

Political institutions and tax rate initiatives

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Fecha de recepción: 18 XII 2008

Fecha de aceptación: 27 VII 2009

Abstract

In a model of a representative democracy, we incorporate into the analysis of tax design the constitutional provision that allows voters to propose tax initiatives. In this paper, we present a theory of tax substitution as the rationale for a tax rate limit (TRL) initiative. In our model the tax system at the status quo is determined by the electoral competition between parties. This political institution aggregates the voters' preferences for tax policy according to the voters' marginal proportion of the expected vote that different coalition of voters can deliver in the election. The approval of a TRL, however, depends on the majority rule, and it aggregates the preferences of the median voter of tax initiatives. Thus, a TRL is the result of two political institutions with different mechanisms to aggregate the preferences of voters. Moreover, our paper distinguishes the role of perfect and imperfect information on the distribution of voters' preferences for tax systems in approving a tax initiative. In this paper we identify conditions on the distribution of preferences and income of the electorate and the median voter that guarantee the approval (rejection) of tax initiatives.

Keywords: Taxation, Tax Limitations, Redistributive Effects, Structure and Scope of Government

Resumen

En un modelo de una democracia representativa incorporamos, en el análisis del diseño de impuestos, la provisión constitucional que permite a los ciudadanos proponer iniciativas de impuestos. En este artículo presentamos una teoría de sustitución de impuestos que explica la propuesta y aprobación

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de una iniciativa de los ciudadanos que buscan limitar los impuestos. En nuestro modelo, el sistema impositivo en el estatus quo es determinado por la competencia electoral entre partidos. Esta institución política agrega las preferencias de los votantes por las políticas de impuestos de acuerdo a la proporción marginal de votos que las diferentes coaliciones de votantes pueden entregar en la elección. Sin embargo, la aprobación de una iniciativa que busca limitar los impuestos, depende de la regla de la mayoría, la cual agrega sólo las preferencias del votante mediano. Por ello, una iniciativa para limitar los impuestos puede ser el resultado de la interacción de dos instituciones políticas con diferentes mecanismos para agregar las preferencias de los votantes. Además, nuestro artículo distingue el papel que juega la información perfecta e imperfecta sobre la distribución de las preferencias de los votantes por los impuestos en la aprobación de una iniciativa de impuestos. En este artículo identificamos condiciones en la distribución de preferencias e ingreso del electorado y del votante mediano que garantizan la aprobación (el rechazo) de una iniciativa de impuestos.

Palabras Claves: impuestos, limitaciones a los impuestos, efectos redistributivos, estructura y alcance del gobierno.

Clasificación JEL: H2; H23; H1

Introduction

In the last decades there has been a growing interest in the literature of public economics to study the influence of different political institutions in the design of the government's spending and taxation, see Buchanan and Tullock (1962), Alesina and Roshental (1995), and Persson and Tabellini (2005) among many others. In particular, economists have been paying attention to the impact of political institutions in the way policy makers aggregate the heterogeneous preferences of individuals over fiscal policies. The problem of preference aggregation is in turn central in explaining the core issues of public economics such as the tradeoff between redistribution and efficiency in tax policy design, and the size and composition of public spending. Moreover, it should be clear that the way in which the individuals' preferences are represented into fiscal policies is also important to explain the perceived legitimacy and welfare properties of the government's fiscal policies.

In this paper we are interested in the interaction between two specific political institutions: the first institution is the electoral competition to form a government in a representative democracy. In such economy, voters delegate the responsibility of designing and implementing tax policies to bureaucrats or representatives selected in an election. The second institution is the

process of initiatives and the direct voting of policies. In this setting, ordinary individuals (and not only the government's officials) can propose tax initiatives that are voted in a ballot by the electorate. If an initiative receives the support of a majority then the initiative is turned into law and then implemented.

The interaction between the direct voting for policies versus voting for representatives in the analysis of tax design is interesting for several reasons: First, our model is relevant to explain the design of fiscal policy in many countries since tax and spending policies reflect the interaction between the executive and the legislative powers. While in a representative democracy the executive power might respond to the electoral incentives of a nationwide election, the legislative bargaining is widely regarded as a direct voting mechanism for choosing tax and spending policies, see Austen-Smith (2000), Baron and Ferejohn (1989), and Denzau et al (1979).² Second, even in democracies in which there is party control, the interaction between direct and representative voting is empirically relevant.³ Several countries, such as the United States and Switzerland, use both institutions to design public policies.

The interaction between the direct voting for policies versus voting for representatives discussed above represents the actual political institutions in place for twenty three states in the U.S.⁴ The use of tax initiatives at the local level in the U.S. has been intense in the last decades. According to a report in 1995 by the U.S. Advisory Commission of Intergovernmental Relations (ACIR), by 1995 forty six states in the U.S approved some sort of tax initiatives known as tax and expenditure limitations (TELEs). The predominant form of these tax initiatives were tax rate limits (voters sought to constraint the level of a tax rate that the government could implement), and local governments in thirty three states were affected by overall and/or specific tax rate limits.⁵

Even when many of the tax and spending initiatives approved in the last decades aimed to constraint or reduce the size of local and state

² Of course, tax and spending policies might also reflect other issues as the principal-agent problem in the interaction between the legislative-executive powers. However, what we want to highlight in this paper are the different political institutions, such as the different elections to select legislators and executive officials, the majority rule, and the legislative procedures, that shape the design and implementation of tax policies.

³ In democracies with party control, the party winning the election controls both the executive and the legislature. For this reason, under party control, the interaction between direct and representative voting could be less relevant.

⁴ In these states voters can vote not only for representatives but also for tax and spending initiatives that are proposed by a coalition of citizens.

⁵ See U.S Advisory Commission of Intergovernmental Relations (1995).

governments, the ACIR (1995) reports that TELs did not affect the size of the government but changed the composition of state and local spending.⁶ Empirical evidence also suggests that TELs modified the structure of state and local tax systems, see ACIR (1995), Joyce and Mullins (1991), Fisher and Gade (1991), Shadbegian (1999), Preston and Ichniowski (1991), Dye and McGuire (1997), and Skidmore (1999). Finally, the evidence indicates that TELs are long lived tax amendments see ACIR (1995), and Shadbegian (1999). To sum up, TELs are a widespread phenomenon affecting state and local spending and tax structures, tax rate limits are the predominant form of tax initiatives, and TELs are long lived tax amendments.

The objective of this paper is to examine the influence on tax design of the constitutional provision that allows voters to vote jointly for representatives and tax initiatives. The problem of tax policy design is at the core of the theory of public economics and it has received a great deal of attention (for a survey of the theory of the design of tax structure see Auerbach and Hines 2002, and Hettich and Winer 1999).

To be more specific, in this paper we are interested in examining why a tax rate limit (TRL) initiative is placed on the ballot, and what explains the approval (rejection) of a TRL. Our paper seeks to provide insights on why voters might choose to constrain themselves by imposing a tax rate or spending limit on the government when they can remove an official out of office if he spends too much or makes other decisions that displease them (for a discussion along these lines see Husted and Kenny 2007).

In addition, we seek to explain some stylized facts. That is, why a majority of voters would approve a TEL even when the analysis of Attiyeh and Engle (1979), Citrin (1979), and Courant, Gramlich and Rubinfeld (1980) suggest that voters were in general satisfied with the spending of the government. This evidence suggests that voters might not seek to reduce spending, but they might have a different rationale for a tax rate initiative such as a change in the tax structure that could modify the distribution of tax burdens.

In this paper we develop a probabilistic model of electoral competition to analyze the tax policies proposed by parties in a representative economy. However, in our economy ordinary citizens can propose tax initiatives. The

⁶ Other studies analyzing the impact of TELs on different measures of the government's size find mixed evidence. For instance, Joyce and Mullins (1991) find that TELs did not affect the government's size, and Fisher and Gade (1991) reports no evidence that the property tax limitation in Arizona restrained the growth of property taxes. In contrast, Preston and Ichniowski (1991) conclude that the growth of the property tax revenues was lower in municipalities in which a TEL had been approved. Similar results are reported by Dye and McGuire (1997) for the case of limits on growth of property tax levies.

polity uses the majority rule to approve a tax initiative.⁷ We use this framework to argue that the electoral competition between parties determines the tax system at the status quo by aggregating the voters' preferences for tax policy in a different way the majority rule aggregates the voters' interests. In our analysis, the electoral competition aggregates the preferences of the whole electorate over policy while the majority rule (the institution that dictates if a tax initiative is approved or rejected) aggregates the preferences of the median voter of the tax initiatives.

