those questions depend significantly on the nature of the voting model, on the number of candidates who are allowed to compete in the elections, and, of course, on the sources of heterogeneity among consumer-voters. We begin our discussion with a paradigmatic model of democracy wherein the winning politician is the one who attracts the required majority of voters.

A. *The Pure Democracy Voting Model*

Let us assume that two politicians are vying for voters in a general election. Each politician announces a feasible tax vector, that is, satisfying equation (3). Each voter casts his vote for that politician whose announced tax vector he most prefers. Hence, only the voter's ordinal preferences are expressed by his voting decision. It is intuitively clear that in this spatial-type model the politically sustainable (or equilibrium) tax vector, if it exists, will be determined by the preferences of the median voter, if a 50 percent majority is needed to win the election. The voting literature suggests that in spatial-type models, equilibria rarely exists. *Per force*, the same situation obtains in the pure democracy voting model.

It is not surprising, therefore, that stringent conditions are required for the Ramsey tax vector t^* to be identical with the equilibrium tax vector of the political process as defined by the median tax vector. The two instances in which this equivalence holds are given in

PROPOSITION 1: *Let* $\Lambda \subset R^1$, *then in the pure democracy model* $t(\alpha^m) = t^{**} = t^*$ (*where* α^m *is the median voter on* R^1) *if* (a) *all consumers have identical homothetic preferences and they differ only with respect to unearned income; or* (b) *consumers receive different wages and the individual utility function can be represented by* $u(x_1, x_2, \ldots, x_n, l) = \phi(x) + al$ *where* ϕ *is a homothetic function and* l *is labor supply.* (A proof of this and the following propositions is in our earlier paper.)

Condition (a) follows from the fact that homotheticity implies that budget shares $k_i = p_i x_i / y$, $i = 0, \ldots, n$, are independent of income. Consequently, for each consumer the same tax vector minimizes the burden of taxation as measured by the income compensation function. Condition (b) follows in fact from (a). Given the posited representation of the utility function, budget shares do not depend on the full income. Furthermore, labor supply can be viewed as being effectively fixed for each worker if workers are to supply any labor at all. Hence, cases (a) and (b) are essentially equivalent.

From this discussion we conclude that unless very restrictive preference structures and sources of heterogeneity among voters are imposed upon the pure democracy model, Ramsey-optimal taxes are not politically sustainable. This is not an entirely unexpected result in view of the fact that in this type of spatial voting model, equilibria rarely exist and the model is not sensitive to the cardinal preference intensities of the voters. The next section presents a model in which these preference intensities influence the election's outcomes.

B. *The Pure Media Voting Model*

In this model we posit that the winning candidate is the one who runs the best campaign. The quality of the campaign is a function of the money a candidate raises. Thus in the pure media voting model, the media alone determines the outcomes of political campaigns and the only function of political (tax) platforms is to raise money with which to wage a campaign and sway the voters. As in the previous section, we assume that each politician strives to maximize his probability of being elected. Hence

each politician will propose that tax vector which, given the tax vector(s) proposed by his opponent(s), maximizes his campaign contributions.

Regarding contributions, we take it that in a two-candidate race, a candidate receives in contributions the amount equal to the maximum amount that voters would be willing to pay to *avoid* the election of the opposing candidate.[4] Thus, from equation (1), the jth candidate receives $Z^j = \Sigma_{\alpha \in C^j} |z^\alpha(t^1, t^2)|$ where C^j is the set of consumers who prefer the tax vector proposed by the jth candidate. With this assumption it can be shown

PROPOSITION 2: *In the pure media voting game with two candidates, the strategy of proposing the Ramsey tax vector t^* is a dominant strategy for each candidate. Furthermore, t^* is a unique equilibrium for that game.*

The intuition behind this result is that the Ramsey-optimal tax vector minimizes the social welfare loss as defined in equation (2) and, therefore, maximizes the sum z^j of campaign contributions made to the candidate who announces it for any tax vector proposed by the opposing candidate. Hence, if candidate 1 announces t^*, the second candidate's best response is to also announce t^* and thus guarantee himself a 50 percent chance of winning the election since no other t can guarantee him that much. If the incumbent politician is allowed to announce the tax vector first, and if the challenger is not allowed to replicate the incumbent's tax vector, then the incumbent can always ensure his reelection by selecting the Ramsey-optimal tax vector: the Ramsey-optimal tax vector is sustainable.

