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European Journal of Political Economy
Vol. 19 (2003) 205–226
European Journal of POLITICAL ECONOMY
www.elsevier.com/locate/econbase

Redistribution and deadweight cost: the role of political competition

Toke Skovsgaard Aidt*

Faculty of Economics and Politics and Jesus College, University of Cambridge, Austin Robinson Building, Sidgwick Avenue, Cambridge CB3 9DD, UK

Received 8 January 2001; received in revised form 26 May 2002; accepted 14 October 2002

Abstract

This paper studies the relationship between political competition and the size of distributive programs with different deadweight cost functions. This is done within an extended version of Becker's [Q. J. Econ. 98 (1983)] pressure group model that allows for endogenous political participation. It is shown that distributive programs that employ inefficient means of subsidization are relatively unlikely to be contested by both taxpayers and subsidy recipients, while the opposite is true for distributive programs that employ inefficient means of taxation. In addition, it is shown that the total social cost (TSC)—including rent seeking expenditures—tends to be self-limiting in the absence of competition.

JEL classification: H21; D72; D78
Keywords: Redistribution; Deadweight costs; Pressure groups

1. Introduction

Can political markets be trusted to promote efficient policy choices? This important question has long been debated intensively among economists and political scientists. Scholars within the tradition of the Virginia school of political economy argue that political markets tend to produce inefficient policy outcomes (see, e.g., Buchanan and Wagner, 1977; Olson, 1982) and that valuable resources are employed in wasteful rent seeking activities (Tullock, 1967). In opposition to this, scholars within the tradition of the

* Tel.: +44-1223-335231; fax: +44-1223-335375.
E-mail address: tsa23@econ.cam.ac.uk (T.S. Aidt).

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doi:10.1016/S0176-2680(02)00167-2

Chicago school of political economy argue that political markets tend to produce efficient policy outcomes (see, e.g., Becker, 1983, 1985; Wittman, 1989, 1995).[1] Becker (1985), for example, argues that

> . . . despite the complaints of economists and others about the social cost of various regulations and programs, policies with high social cost would not survive competition among pressure groups unless those benefiting were *exceedingly* powerful politically. More commonly, surviving policies have low social cost *relative* to the millions of proposals that fail to gain political support. (Becker, 1985, p. 338)

This optimistic view of what competition between pressure groups can achieve is based on two well-known propositions proved by Becker (1983) and elaborated on by Becker (1985). The first of Becker's two propositions (Proposition 2) shows how an exogenous change in the deadweight cost function associated either with the policy instrument used to collect taxes or with the policy instrument used to distribute subsidies affects the scale of redistribution implied by political equilibrium. In particular, higher marginal deadweight costs reduce the equilibrium scale of redistribution. This is because those groups benefitting from redistribution have relatively little incentive to make costly political investments in support of redistribution when it is carried out by highly distorting policy instruments while to-be taxpayers on the contrary have a relatively strong incentive to make such investments to oppose. In short,

> politically successful policies are 'cheap' relative to the millions of policies that are too costly to muster enough political support where 'cheap' and 'expensive' refer to the marginal deadweight costs, not to the size of taxes or subsidies (Becker, 1983, p. 381).

The second of Becker's propositions (Proposition 4) compares the utility of taxpayers and subsidy recipients under different distributive programs that employ more or less distorting policy instruments (have different deadweight cost functions) taking into account that the equilibrium scale of redistribution under each program is different. Interestingly, both groups prefer distributive programs that employ a less distorting instrument to collect taxes to programs that employ a more distorting tax instrument. As Becker (1983, p. 386) puts it, "competition among pressure groups favors efficient methods of taxation." With regard to distributive programs employing more or less distorting policy instruments to distribute subsidies, the preference ordering of taxpayers is ambiguous, but subsidy recipients always prefer programs that employ a less distorting policy instrument to hand out subsidies to them.

These are important results, and for that reason alone, it is important to understand their scope and limitations. It is clear that competition between pressure groups is of paramount importance for the results, and that the two propositions are based on the presumption that both supporters *and* opponents actively participate in the political process. In other words, political participation is assumed to be complete and competition is assumed to be intense.