For this reason, the tax structure at the electoral competition might be different to the ideal tax structure of the median voter. This, in turn, may explain why the median voter might approve an initiative to constraint a tax rate. The approval of the tax amendment, however, does not necessarily imply that voters are unsatisfied with the size of the budget or that voters question the efficiency of the government to transform public revenues into services (these two arguments have dominated the discussion of the rationale for a tax rate limit). Therefore, in this paper we provide a different rationale for the approval (rejection) of tax rate initiatives. In particular, we argue that the rationale for a TRL proposal is to substitute feasible tax structures rather than to constraint the government's power to collect taxes (or equivalently in this paper, the size of the government). Finally, we provide a model that predicts the tax structure that would arise as a result of a TRL.

The paper is structured as follows: In section I, we review the literature on tax initiatives known as tax and expenditure limitations. Section II considers the behavior of voters and the equilibrium derived from the political competition in this economy. The preferences of voters over tax instruments and the option of a tax rate limit are studied in section III. Section IV includes a discussion section. The last section concludes.

1. Stylized Facts and the Literature Review on Tax and Expenditure Limitations

The literature on TELs has centered on explaining why the government does not provide the fiscal policies demanded by the median voter, see Shapiro, et al (1979). The celebrated model of electoral competition under perfect information on the distribution of voters' preferences, the model of Downs (1957), can not rationalize why a tax initiative is approved. This result follows from the fact that the Downs' model predicts that the tax policy at the political equilibrium produces the ideal policy of the median voter. For

⁷ That is, if the initiative beats by a majority of the votes to the tax policy at the status quo then the initiative is implemented.

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this reason, the median voter would not approve a tax initiative to control the power of a government that seeks to maximize his utility.

In fact, Denzau, Mackay and Weaver (1979) y Denzau y Mackay (1980) depict a TEL as a mechanism to restore the median voter outcome (MVO). They argue that the MVO can be upset by a group of high demanders with the power to control the agenda. In their model of legislative bargaining, a representative can control the agenda to produce a size of government that is higher than that desired by the median voter. For this reason, the median voter might approve a tax initiative that seeks to control the size of the government.

The apparent inability of the median voter model to explain the approval of tax and expenditure initiatives persuaded Brennan and Buchanan (1978a, 1978b, 1980) to provide a model in which a dictator rules the government. In their framework, the dictator has incentives to maximize the public budget. In addition, the dictator is not constrained by electoral considerations which leads to the obvious result of a big government.⁸ In this case, dissatisfied citizens seek to limit the power of a government that maximizes the “Leviathan”, by approving a proposal that effectively constraints the government’s capacity to collect taxes.

Two observations are worth to be noticed on the hypothesis that the objective of a TRL is to control the government’s spending or its capacity to collect taxes. First, as Brennan and Buchanan (1978b) recognize, an isolated tax rate limitation is unlikely to constraint the government’s capacity to raise public revenue. Thus, in the context of a Leviathan government, what is the rationale for a single tax rate limit?

Second, in the light of an important expansion of the public sector after the 50’s, the explanation of a big government as the rationale of a TEL seems appealing. However, Attiyeh and Engle (1979), Citrin (1979), Courant, Gramlich and Rubinfeld (1980), and Ladd and Wilson (1982) use survey techniques to reveal that voters were in general satisfied with the government’s expenditure. This finding led Ladd and Wilson (1982) to argue that the approval of a TEL initiative (in particular the Massachusetts’ proposition 21/2) was more an attempt to reduce tax burdens and obtain higher efficiency from the government rather than to reduce spending.

Courant and Rubinfeld (1981) provide a model in which the government’s services are inefficient since public employees have monopolistic power in

⁸ For arguments along these lines see Denzau and Mackay (1980), Romer and Rosenthal (1979), Shapiro and Sonstelie (1982), among many others.

setting public wages. In this setting, a coalition of voters seeks to increase their well being by limiting the public budget. However, the voters' approval of a budget limit requires that voters expect that public employees, in their self interest, reduce their wages after the budget limit is approved. In the model, however, the mechanisms that explain how public employees respond to a budget limit and the voters' system of beliefs on the response of public employees are exogenous. For this reason, it is not clear why voters would approve a budget limitation.

In summary, tax initiatives have been regarded as a mechanism of voters to impose a non electoral control over a big government, as an attempt to improve the efficiency of the government, and as a way to restore the median voter outcome that was initially upset by a group of high demanders with the power to control the agenda. Other explanations for TELs proposed in empirical analysis include: Tax initiatives might be explained as the voters' attempt to change the composition of tax collections and reduce tax burdens.⁹ However, to the best of my knowledge, no formal argument has been provided to show that some of the claims in the empirical analysis surveyed above can be characterized through the existing bureaucratic and/or political models.

Although we have learned a great deal from the models surveyed above, there are several elements that can explain the proposal-approval of TRLs that have received little attention: first, the role of preference aggregation in determining tax policy, and second, in the context of uncertainty, the government's tax policy at the electoral equilibrium might not be the ideal tax policy of the median voter. To see the latter point, note that a party could choose a policy that fails to represent the preferences of a majority if parties have imperfect information on the actual ideal policies of voters.

If Downsian parties know with certainty that a policy is a Condorcet winner then parties' dominant strategy is to choose such a policy.¹⁰ Still, a Condorcet winner might exist but such a policy could be unknown for parties. Thus, the objective of the paper is to incorporate a model of imperfect information on the distribution of voters' preferences to study the

⁹ See also Alm and Skidmore (1999) for an excellent review of previous works and for an alternative hypothesis on the partisan composition of the legislature as a source of possible deviations of the median voter outcome.

¹⁰ A Condorcet winner is a policy that provides a probability of winning the election that is no less than $\frac{1}{2}$. An alternative interpretation is that a Condorcet winner is a policy that beats any other alternative by majority. Roemer (2001), Coughlin (1992), and many others, show that proposing a policy that is a Condorcet winner (if such a policy exists) is a dominant strategy for Downsian parties.

interaction between political institutions related with a representative and a direct democracy.

Our model is also different in another dimension to the existing literature. While the literature has focused on the hypothesis that tax initiatives seek to control the size of spending of the government, in our analysis voters disagree on the tax structure that seeks to finance the government's services. This characterization allows us to show that a tax rate initiative can be approved to change the distribution of the tax burdens rather than to constraint the size of the government. Thus, our model can rationalize the empirical findings that suggest that the voter's tax and spending initiatives did not reduce the size of government but changed the tax structure of state and local governments.