One important implication of the pure media voting model is

PROPOSITION 3: *If candidates are allowed to propose identical tax vectors then in equilibrium no candidate receives any contributions.*

If the challenger cannot imitate the incumbent's tax vector, the incumbent receives positive, albeit arbitrarily small, total contributions. Hence, in a pure media voting model, competition for voters drives campaign contributions towards zero.

Proposition 3 follows from the fact that when both politicians are proposing t^* (or any pair of identical tax vectors), consumer-voters are indifferent between them and hence find it unnecessary to contribute to either one. Furthermore, the candidate who deviates from that equilibrium can expect in contributions an amount that is smaller than the countervailing flow of contributions to the other candidate that is induced by his deviation.

It is instructive to explore whether the results reported in this section generalize to a $k>2$ candidate race. In general, we find that the incumbent can still assure reelection by proposing the Ramsey tax vector if challengers cannot replicate his tax program. However, with replication, the Ramsey tax vector is not an equilibrium tax vector. Thus,

PROPOSITION 4: *If individual preferences are strictly quasi concave, then in a k-candidate race, under appropriate continuity conditions, the Ramsey-optimal tax vector is not a voting equilibrium tax vector.*

This negative conclusion follows from the fact that if k-1 politicians announce the Ramsey tax vector t^*, then the remaining politician by announcing a tax vector $t^* + \varepsilon$, with ε arbitrarily small, can raise in contributions an amount smaller but nonetheless almost equal to the sum of contributions made to the remaining k-1 candidates. However, the k-1 candidates must split those contributions k-1 ways. Consequently the contribution of the deviant politician must exceed the per candidate campaign contributions of the remaining candidates and hence, by assumption he must win.

This result rests on the assumption that candidates can imitate each other's platform. If they cannot, we have

[4]This assumption rules out any type of free-rider problems that may arise on the voter side of the model. As we will see, however, *at the equilibrium* all such free-rider problems disappear. For another method of dealing with the free-rider problem, see Ordover and Willig.

PROPOSITION 5: *In a k-candidate race, the Ramsey tax vector is sustainable, that is, a candidate who announces it wins the election, if the other candidates cannot replicate his platform.*

Now that we have illustrated the pure democracy and pure media models let us investigate the mixed-media model, which is a hybrid of the two.

C. *The Mixed-Media Model*

Space does not permit a full description of the mixed-media model. Briefly, it is a model in which both the cardinal (intensity of) preferences and the ordinal preferences of the voters help to influence the outcome of the election. In the model, politicians first announce tax platforms. Upon these platforms the voters decide who they prefer (in terms of their ordinal preference) and also how much they want to contribute to the candidate they most prefer as defined by equation (1) (for a two-candidate race). The candidates then use these contributions to run their campaign with the assumption that the candidate who raises the most in campaign contributions will be able to steal some of the voters who ordinally prefer the other candidate by engaging in a media campaign. This possibility is summarized by a media technology as represented by a "stealing function" (a function of the excess of contributions of the candidate with the largest campaign chest over his competitor). Hence the model is a hybrid of the pure democracy and the media models.

The results we derive are of interest because they alter the median voter result typically encountered in the voting literature. To summarize these results consider the following two propositions.

PROPOSITION 6: *In a two-candidate n-tax race, the median tax vector is an equilibrium tax vector if it is also the Ramsey tax vector.*

Most often, however, the Ramsey tax vector is not identical to the median tax vector. When this is the case, we are able to establish the following result:

PROPOSITION 7: *In a two-candidate two-tax race, where t^* is the Ramsey tax vector and t^m is the median tax vector, with $t^* \neq t^m$, and in which candidates compete by setting t_1 only (t_2 is then defined from the revenue constraint (3)), then; 1) if an equilibrium exists it must be an equilibrium in which both candidates set the same tax vector t^{**}, and 2) if $t_1^* \leqslant t_1^m$, then $t_1^* \leqslant t_1^{**} \leqslant t_1^m$. In other words, the equilibrium tax vector of the mixed-media game lies betwen the Ramsey and median tax vector.*

III. Conclusions

To conclude our discussion we can state that, unlike the system of economic competition, political competition is unlikely to lead to first (or even second) best societal outcomes. The more that cardinal intensities can be represented in the voting game described by the political process, however, the more likely we are (as in the pure media game) to have the politically sustainable outcomes of the process be economically efficient.

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