[1] The literature on the subject is discussed extensively by Persson and Tabellini (2000).

This is in contrast to what is observed in many situations in practise where political participation (particularly by taxpayers) is often absent and actual competition, as a consequence, is weak.

The purpose of this paper is to analyze—within the structure of Becker's pressure group model—the role of actual and potential political competition in relation to the two "efficiency" propositions. To this end, Becker's (1983) model is extended to allow for endogenous political participation choices, as in Aidt (2002). Within this (extended) structure, political competition takes place in two stages: first, two groups (called taxpayers and subsidy recipients) simultaneously decide if they want to become politically active; second, the politically active groups make costly political investments to seek influence on the scale of redistribution. It is demonstrated that political participation is sometimes incomplete because certain groups opt out of the political process for strategic reasons (Proposition 2). This implies that the premise behind Becker's two propositions—that both taxpayers and subsidy recipients are politically active no matter what methods are used to distribute between them—need not be satisfied. More importantly, it is also demonstrated that the participation decisions are systematically related to the particular methods used to collect taxes and distribute subsidies, as captured by differences in average deadweight costs (Proposition 3). It is, therefore, not a foregone conclusion that *potential* competition is sufficient to contain the size of distributive programs using highly distorting policy instruments (as suggested by Becker's Proposition 2) nor that the political process favors efficient means of taxation (as suggested by Becker's Proposition 4). On the one hand, the more distorting the policy instrument employed to distribute subsidies is, the less likely it is that the policy will be contested; on the other hand, the more distorting the policy instrument employed to collect taxes is, the more likely it is that the policy will be contested. The implication for the equilibrium level of redistribution depends on whether political competition is weak because taxpayers or subsidy recipients decide not be active, and a range of possibilities arises. For example, active opposition from taxpayers to programs employing highly distorting policy instruments to distribute subsidies is often missing, and, when it is, such programs are allowed with the active support of subsidy recipients to grow large. More surprisingly, in some cases, a program that induces taxpayers to be political inactive (because it makes use of a distorting subsidy instrument) is preferred by both groups to alternative programs using less distorting subsidy instruments, but which encourage taxpayers to become politically active.

These results concern the relationship between the average and marginal deadweight costs generated by different methods of distributing income between groups and political competition. A related question concerns the relationship between political competition and the total social cost (TSC) of redistribution, counting both total deadweight *and* aggregate rent seeking costs. For a given set of deadweight cost functions, I show that the *total* deadweight cost is maximum in the absence of active opposition to redistribution from taxpayers and minimum in the absence of active support from subsidy recipients, basically reflecting the scale of equilibrium redistribution. Therefore, political competition reduces the total deadweight cost only when it arises from mobilization of taxpayers. More interestingly perhaps, the total social cost—including rent seeking expenditures—is significantly higher when political participation is complete and competition is intense than when it is not. This demonstrates that the total social cost of redistribution tends to be self-limiting in the absence of political competition, and that political competition is not necessary to contain it.

This paper adds to a growing literature that casts doubt on the universal capacity of political markets to promote efficient policy choices. Alesina and Drazen (1991) show how competition between social groups can lead to delay in the adaptation of efficient policies. Fernandez and Rodrik (1991) show how individual-specific uncertainty can lead a majority to block Pareto-efficient reforms. Coate and Morris (1995) demonstrate how inefficient methods of redistribution can arise in situations in which voters have imperfect information about both the effects of policy and the predisposition of politicians. Besley and Coate (1998) study the efficiency of policy choice in a representative democracy and show that policies that are efficient according to standard economic criteria are not necessarily adopted in political equilibrium. Baba (1997) analyses the role of differential costs of informing voters about the efficiency cost associated with various economic policies. He shows how inefficient distributive policies can arise in political equilibrium if the cost of informing voters is low for efficient and high for inefficient economic policies. His model contains Becker's "efficiency" propositions in the special case in which voters are completely ignorant about the relative cost of different policies.