2. The Model

The economy is constituted by voters indexed by $h = 1, 2, \dots, H$. Voters engage in several types of activities: They vote for a candidate (party) representing the government or directly over tax policies. They can propose tax initiatives, and lastly, they select their consumption bundle. Evidence suggests that the individuals' choice of a vote for a representative reflects a complex calculus of, among other things, voters' preferences over policies, candidates' attributes, partisanship, and a retrospective evaluation of the candidates' performance in office, see Fiorina (1997). For simplicity, we assume the individuals' choice of the vote depends only on tax policy issues. We denote a voting choice set $C_S^h \forall h$ that records the party receiving the vote from the individual h . Thus, a voter h votes for party k if:

$$k \in C_S^h \Leftrightarrow C_S^h = \left\{ \forall h \mid v^{hk}(\mathbf{t}^k) - v^{h-k}(\mathbf{t}^{-k}) \geq 0 \right\} \quad (1)$$

Where $v^{hk}(\mathbf{t}^k)$ and $v^{h,-k}(\mathbf{t}^{-k})$ are the indirect utility functions for individual h when parties k and $-k$ propose tax policies \mathbf{t}^k and \mathbf{t}^{-k} . The indirect utility of voter h under policy \mathbf{t}^k of party k is defined as follows:

$$v^{hk}(\mathbf{t}^k) = \left\{ \underset{\{\mathbf{x}^h\}}{\text{Max}} \mu^h(\mathbf{x}^h) \text{ s.t. : } \mathbf{q}^k \mathbf{x}^h \leq e^h \right\} \forall h = 1, 2, \dots, H \quad (2)$$

The expression in (2) defines the preference ordering over feasible policies characterized by a quasi-concave utility function determined by $\mu^h(\mathbf{x}^h) = \prod_{i=1}^n (x_i^{\beta_i^h})$ with $\sum_{i=1}^n \beta_i^h = 1 \forall h$, and $\mathbf{x}^h \in \mathfrak{R}^n$ is the vector of feasible

commodities. The consumer's price vector is $\mathbf{q}^k = \mathbf{p} + \mathbf{t}^k$; \mathbf{p} is the vector of the producers' prices, and \mathbf{t}^k is the vector of commodity taxes proposed by party k . The supply of private commodity i is perfectly elastic at p_i , and for simplicity we normalize $p_i = 1 \forall i = 1, 2, \dots, n$ commodities. From the budget constraint, e^h as the voter's endowment.

In this economy two parties compete for votes by designing the tax structure that raises an amount of public revenue \bar{R} (assumed to be exogenously given). Note that by assuming parties seek to collect the public revenue \bar{R} , our analysis about the rationale of tax initiatives will hold for any size of the government (because the value of \bar{R} can be set as high, or as low, as we consider appropriate).

As opposed to the literature that studies on the size of the government, our analysis is focused on the fact that the heterogeneity of preferences and endowments of voters leads to a social choice problem defined by the type of tax structure that collects public revenue \bar{R} . A voter h who consumes more of commodity i relative his consumption on commodity j would prefer a tax structure that relies heavily on a high tax on commodity j relative the tax on commodity i . The reason is simple, such a tax system would minimize the tax burden of voter h while at the same time would collect the public revenue \bar{R} . The problem of preference aggregation for parties is that candidates need to use an electoral measure to weigh the conflictive interests of voters over taxes and design a tax system that maximizes the votes that parties expect to receive in the election.¹¹

The strategy space for candidates $c = \{k, -k\}$ is $S^c = \{\mathbf{t}^c\}$, and it is assumed to be a convex, closed and bounded set representing the taxes that raise a public revenue \bar{R} . For the purpose of analyzing the design of tax policies we assume candidates are uncertain on how the tax policies proposed by parties k and $-k$ will be translated into votes. From the candidates' perspective, their system of beliefs on the individual's voting behavior corresponds to a common cumulative distribution function, $F^{hk} \in [0, 1]$, over the set of voters' preferences over taxes proposed by parties, $\Psi^{hk} = v^{hk}(\mathbf{t}^k) - v^{h,-k}(\mathbf{t}^{-k})$, where Ψ^{hk} is the welfare gain (loss) of voting for

¹¹ In the models of electoral competition parties and candidates represent a united team. In this paper we will use the words parties or candidates as we considered convenient.

party k instead of party $-k$. In other words, given the parties' tax policies \mathbf{t}^k and \mathbf{t}^{-k} , the probability that an individual h votes for party k is

$$\Pr^{hk} = F^{hk}(\nu^{hk}(\mathbf{t}^k) - \nu^{h,-k}(\mathbf{t}^{-k})) \quad (3)$$

Let the proportion of voters with endowment e^h be given by $\varphi^h : \sum_{\forall h} \varphi^h = 1$. The expected proportion of the vote for party k is $EV^k(\mathbf{t}^k, \mathbf{t}^{-k}) = \sum_{\forall h} \varphi^h F^{hk}(\nu^{hk}(\mathbf{t}^k) - \nu^{h,-k}(\mathbf{t}^{-k}))$, and the party's plurality is $P\ell^k = EV^k(\mathbf{t}^k, \mathbf{t}^{-k}) - EV^{-k}(\mathbf{t}^k, \mathbf{t}^{-k})$. In this economy all voters vote therefore $EV^k + EV^{-k} = 1$; A party k wins the election if $P\ell^k > 0$. The objective of party k can be re-written as $P\ell^k = 2EV^k(\mathbf{t}^k, \mathbf{t}^{-k}) - 1$. Under our assumptions, to maximize the expected proportion of votes is equivalent to maximize the expected proportion of the party's plurality. Hence, the objective of party k can be stated as:

$$\begin{aligned} \underset{\{\mathbf{t}^k\}}{\text{Max}} \quad & EV^k(\mathbf{t}^k, \mathbf{t}^{-k}) = \sum_{\forall h} \varphi^h F^{hk}(\nu^{hk}(\mathbf{t}^k) - \nu^{h,-k}(\mathbf{t}^{-k})) \\ \text{s.t.} \quad & \bar{R} = \sum_{i=1}^n t_i^k \sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}^k, e^h) \end{aligned} \quad (4)$$

In (4) the aimed public revenue \bar{R} is financed by a commodity tax structure $\mathbf{t}^{*k} = [t_1^k, \dots, t_n^k]$ over the Marshallian demand functions $x_i^h(\mathbf{t}^k, e^h) \forall i, \forall h = 1, \dots, H$. The assumption that the government uses a commodity tax structure is made for simplicity. However, this assumption is empirically relevant and common in the literature of taxation see for instance, among many others, Atkinson and Stiglitz (1972), and more recently Sheshinski (2007). The analysis of a mixed tax structure will be the subject of future research.

Let the expected proportion of votes over the constrained policy space be concave on taxes.¹² The electoral game is characterized by

¹² This assumption requires that the expected proportion of votes for the party over the constrained policy space, $\delta^k(\mathbf{t}^k, \mathbf{t}^{-k}) \forall c$, be concave on taxes. The constrained indirect utility function for any party k , $\delta^k(\mathbf{t}^k, \mathbf{t}^{-k})$, is given by

$$\delta^k(\mathbf{t}^k, \mathbf{t}^{-k}) = \sum_{\forall h} \varphi^h F^{hk}(\nu^{hk}(\mathbf{t}^k) - \nu^{h,-k}(\mathbf{t}^{-k})) + \zeta^k \left\{ \bar{R} - \sum_{i=1}^n t_i^k \sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}^k, e^h) \right\}$$

where ζ^k is the Langrange multiplier of the public revenue constraint of the government. This condition is satisfied if $\partial^2 \delta^k(\mathbf{t}^k, \mathbf{t}^{-k}) / \partial^2 t_i^k \leq 0 \quad \forall t_i^k, \forall k$. In this paper we assume this condition holds. For more

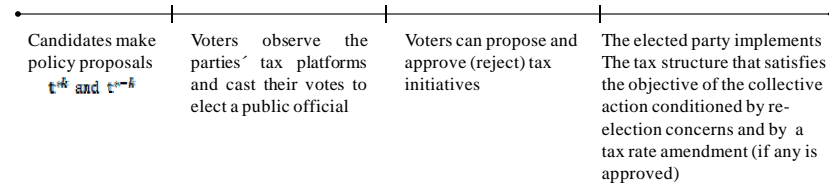
$\Gamma^{EC} = \{ \{C_S^h\}_{\forall h} \in S^v, \mathbf{t}^{*k}, \mathbf{t}^{*-k} \in S^c, \varphi^l \in \Theta, \{v^{hc}\}_{\forall h}, EV^c \}$ where the strategy set S^v contains the voters' decisions over consumption and parties $\{C_S^h\}_{h=1}^H$. The payoff for voters is the sequence of the preference relation $\{v^{hc}\}_{h=1}^H$ for $c=\{k, -k\}$, and the candidates' payoff is the expected proportion of the vote in the election EV for $c=\{k, -k\}$. Finally, the strategy policy space is $\mathbf{t}^k, \mathbf{t}^{-k} \in S^c$. The political equilibrium for this economy will be discussed below.