The paper is organized as follows. In Section 2, I present the basic model, which is an extended version of the pressure group model proposed by Becker (1983). The extension allows for endogenous participation choices. In Section 3, I reproduce Becker's two propositions about efficient policy choices (Becker, 1983, Propositions 2 and 4). In Section 4, I analyze the relationship between average deadweight cost and the degree of political competition as measured by the number of active pressure groups. In Section 5, I focus on a given set of tax and subsidy instruments (with fixed deadweight cost functions), and study the role played by political competition in containing the total social cost that is generated in political equilibrium. In Section 6, I provide some concluding remarks, stressing the limitations of the results.

2. The model

Consider a society with two homogeneous groups of citizens, called taxpayers and subsidy recipients, and a government.[2] The government can distribute income from taxpayers to subsidy recipients by adopting *distributive programs* from a set of feasible programs. A distributive program is associated with a particular method of taxation and a particular method of subsidization and generates deadweight costs with respect to both tax collection (the deadweight cost of taxes) and subsidy distribution (the deadweight cost of subsidies) insofar as resource allocation is distorted by the methods of taxation and subsidization employed. Tax collection creates deadweight costs because of the distorting effects on taxpayers' economic choices regarding, for example, labor supply and investments, while subsidy distribution creates deadweight costs because of the distorting effects on subsidy recipients' economic choices. Following Becker (1983), the deadweight costs

[2] The formulation of the basic model follows Becker (1983) closely. Becker (1985) offers an alternative, but equivalent, formulation. See also Kristov et al. (1992) and Becker and Mulligan (1998).

are modelled as follows. The *utility cost* to taxpayers generated by the tax payment they make is denoted T, while the *utility gain* to subsidy recipients generated by the same program is denoted S.[3] For a given utility loss to taxpayers (T), let $F(T)$ measure the amount of tax revenue raised by the program, and let $G(S)$ measure the financial cost of providing the utility gain S to subsidy recipients. The two functions incorporate, in reduced form, the deadweight costs arising from the distorting effects of collecting taxes from taxpayers and distributing subsidies to subsidy recipients, respectively. In the following, I shall refer to F and G as the *deadweight cost functions*. The deadweight cost functions have the following properties: $F(T) \leq T$ and $G(S) \geq S$ and $0 < F' \leq 1$ and $G' \geq 1$. The amount distributed as subsidies is linked to the amount raised by taxes by the budget constraint

$$G(S) = t = F(T) \tag{1}$$

where t is the (monetary) transfer between the two groups. The budget constraint states that the amount paid in taxes and the amount received as subsidies must be equal.

The size (t) of a particular distributive program depends on the political activities of the two groups. Taxpayers and subsidy recipients can, if they so desire, organize pressure groups, and if they do, they can seek influence on the size of a given redistribution program by making *political investments*, denoted $y_j \geq 0$, where subscript $j = S,T$ refers to the two groups. The political investments represent a host of different activities ranging from provision of policy-relevant information and election campaign finance to civic disobedience and taxpayer revolts.

The political investments are translated into a policy outcome, t, via an influence function, $t = I(y_S, y_T)$.[4] The influence function itself is independent of the particular method of taxation and subsidization (as captured by different deadweight cost functions) associated with the underlying program, i.e., the size of the transfer (t) would be the same if political investments happened to be the same under two different programs with different deadweight cost functions. It is important to note therefore that the size of different programs are (potentially) different, not because the influence function is assumed to be different, but because programs with different deadweight cost functions affect the behavior of groups differently and so induce differential political choices.

To facilitate the analysis, I assume that the influence function is quadratic:

$$t = I(y_S, y_T) = \bar{t} - 2y_T + \frac{y_T^2}{2} + 2y_S - \frac{y_S^2}{2} + f y_S y_T. \tag{2}$$

The use of a quadratic influence function is restrictive, but enables me to obtain closed form solutions. The influence function has two properties that should be noted. First, in the

[3] These can be thought of as the change in full income resulting from the introduction of the program.