3. The Political Equilibrium and the Parties' Tax Platforms

In this section we propose a dynamic game to analyze the proposal and approval (rejection) of tax initiatives, and the effect of the voters' initiatives on the government's tax structure. In the first stage of the game, see figure 1, parties k and $-k$ propose \mathbf{t}^{*k} and \mathbf{t}^{*-k} . In the second stage, voters observe the parties' proposals and vote according to their preferences to elect a public official. The voters will cast a vote for the party that advances a tax system that is closest to the voter's own preferences over the tax system that collects \bar{R} . At the end of the second stage a representative, or bureaucrat, is chosen by majority and forms the government.

In the third stage, voters can propose tax initiatives. After observing the initiatives advanced by the coalitions of voters, the polity chooses by majority rule if an initiative is approved. We assume it is costless to propose tax initiatives. To guarantee a majoritarian equilibrium for the process of selecting tax initiatives, we assume that individuals are allowed to propose tax rate limits *only* over t_i (the tax over commodity i).

Figure 1
The Game of Voters' Initiatives



details on the conditions that guarantee a political equilibrium see Coughlin (1992) and Ponce (2006).

The approval (rejection) of a tax rate limit should be related with the voters' system of beliefs on the response of the government to a tax rate initiative.¹³ That is, from the point of view of rational voters, the approval (rejection) of a tax motion requires the comparison of the ex-ante tax structure versus the tax system that would arise as a result of a TRL. Therefore, in the fourth stage the elected candidate, say from party k , within the context of the electoral competition and conditioned to a tax rate limit (if any is approved) implements the tax structure $\bar{\mathbf{t}}^k = [\bar{t}_1^k, \dots, \bar{t}_i^k, \dots, \bar{t}_n^k]$. If a tax rate limit is not approved by majority in the third stage of the game then the elected party implements \mathbf{t}^{*k} . It follows that in the third stage of the game the median voter compares $\bar{\mathbf{t}}^k$ versus \mathbf{t}^{*k} .

In this paper we consider the case in which the tax structure is defined by two tax instruments t_i^k and t_j^k that raise the public revenue \bar{R} . Suppose a tax rate limitation is considered to be placed on the ballot with a proposal of fixing $t_i = \bar{t}_i < t_i^*$. Note that the tax structure can be defined as a one

dimensional function, since $\forall t_i, t_j \in \bar{R}: \bar{R}(t_i, t_j) = \sum_{i=1}^2 t_i^k \sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}^k, e^h)$

$\exists t_j : t_i \rightarrow t_j$ such that $\bar{R} = R(t_i, t_j(t_i)) = R(t_i)$. Moreover, the voters' preferences over tax policy are single peaked.¹⁴ By the result of the median voter theorem, for a proof see Black (1948) and Mueller (2003), a Condorcet winner will be chosen in the third stage of the game.¹⁵

In this case, the median voter selects the feasible tax amendment that induces the maximum difference between the utility level set from the (ex-post) constrained tax structure, and the utility derived from the tax system proposed by parties in the second stage of the game. In other words, the median voter selects $t_i = \bar{t}_i \leq t_i^*$ such that

$$\begin{aligned} \bar{t}_i \in \arg \max \left\{ \chi^{mv} = v^{mv}(t_i, t_j(\bar{t}_i)) - v^{mv}(t_i^*, t_j^*) \right\} \\ \text{s.t. } a) \quad \bar{t}_i, t_j(\bar{t}_i) \in \bar{R} = R = \sum_{i=1}^n t_i \left(\sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}, e^h) \right) \end{aligned} \quad (5)$$

¹³ That is, rational voters incorporates that a TRL imposes a constraint only in one of the tax instruments available to the government. Tax authorities might respond to a TRL by increasing the non-constrained tax instruments.

¹⁴ This follows by the assumption that the indirect utilities of voters over the constrained tax policy space are concave on taxes.

¹⁵ A Condorcet winner is a policy that beats any other alternative by a majority of the votes.

In equation (5) the median voter recognizes that the government will respond by changing the non-constrained tax instruments to satisfy the tax revenue objective \bar{R} . This is represented in the restriction (a) by the expected reaction function of the government $t_j = t_j(t_i)$. Clearly, a tax rate limit will be approved if

$$\frac{d\chi^{mv}}{dt_i} = \frac{\partial \chi^{mv}}{\partial t_j} \left\{ \frac{dt_j}{dt_i} \Big|_{d\bar{R}=0} - \frac{dt_j}{dt_i} \Big|_{d\bar{v}^{mv}=0} \right\} \leq 0 \quad (5')$$

Since $\frac{\partial \chi^{mv}}{\partial t_j} \leq 0$ then $\left\{ \frac{dt_j}{dt_i} \Big|_{d\bar{R}=0} - \frac{dt_j}{dt_i} \Big|_{d\bar{v}^{mv}=0} \right\} \geq 0$ must hold in the event a tax rate limit is approved by majority.¹⁶

In our economy, a proposal for a TRL is placed on the ballot by a coalition of voters who seek to obtain a tax structure that is closer to their most preferred feasible tax policy. A TRL will be approved if the marginal rate of tax substitution of the median voter $-dt_j/dt_i|_{d\bar{v}^{mv}=0}$ (defined as the rate at which changes in the tax structure leads to a constant utility for the voter) is at least as high as the parties' reaction functions $-dt_j/dt_i|_{d\bar{R}=0}$ (or changes in the non constrained tax instruments as a result of the approval of a TRL). The intuition behind of this result is simple: when condition (5') is satisfied with the inequality, the median voter changes the distribution of tax burdens such that the government keeps collecting the same amount of public revenue \bar{R} , but with the tax system resulting from the voters' initiatives the tax burden of the median voter is lower.

¹⁶ Condition (5') is derived as follows: Calculate $\frac{d\chi^{mv}}{dt_i} = \frac{\partial v^{mv}}{\partial t_i} + \frac{\partial v^{mv}}{\partial t_j} \frac{dt_j}{dt_i} \Big|_{d\bar{R}=0}$ then re-express this condition as $\frac{d\chi^{mv}}{dt_i} = \frac{\partial v^{mv}}{\partial t_j} \left\{ \frac{\partial v^{mv}}{\partial t_i} / \frac{\partial v^{mv}}{\partial t_j} + \frac{dt_j}{dt_i} \Big|_{d\bar{R}=0} \right\}$. From the definition of the indirect utility $v^{mv} = v^{mv}(t_i, t_j)$. By the envelope theorem it is simple to show that $\frac{dt_j}{dt_i} \Big|_{d\bar{v}^{mv}=0} = -\frac{\partial v^{mv}}{\partial t_i} / \frac{\partial v^{mv}}{\partial t_j}$. From the definition of the tax revenue function $\bar{R} = \bar{R}(t_i, t_j)$, and again by the envelope theorem, it is simple to show that $\frac{dt_j}{dt_i} \Big|_{d\bar{R}=0} = -\frac{\partial \bar{R}}{\partial t_i} / \frac{\partial \bar{R}}{\partial t_j} \leq 0$, where $\frac{\partial \bar{R}}{\partial t_i} = \sum_{h=1}^H x_i^h(\mathbf{t}, e^h) + \sum_{j=1}^n t_j \{ \sum_{h=1}^H \partial x_j^h(\mathbf{t}, e^h) / \partial t_i \} \geq 0$ is the marginal tax revenue due to a marginal change in t_i (note that at the political equilibrium, rational parties will set taxes that satisfy $\frac{\partial \bar{R}}{\partial t_i} \geq 0$). Use the expressions for $\frac{dt_j}{dt_i} \Big|_{d\bar{v}^{mv}=0}$ and $\frac{dt_j}{dt_i} \Big|_{d\bar{R}=0}$ derived above in condition (5').

Proposition 1 *The political equilibrium for this economy is constituted as follows: In the first stage of the game, parties propose a tax structure \mathbf{t}^* that maximizes the parties' expected proportion of the votes in the election. In the second stage, citizens choose a party in the election. In the third stage, voters observe the results of the election and consider to propose (or not) a tax initiative. After observing the set of tax initiatives (if any), the proposed tax initiatives are evaluated by the electorate through a set of pair wise comparisons. If a tax initiative beats any other alternative by a simple majority, then the winning tax initiative is implemented. In this case, in the fourth stage of the game, parties choose the rest of taxes that are not subject to a limitation. If there is no Condorcet winner in the set of tax initiatives, then the policy \mathbf{t}^* proposed by the party in the first stage of the game is implemented. Formally the political equilibrium is:*

I. In the first stage parties select \mathbf{t}^* .¹⁷

$$\mathbf{t}^* \in \arg \max \sum_{h=1}^H \varphi^h \Gamma^{hc} (v^{hc}(\mathbf{t}^c) - v^{h,-c}(\mathbf{t}^{-c}))$$

$$\text{s.t. } \bar{R} = \sum_{i=1}^n t_i^c \left(\sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}^k, e^h) \right) \forall c = \{k, -k\}$$

II. In the second stage of the game, voters vote for a party in the election such that $k \succ -k \in C_S^h \iff C_S^h = \{ \forall h \mid v^{hk}(\mathbf{t}^k) - v^{h-k}(\mathbf{t}^{-k}) \}$
And a representative is elected.

III. In the third stage, there exists voters who propose initiatives $\bar{t}_i^h \forall h$:

$$\bar{t}_i^h \in \arg \max \left\{ v^h(t_i, t_j(\bar{t}_i^h)) - v^h(t_i^*, t_j^*) \right\} \forall h$$

$$\text{s.t. } \forall \bar{t}_i, \exists t_j(\bar{t}_i): \bar{t}_i, t_j(\bar{t}_i) \in \bar{R} = \sum_{i=1}^n t_i \left(\sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}^k, e^h) \right)$$

IV. The median voter approves a tax rate limit $t_i \leq \bar{t}_i < t_i^*$ such that

$$\bar{t}_i \in \arg \max \left\{ v^{mv}(t_i, t_j(\bar{t}_i)) - v^{mv}(t_i^*, t_j^*) \right\}$$

$$\text{s.t. } i) \bar{t}_i, t_j(\bar{t}_i) \in \bar{R} = \sum_{i=1}^n t_i \left(\sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}, e^h) \right)$$

¹⁷ The notation means that if a party is denoted $c = k$, then the other party is denoted $-c = -k$.

V. In the fourth stage of the game, parties respond to a tax rate limit (if any is approved) by selecting $t_j(\bar{t}_i)$ such that $\bar{\mathbf{t}} = [\bar{t}_i, t_j(\bar{t}_i)]$ where¹⁸

$$t_j(\bar{t}_i) \in \arg \max \sum_{h=1}^H \phi^h F^{hc} (v^{hc}(\mathbf{t}^c) - v^{h-c}(\mathbf{t}^{h-c}))$$

$$\text{s.t. } \bar{\mathbf{t}} = [\bar{t}_i, t_j(\bar{t}_i)] \in \bar{R} = \sum_{i=1}^n t_i^c \left(\sum_{h=1}^H \phi^h x_i^h(\mathbf{t}^k, e^h) \right)$$

If a tax rate initiative is not approved by the median voter then parties implement \mathbf{t}^ .*

It should be clear that the strategies *I* to *V* are weakly dominant strategies, and hence there are no profitable deviations from the prescribed strategies in proposition 1. However, it is instructive to analyze here whether parties select tax policies that maximize the expected proportion of the vote in the second stage, or alternatively, select tax policies to avoid the approval of any tax rate initiative in the third stage of the game. To see that the tax strategies in *I* belong to the subgame perfect Nash equilibrium, consider an alternative strategy in which parties select a tax structure that seeks to maximize their chances of winning the election, and simultaneously minimize the possibility that a TRL is approved in the third stage of the game.

Our argument is that parties have no incentives to adopt the latter strategy. This conclusion follows by the simple recognition that adding constraints to the parties' tax design problem leads to lower (or at most to the same) plurality that the parties can achieve over a less constrained policy space (the strategy prescribed in *I*). Since the prospect of winning the election for each party depends on how tax policy platforms are translated into votes, then parties have no incentives to constraint their policy space, and therefore, their chances of winning the election. This doesn't mean that parties will propose any policy; parties maximize their chances of winning the election if parties propose a tax policy that weighs the voters' demands for tax structure according to the voters' marginal proportion of the expected vote (see a proof of this argument in proposition 2). Any deviation from this strategy hurts the parties' chances of winning the election in the second stage of the game.

We proceed to show this result and to characterize the tax structure resulting from the parties' electoral competition in the second stage of the game.

¹⁸ In this paper we ignore the information that the process of direct voting provides to parties about the true distribution of voter's preferences over tax policies. Ponce (2007) has provided a model along these lines in which the Perfect Bayesian equilibrium leads to an updating process over the systems of beliefs over the distribution of preferences.

Proposition 2 In the second stage of the game, parties converge in proposing a tax rate on commodity i that is given by

$$\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} = 1 + \frac{f^{hk}(0) \sum_{h=1}^H \varphi^h \alpha^h \beta_i^h e^h}{\zeta^k \sum_{h=1}^H \varphi^h \beta_i^h e^h} \quad \forall i \quad (6)$$

Proof

The first order conditions for the problem of tax policy design for any party k in the second stage are

$$\sum_{h=1}^H \varphi^h f^{hk} \frac{\partial v^{hk}}{\partial t_i^{*k}} - \zeta^k \left\{ \sum_{h=1}^H \varphi^h x_i^h + \sum_{j=1}^n t_j^{*k} \left(\sum_{h=1}^H \varphi^h \frac{\partial x_j^h}{\partial t_i^{*k}} \right) \right\} = 0 \quad \forall t_i^{*k}, \forall i \quad (7)$$

In condition (7) $\zeta^k < 0$ is the marginal proportion of the expected votes lost for party k , when the government needs to increase public revenue from taxation.¹⁹

From the optimal choice of consumption of any voter h it is satisfied that the vector of Marshallian demands $\forall x_i^h(\mathbf{t}^k, e^h) \in \arg \max_{\{x_i^h\}} \{ \text{Max } \mu^{hk}(\mathbf{x}^h) \text{ s.t. } \mathbf{q}^k \mathbf{x}^h \leq e^h \}$. Using the parametric form of the utility $\mu^{hk}(\mathbf{x}^h) = \prod_{i=1}^n (x_i^{\beta_i^h})$ with $\sum_{i=1}^n \beta_i^h = 1 \forall h$, it is satisfied

$$x_i^h(\mathbf{t}^k, e^h) = \frac{\beta_i^h e^h}{(1+t_i^k)} \quad \forall i, \forall h \quad (8)$$

The cross price effects from the Marshallian demands are zero, hence $\frac{\partial x_j^h}{\partial t_i^k} = 0 \quad \forall j \neq i$. For this reason condition (7) becomes

¹⁹ Recall that the parties' tax design problem is to choose $t_i^{*k}, \forall i$ to maximize

$$\delta^k(\mathbf{t}^k, \mathbf{t}^{-k}) = \sum_{\forall h} \varphi^h F^{hk}(v^{hk}(\mathbf{t}^k) - v^{h,-k}(\mathbf{t}^{-k})) + \zeta^k \left\{ \bar{R} - \sum_{i=1}^n t_i^k \sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}^k, e^h) \right\}$$

where ζ^k is the Langrange multiplier of the public revenue constraint of the government. The first order conditions in (7) are $\partial \delta^k(\mathbf{t}^k, \mathbf{t}^{-k}) / \partial t_i^{*k} = 0 \quad \forall i$.

$$\sum_{h=1}^H \varphi^h f^{hk} \frac{\partial v^{hk}}{\partial t_i^{*k}} - \zeta^k \left\{ \sum_{h=1}^H \varphi^h x_i^h + t_i^{*k} \left(\sum_{h=1}^H \varphi^h \frac{\partial x_i^h}{\partial t_i^{*k}} \right) \right\} = 0 \quad \forall t_i^{*k}, \forall i \quad (9)$$