[4] The specification of the influence function differs from other contest success functions used in the literature. In particular, the "rent" is a transfer between the two groups and so the loser cannot avoid financing it by opting out of the contest. This is similar to the *transfer* contest studied by Hillman and Riley (1989), but is in contrast to many other studies that assume that the cost of financing a given rent is borne by some exogenous third party (Nitzan (1994) provides a survey). The influence function approach, moreover, differs from Hillman and Riley's transfer contest in a number of ways. Most importantly, the size of the transfer is endogenous and determined by the political investments made by the active contestants, also when competition is absent.

economically relevant range, the government increases (at a decreasing rate) the size of the transfer ($\partial I/\partial y_S > 0$ and $\partial^2 I/\partial y_S^2 < 0$) in response to political investments from subsidy recipients, and decreases (at a decreasing rate) the transfer in response to political investments from taxpayers ($\partial I/\partial y_T > 0$ and $\partial^2 I/\partial y_T^2 < 0$). Second, $f = \partial^2 I/\partial y_S \partial y_T \neq 0$ introduces "complementarity" between the investments made by the two groups. Complementarity in the influence function arises because the political investment of one group affects, positively or negatively, the marginal influence of the opponent, and, by necessity, works to the advantage of one group and to the disadvantage of the other. The advantage is in favor of subsidy recipients when $f > 0$. This is because an increase in the political investment made by taxpayers increases the marginal influence of subsidy recipients, while an increase in the political investment made by subsidy recipients decreases the marginal influence of taxpayers. The advantage is in favor of taxpayers when $f < 0$ for the opposite reasons. I do not make any assumptions about the sign or size of f at the outset, but, as shall be seen, complementarity plays a key role in the characterization of political equilibrium, and it is, therefore, worthwhile to pause and think about some possible interpretations of f.

The interpretation given to f, of course, depends on the context, but, in general, there are good reasons to believe that $f \neq 0$. For example, suppose that the influence function is a reduced form representation of a more elaborate political model with two election-motivated and ideological political parties and two pressure groups that can provide election finance to help their most-favored party win elections. The incumbent party typically enjoys an advantage over the challenger party in the sense of having a high probability of reelection. In this case, f can be related to the probability function that describes the election prospect of the two parties, and, if this probability function is logistic, it follows immediately that the complementarity between the political contributions of the two groups works to the advantage of the group that supports the incumbent party.[5]

Becker's propositions about political competition between pressure groups and efficient methods of taxation and subsidization are based on a comparison between programs with different deadweight cost functions. To enable such a comparison, a definition of efficiency is required. Becker (1983, p. 385) adopts the following definition:

Definition 1. (Efficiency) A distributive program with deadweight cost functions F^* and G^* is said to be more efficient than an alternative program with deadweight cost functions F and G if, for each T and S

$$F^* \geq F \text{ and } F^{*\prime} \geq F' \tag{3}$$

$$G^* \leq G \text{ and } G^{*\prime} \leq G' \tag{4}$$

with at least one set of inequalities being strict.

I parameterize the deadweight cost functions as follows: $F(T) = T/\theta_T$ and $G(S) = S/\theta_S$, where $\theta_T \geq 1$ and $0 < \theta_S \leq 1$. The configuration $\theta_S = \theta_T = 1$ corresponds to a distributive program where taxes are raised and subsidies are distributed lump sum. For other

[5] See, for example, Dixit (1987).

programs, the average deadweight cost of taxes, d^T=(θ_T-1)/θ_T, and the average deadweight cost of subsidies, d^S=($1-\theta_S$)/θ_S, are positive and equal to the marginal deadweight costs.[6] According to Definition 1, a distributive program with deadweight costs $\{\theta_T^*,\theta_S^*\}$ is more efficient that an alternative program with deadweight costs $\{\theta_T^{**},\theta_S^{**}\}$ if either $\theta_T^*<\theta_T^{**}$ and $\theta_S^*\geq\theta_S^{**}$ or $\theta_T^*\leq\theta_T^{**}$ and $\theta_S^*>\theta_S^{**}$. This definition of efficiency basically says that redistribution program 1 is more efficient than redistribution program 2 if the former raises more revenue and distributes more subsidies for given utility costs and gains than the later. It is important to notice that this definition does not imply that a program that is more efficient (in the sense of the definition) than an alternative program is *necessarily* preferred by all groups. The utility of the groups also depends on the political investments they make under the two programs.