It is well known that $\frac{\partial v^{hk}}{\partial t_i^k} = -\alpha^h x_i^h(\mathbf{t}^k, e^h) \leq 0$ where α^h is the marginal utility of income for individual h . Using the last condition and the expression (8) we obtain

$$-\sum_{h=1}^H \varphi^h f^{hk} \alpha^h \frac{\beta^h e^h}{(1+t_i^{*k})} - \zeta^k \left\{ \sum_{h=1}^H \varphi^h \beta^h e^h \frac{t_i^{*k}}{(1+t_i^{*k})^2} \left(\sum_{h=1}^H \varphi^h \beta^h e^h \right) \right\} = 0 \quad \forall t_i^{*k}, \forall i \quad (10)$$

Since parties share a common system of beliefs over voting behavior, that is since $f^{hk}(v^h(\mathbf{t}^k) - v^h(\mathbf{t}^{-k})) = f^{h,-k}(v^h(\mathbf{t}^{-k}) - v^h(\mathbf{t}^k))$ for $v^h(\mathbf{t}^k) = v^h(\mathbf{t}^{-k})$, and candidates are not otherwise differentiated, then parties converge in their tax platforms and select $\mathbf{t}^{*k} = \mathbf{t}^{*-k} = \mathbf{t}^*$ (for a formal proof of this result see Coughlin 1992). It follows, $v^h(\mathbf{t}^{*k}) = v^h(\mathbf{t}^{*-k})$ implies $f^{hk}(0) = f^{h,-k}(0) = c \quad \forall h$ where $c > 0$ is a non-negative constant. Therefore, the optimality conditions for $\forall t_i^{*k}$ are characterized by

$$-\frac{f^{hk}(0)}{(1+t_i^{*k})} \sum_{h=1}^H \varphi^h \alpha^h \beta^h e^h - \zeta^k \left\{ \sum_{h=1}^H \varphi^h \beta^h e^h \frac{t_i^{*k}}{(1+t_i^{*k})^2} \left(\sum_{h=1}^H \varphi^h \beta^h e^h \right) \right\} = 0 \quad \forall t_i^{*k}, \forall i \quad (11)$$

Reducing terms we obtain

$$\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} = 1 + \frac{f^{hk}(0) \sum_{h=1}^H \varphi^h \alpha^h \beta^h e^h}{\zeta^k \sum_{h=1}^H \varphi^h \beta^h e^h} \quad (12) \quad \blacksquare$$

In condition (6), the design of taxes is explained by political incentives to redistribute tax burdens, and the political costs from the deadweight costs of taxation.²⁰ Proposition 2 provides a characterization of the tax rate for

²⁰ Taxes distort relative prices of commodities which, in turn, distort the consumer's choices. These deadweight costs of taxation are given by the changes in consumption of individuals tracked by the compensated (Hicksian) demands that can be calculated by the Slutsky equation. In the first order conditions of (7), the political costs from the

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commodity i , $\left\{ t_i^{*k} / 1 + t_i^{*k} \right\}$, that depends on the pattern of consumption over commodities, and the distribution of the marginal utility of income across voters.

To see this, re-express (6) as $\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} = 1 + \frac{f^{hk}(0) \sum_{h=1}^H \varphi^h \alpha^h s_i^h}{\xi^k}$ where $s_i^h = x_i^h / X_i$ and $X_i = \sum_{h=1}^H x_i^h(\mathbf{t}^k, e^h)$. Thus, s_i^h is the share of consumption of individual h in good i in relation to the market.²¹ At the political equilibrium the tax rate on commodity i will be lower the higher is the weighted average share of consumption of good i en relation to the market $\sum_{h=1}^H \varphi^h \alpha^h s_i^h$, the higher is the

marginal probability that voters vote for party k in the election $f^{hk}(0)$, and the higher is the marginal proportion of the expected votes lost when the party relaxes (increases) the public budget constraint of the government \bar{R} (the more negative is $\xi^k < 0$).

As mentioned before, parties have incentives to redistribute tax burdens to minimize political opposition for tax structures in the election. To see this, consider a politically optimal two commodity tax structure $\mathbf{t}^{*c} = [t_i^{*c}, t_j^{*c}] \forall c = \{k, -k\}$. Each tax rate is characterized by condition (6), then parties might choose $t_i^{*k} > t_j^{*k}$ in their tax structure because the distribution of preferences and incomes of voters is such that the weighted average share of consumption on commodity i is lower relative than that of commodity j . Formally,

deadweight costs of taxation can be traced by the term $\xi^k \left\{ \sum_{j=1}^n t_j^{*k} \left(\sum_{h=1}^H \varphi^h \partial x_j^h / \partial t_i^{*k} \right) \right\}$,

where ξ^k is the marginal proportion of the expected votes lost when the party relaxes the public budget constraint \bar{R} .

²¹ To see this, note that dividing the numerator and the denominator of (6) by $(1+t_i^k)$, we can use $x_i^h(\mathbf{t}^k, e^h) = \beta_i^h e^h / (1+t_i^k)$, and re-express (6) as $\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} = 1 + \frac{f^{hk}(0) \sum_{h=1}^H \varphi^h \alpha^h x_i^h}{\xi^k \sum_{h=1}^H \varphi^h x_i^h}$.

Finally, use the definition of $s_i^h = x_i^h / X_i$.

$$\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} - \left\{ \frac{t_j^{*k}}{1+t_j^{*k}} \right\} = \left\{ \frac{f^{hk}(0)}{\xi^k} \right\} \left\{ \sum_{h=1}^H \varphi^h \alpha^h s_i^h - \sum_{h=1}^H \varphi^h \alpha^h s_j^h \right\} > 0 \quad ^{22}$$

3.1 Direct Voting over Taxes and the Option of a Tax Rate Limit

In this section we analyze the proposal and approval of tax initiatives. As mentioned before, after observing the tax platforms of parties in the third stage of the game, voters might propose tax initiatives. If a tax rate limitation is approved by majority, then the tax rate initiative over commodity i , say \bar{t}_i , reflects the ideal deviation of the median voter over the tax structure proposed by parties $\mathbf{t}^{*c} = [t_i^{*c}, t_j^{*c}] \forall c = \{k, -k\}$ such that $\bar{t}_i \in \arg \max \{v^{mv}(t_i, t_j(\bar{t}_i)) - v^{mv}(t_i^*, t_j^*)\}$ s.t. $i) \bar{t}_i, t_j(\bar{t}_i) \in \bar{R}$, where $v^{mv}(t_i, t_j(\bar{t}_i))$ are the preferences of the median voter over taxes, and $t_j(\bar{t}_i)$ is the parties' response function to a tax rate limitation in the fourth stage of the game. Finally, because $v^{mv}(t_i^*, t_j^*)$ is given in the third stage of the game then \bar{t}_i is the ideal tax over commodity i of the median voter since \bar{t}_i also satisfies $\bar{t}_i \in \arg \max \{v^{mv}(t_i, t_j(\bar{t}_i)) \text{ s.t. } \bar{t}_i, t_j(\bar{t}_i) \in \bar{R}\}$.

It is relevant to point out that in this paper the decision over which type of tax instrument to limit is exogenous. This assumption is justified by simplicity of the analysis and because our interest in this paper is to explain: First, why certain tax initiatives are approved (rejected) by majority. Second, what is the role of the aggregation of preferences of the electoral competition and the majority rule in determining the tax policies chosen by parties and the initiatives that the median voter will support (reject). An extension of the type of tax instruments would complicate the analysis although it is likely to provide more insights on how preferences are aggregated by the two political institutions of interest of this paper. Future research might address these issues.

Now we are ready to state Proposition 3 which characterizes the ideal tax system of the median voter.

²² To see this, note that the weighted average share of consumption on commodity i is lower relative than the share of consumption on commodity j implies $\sum_{h=1}^H \varphi^h \alpha^h s_i^h - \sum_{h=1}^H \varphi^h \alpha^h s_j^h < 0$, moreover $\xi^k < 0$ which implies $\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} - \left\{ \frac{t_j^{*k}}{1+t_j^{*k}} \right\} > 0$.

Proposition 3 *The ideal tax structure of the median voter*

$\mathbf{t}^{*mv} = [t_i^{*mv}, t_j^{*mv}]$ is given by

$$\left\{ \frac{t_i^{mv}}{1+t_i^{mv}} \right\} = 1 + \frac{\alpha^{mv} \beta_i^{mv} e^{mv}}{\xi^{mv} \sum_{h=1}^H \varphi^h \beta_i^h e^h} \quad \forall t_i^{mv}, \forall i \quad (13)$$

Proof

The ideal tax structure of the median voter $\mathbf{t}^{*mv} = [t_i^{*mv}, t_j^{*mv}]$ can be found by obtaining the first order conditions of the following maximization problem

$$\underset{\{t_i, t_j\}}{\text{Max}} \delta^{mv} = v^{mv}(t_i, t_j, e^{mv}) + \xi^{mv} \left\{ \bar{R} - \sum_{i=1}^n t_i \left(\sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}, e^h) \right) \right\} \quad (14)$$

Where δ^{mv} a constrained indirect utility of the median voter, and ξ^{mv} is the corresponding Lagrange multiplier of the public revenue constraint. The first order conditions of (14) are

$$\frac{\partial v^{mv}}{\partial t_i^{mv}} - \xi^{mv} \left\{ \sum_{h=1}^H \varphi^h x_i^h + \sum_{j=1}^n t_j \left(\sum_{h=1}^H \varphi^h \frac{\partial x_j^h}{\partial t_i^{mv}} \right) \right\} = 0 \quad \forall t_i^{mv}, \forall i \quad (15)$$

Following similar steps as those shown in proposition 2, condition (15) is given by

$$-\frac{\alpha^{mv} \beta_i^{mv} e^{mv}}{(1+t_i^{mv})} - \xi^{mv} \left\{ \sum_{h=1}^H \frac{\varphi^h \beta_i^h e^h}{(1+t_i^{mv})} - \frac{t_i^{mv}}{(1+t_i^{mv})^2} \left(\sum_{h=1}^H \varphi^h \beta_i^h e^h \right) \right\} = 0 \quad \forall t_i^{mv}, \forall i \quad (16)$$

Reducing terms we obtain

$$\left\{ \frac{t_i^{mv}}{1+t_i^{mv}} \right\} = 1 + \frac{\alpha^{mv} \beta_i^{mv} e^{mv}}{\xi^{mv} \sum_{h=1}^H \varphi^h \beta_i^h e^h} \quad \blacksquare$$

Proposition 4 *A tax rate limit is approved by majority in the third stage of the game if*

$$\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} - \left\{ \frac{t_i^{mv}}{1+t_i^{mv}} \right\} = \left\{ \sum_{h=1}^H \varphi^h \beta_i^h e^h \right\}^{-1} \left\{ \frac{f^{hk}(0) \sum_{h=1}^H \varphi^h \alpha^h \beta_i^h e^h}{\xi^k} - \frac{\alpha^{mv} \beta_i^{mv} e^{mv}}{\xi^{mv}} \right\} > 0 \quad (17)$$

Proof

A tax rate will be approved by a majority in the third stage of the game if

$$\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} - \left\{ \frac{t_i^{mv}}{1+t_i^{mv}} \right\} > 0. \text{ By propositions (2) and (3), the former condition is}$$

satisfied when the following holds

$$\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} - \left\{ \frac{t_i^{mv}}{1+t_i^{mv}} \right\} = \left\{ \sum_{h=1}^H \varphi^h \beta_i^h e^h \right\}^{-1} \left\{ \frac{f^{hk}(0) \sum_{h=1}^H \varphi^h \alpha^h \beta_i^h e^h}{\xi^k} - \frac{\alpha^{mv} \beta_i^{mv} e^{mv}}{\xi^{mv}} \right\} > 0$$

■

Proposition 4 says that there is no reason to think that the tax policies emerging from the electoral competition in a representative democracy with a probabilistic voting model will be equivalent to the tax policies that would arise in the political equilibrium for an economy that uses direct voting. While the tax structure in the electoral equilibrium of a representative democracy selects a tax system that represents the whole distribution of preferences and income of voters, the equilibrium of a direct voting economy aggregates the preferences and income of only the decisive (the median) voter.

The main point of proposition 4 is to show the different dimensions that may explain why the electoral incentives of parties in the second stage of the game might lead to a tax structure that is different to the ideal tax system of the median voter. In other words, there are parametric values on the distribution of preferences and income $\sum_{h=1}^H \varphi^h \alpha^h \beta_i^h e^h$, the marginal

probability that voters vote for party k , $f^{hk}(0)$, the expected proportion of votes when the party relaxes the public budget constraint of the government, ξ^k , the preferences and income of the median voter, $\alpha^{mv}, \beta_i^{mv}, e^{mv}$, as well as the marginal disutility for the median voter when the government relaxes the public budget constraint of the government, ξ^{mv} , that might guarantee the approval (rejection) of a tax rate limit.

We should expect that a tax initiative would be approved by majority when the distribution of ideal taxes over commodity i are asymmetric. In

particular, when the distribution of ideal tax policies are skewed to the right condition (17) is likely to be satisfied because the tax on commodity i that maximizes the parties' expected proportion of the votes could be higher than that desired by the median voter. The model of Downs (1957) of electoral competition under perfect information predicts that if the distribution of ideal taxes of citizens over the commodity i is symmetric then a tax rate initiative would not be approved (we say more about this below). In proposition 5 we identify conditions, related with the role of imperfect information of parties over the distribution of voter's preferences for tax policy, in which a tax rate initiative can be approved even if the actual distribution of the ideal tax policies is symmetric.

Proposition 5 *Assume the actual distribution over ideal tax structures is symmetric. Assume further, $\xi^{mv} = \xi^c \quad \forall c = \{k, -k\}$. In this case, a tax rate limit \bar{t}_i with $\bar{t}_i = t_i^{mv} < t_i^{*c} \quad \forall c = \{k, -k\}$ is approved by majority in the third stage of the game.*

Proof

By condition (17) in proposition 4, the condition that guarantees the approval of a tax rate initiative is satisfied when

$$\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} - \left\{ \frac{t_i^{mv}}{1+t_i^{mv}} \right\} = \left\{ \sum_{h=1}^H \varphi^h \beta_i^h e^h \right\}^{-1} \left\{ \frac{f^{hk}(0) \sum_{h=1}^H \varphi^h \alpha^h \beta_i^h e^h}{\xi^k} - \frac{\alpha^{mv} \beta_i^{mv} e^{mv}}{\xi^{mv}} \right\} > 0$$

By assumption the distribution of the ideal tax structures is symmetric. Therefore, the ideal tax policy of the median voter t_i^{*mv} is equivalent to the ideal tax policy of the average voter $t_i^{*average}$, that is, $t_i^{*mv} = t_i^{*average}$. The ideal tax on commodity i for the average voter solves the next maximization problem

$$\underset{\{t_i, t_j\}}{\text{Max}} \quad \mathcal{S}^{average} = \sum_{h=1}^H \varphi^h v^h(t_i, t_j, e^h) + \xi^{average} \left\{ \bar{R} - \sum_{i=1}^n t_i \left(\sum_{h=1}^H \varphi^h x_i^h(\mathbf{t}, e^h) \right) \right\} \quad (18)$$

Following the steps of proposition (3) and (4), it is simple to show that the ideal tax on commodity i for the average voter is

$$\left\{ \frac{t_i^{*average}}{1+t_i^{*average}} \right\} = 1 + \frac{\sum_{h=1}^H \varphi^h \alpha^h \beta_i^h e^h}{\xi^{average} \sum_{h=1}^H \varphi^h \beta_i^h e^h} \quad \forall t_i^{*average}, \forall i \quad (19)$$

Therefore, $t_i^{*mv} = t_i^{*average}$ implies

$$\frac{\sum_{h=1}^H \varphi^h \alpha^h \beta_i^h e^h}{\xi^{average} \sum_{h=1}^H \varphi^h \beta_i^h e^h} = \frac{\alpha^{mv} \beta_i^{mv} e^{mv}}{\xi^{mv} \sum_{h=1}^H \varphi^h \beta_i^h e^h} \quad (20)$$

By assumption $\xi^{mv} = \xi^c \quad \forall c = \{k, -k\}$, use condition (20) to show that (17) is

$$\left\{ \frac{t_i^{*k}}{1+t_i^{*k}} \right\} - \left\{ \frac{t_i^{mv}}{1+t_i^{mv}} \right\} = \frac{\sum_{h=1}^H \varphi^h \alpha^h \beta_i^h e^h}{\xi^k \sum_{h=1}^H \varphi^h \beta_i^h e^h} \{f^{hk}(0) - 1\} > 0 \quad (21)$$

Condition (18) is satisfied because $\sum_{h=1}^H \varphi^h \alpha^h \beta_i^h e^h / \xi^k \sum_{h=1}^H \varphi^h \beta_i^h e^h < 0$, and $\{f^{hk}(0) - 1\} < 0$ since $f^{hk}(0) \in (0,1)$. This proves that an initiative to limit the tax rate on commodity i will be approved by a majority in the third stage of the game. ■

Proposition 5 characterizes the role of imperfect information in models of electoral competition in explaining why a tax rate initiative can be approved by majority. For an economy with direct and representative voting under perfect information on the distribution of voter's preferences, it is satisfied that a tax rate initiative can never be approved by majority. In this case, the electoral competition in the second stage produces the ideal tax policy of the median voter.²³ Therefore, from the perspective of the median voter, the process of tax initiatives in the third stage of the game (or equivalently the direct voting over tax systems) can never improve upon the tax structure produced by the electoral competition in the second stage of the game. As a result, a tax rate initiative will never be approved by the median voter.

²³ For an economy with perfect information and no abstentions to the vote, the electoral competition produces the median voter outcome for symmetric and asymmetric distributions of voters' preferences over tax policies, see Mueller (2003).

Our model identifies conditions in which a tax rate limit is approved by majority even if the actual distribution of preferences over taxes on commodity i is symmetric. This result follows because the expected proportion of votes lost because of taxes in the electoral game under uncertainty is strictly lower than the proportion of votes lost in the electoral competition with perfect information. As a result, the probabilistic electoral equilibrium produces a tax rate on commodity i that is higher than that desired by the median voter. This, in turn, leads to the approval of a tax rate limitation in the third stage of the game in models of political competition under uncertainty.

Another implication of our model is that imposing a tax rate initiative in the government is welfare increasing for the median voter relative the strategy of moving politicians out of office.²⁴ This result is explained as follows: in our economy, we have identified a set of parameters that can explain why the electoral competition might induce both parties to propose a policy that does not maximize the well being of the median voter. (recall that the parties' tax policies converge, see proposition 2). As a result, moving politicians out of office does not improve the utility of the median voter. The decisive voter is better off by imposing a tax rate limit that is welfare improving. This result might provide a rationale of why tax and expenditure limits are so prevalent in the U.S.²⁵

4. Discussion

The interest of this paper is to study how the interaction of two political institutions, the majority rule and the electoral competition, aggregates the preferences of voters, and how the process of preference aggregation affects the choices made by politicians over tax policy. By so doing we have used a simplified model that ignores, among other things, the choice of the instruments that can be limited by voters, and the communication of voters of their preferences to policy makers.

On the former issue, a model that makes endogenous the choice of the tax instrument to be limited might provide further insights on the hypothesis that tax rate initiatives seek to change the distribution of tax prices while keeping the same level of spending by the government. An analysis along this line,

²⁴ I thank an anonymous referee for pointing out this result.

²⁵ However, there are models that can rationalize the divergence of the parties' policy proposals. In this case, it would be interesting to study the conditions in which the median voters is better off by approving a tax rate initiative relative the strategy of voting for a change in the administration of the government.

but in the context of a federation, might also mean that the voters of a jurisdiction might want to export the tax burden of the services of their government to other jurisdictions or might seek to change the existing arrangement of fiscal federalism (that is, voters might want to change the distribution of tax prices that citizens pay to the federal, state, and local government).

On the latter issue, there is a literature that seeks to study the role of communication among economic agents see for instance the work on signaling by Banks and Sobel (1987) and on strategic information transmission by Austen-Smith (1990), and Kahn and Tsolulouhas (1999). However, there is little research on the impact of preference communication of voters and the approval (rejection) of tax initiatives. A paper that addresses one dimension of this issue is Ponce (2007) who studies the role of preference communication in explaining the rationale for tax initiatives and the effect of tax initiatives on the government's behavior. In that paper I develop a model in which parties have imperfect information on the distribution of preferences over taxation, and voters communicate their preferences by voting over different choices of taxes. Parties observe how voters vote for different tax structures and update their system of beliefs on the distribution of voter's preferences.

In the perfect Bayesian equilibrium of that paper, a tax rate initiative not only constrains the choices over policy of the government but also modifies the objective to be maximized by the government. As mentioned before, after observing a tax rate limit, parties update their beliefs on how tax policies translate into votes. This in turn affects the way parties aggregate the voters' preferences for tax policies in a way in which the resulting tax policy is more likely to receive the support of a stable majority. Moreover, the change in the way parties aggregates the voters' preferences tends to accommodate the approval of the tax initiative. Hence, the model of Ponce (2007) suggests that governments with electoral constraints will not go against the sentiment expressed by voters through tax initiatives. This result explains the observed fact that tax initiatives are long lived (in general, the probability that the government reverts the tax initiative approved by voters is small).²⁶

Finally it is important to assess the empirical relevance of the model. Even though the objective of the paper is to study the approval (rejection) of the voter's tax initiatives in the U.S., our model can be applied to a broad set of economies. As mentioned before, the model studies the impact on tax design

²⁶ For evidence that tax rate initiatives are long lived see the paper by the Advisory Commission of Intergovernmental Relations U.S. (1995).

of the interaction between the direct voting for policies versus voting for representatives who design policies in behalf of voters. Therefore, our model is relevant to explain the design of fiscal policy in those countries in which tax and spending policies reflect the interaction between the executive and the legislative powers (that is to say, most of the economies in the world with majoritarian and proportional representation electoral systems in which the electoral competition influences economic policy).²⁷ This model could also be useful to understand the effect of constitutional changes in the type of public policies that the government might adapt. Therefore, our analysis provides insights to those countries that are planning to make changes in their political institutions.

Conclusions

In this paper we analyze the influence of the interaction between direct versus representative voting in determining tax policy. In a model of a representative democracy, we incorporate into the analysis of tax design the constitutional provision that allows voters to propose tax initiatives. In particular, we focus our attention on initiatives known as tax rate limits. The objective of the paper is to study why tax rate limits are placed on the ballot, and what explains the approval (rejection) of these initiatives.

In this paper we provide a different rationale for the approval (rejection) of tax rate initiatives. Our model is different to the existing literature that focuses on how tax initiatives seek to control the size of government. In our model, the heterogeneity of voters' preferences and income leads to conflicts among citizens about the distribution of tax burdens. In our economy, a proposal for a TRL is placed on the ballot by a coalition of voters who seek to obtain a tax structure that is closer to their most preferred feasible policy (a coalition of voters wants to reduce their tax burden while they seek to maintain the tax revenue collections).

We argue that a tax rate limit is likely to arise as a result of two institutions with different mechanisms to aggregate the voters' preferences for tax policy. This might explain why a median voter might gain by approving a tax rate limit. It might also explain why tax initiatives are so prevalent across state and local governments in the U.S. In this paper we show that a TRL will be approved if the marginal rate of tax substitution of the decisive voter

²⁷ This is so, because in these economies, fiscal policy reflects a bargaining process between the executive power, which responds to the electoral incentives of a general election (the first political institution of interest in this paper), and the legislative power which commonly uses the majority rule (the other political institution of interest) as a mechanism to achieve social choices.

(defined as the rate at which changes in the tax structure leads to a constant utility for the voter) is at least as high as the parties' reaction functions (or changes in the non constrained tax instruments as a result of the approval of a TRL).

Finally our paper distinguishes the role of perfect and imperfect information on the distribution of voters' preferences for tax systems in approving a tax initiative. If parties design policies to win the election and have perfect information on the distribution of voters' preferences for tax policy, then any tax rate initiative will be rejected by the median voter. In this paper we identify conditions in which the Downsian electoral competition under imperfect information on the distribution of voters' preferences might lead to the approval of a tax rate initiative.

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