In the following, I restrict attention to average deadweight costs in the range from 0 to 50% of each dollar transferred. This interval seems wide enough to accommodate most reasonable empirical estimates, and implies that I only compare programs with average deadweight costs satisfying

Assumption 1. $(\theta_T,\theta_S)\in\Delta\equiv[1,4/3]\times[4/5,1]$.

Unless otherwise stated, the term "deadweight cost of taxes" refers to the *average* deadweight cost generated by the policy instrument employed to collect taxes, and the term "deadweight cost of subsidies" refers to the average deadweight cost generated by the policy instrument employed to distribute subsidies.

3. Complete political participation

The purpose of this section is to reproduce Becker's propositions about political competition and efficient methods of redistribution. Becker (1983) proves two important propositions in this regard. The first proposition (Becker, 1983, Proposition 2) compares the *size* of two redistribution programs with different deadweight cost functions, while the second (Becker, 1983, Proposition 4) compares the utility of the two groups under the two programs. Both of Becker's propositions are based on the assumption that all (relevant) groups are politically active. The analysis below therefore provides the benchmark for the discussion of participation choices in Section 4.

Political competition takes the following form. The two groups simultaneously make a political investment, taking as given the political investment of the other group. The objective of each group is, respectively, to maximize

$$v_T=-T-y_T \tag{5}$$

and

$$v_S=S-y_S \tag{6}$$

subject to the influence function and the budget constraint, and taking the characteristics of the underlying distributive program, $\{\theta_S,\theta_T\}$, as given. Using the budget constraint in Eq.

[6] This is a somewhat restrictive simplification, as deadweight costs might well be increasing at the margin.

(1), we can rewrite the objective functions of the two groups as functions of the (monetary) size of the program (t) and the program's average deadweight costs: $v_T = -\theta_T t - y_T$ and $v_S = \theta_S t - y_S$. The first-order conditions are[7]

$$-\theta_T(-2 + y_T + f y_S) - 1 \leq 0 \tag{7}$$

$$\theta_S(2 - y_S + f y_T) - 1 \leq 0. \tag{8}$$

The two best response functions, defined by the these conditions, have reverse slopes whenever $f \neq 0$.[8] I shall use the terminology that a group is *defensive* when its best response function is downwards sloping, and *offensive* when it is upwards sloping. The political equilibrium with complete political participation is characterized in the next lemma.[9,10]

Lemma 1. *Let $(\theta_S, \theta_T) \in \Delta$ be given. A unique interior Nash equilibrium exists whenever $f \in (\underline{f}, \bar{f})$, where $\bar{f} \equiv [(1-2\theta_T)\theta_S]/[(1-2\theta_S)\theta_T] \in [1, 5/3]$ and $\underline{f} \equiv [(1-2\theta_S)\theta_T]/[(2\theta_T - 1)\theta_S] \in [-1, -3/5]$. The equilibrium political investments are*

$$y_S^A(\theta_T, \theta_S, f) = \frac{2(1+f) - \frac{1}{\theta_S} - \frac{f}{\theta_T}}{1+f^2}, \tag{9}$$

$$y_T^A(\theta_T, \theta_S, f) = \frac{2(1-f) + \frac{f}{\theta_S} - \frac{1}{\theta_T}}{1+f^2}, \tag{10}$$

and the equilibrium transfer is

$$t^A(\theta_T, \theta_S, f) = \bar{t} + \frac{1}{1+f^2}\left[\frac{\theta_S^2 - \theta_T^2}{\theta_T^2\theta_S^2} + \left(\frac{4\theta_T\theta_S - 1}{\theta_T\theta_S}\right)f\right]. \tag{11}$$

In the following, I assume that the Nash equilibrium under complete political participation is interior, that is, $f \in (\underline{f}, \bar{f})$.[11] This basically requires that complementarity in the influence function between the political investments of the two groups is not too strong.

The first of Becker's two propositions (Becker, 1983, Proposition 2) makes a comparison between the size of a program with high marginal deadweight costs and a program with low marginal deadweight costs under the maintained assumption that both

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7 The second-order conditions are satisfied.

8 When $f = 0$, the political investment strategies are independent. The "reverse slope" property arises because of the simple linear-quadratic structure of the model and, in a more general model, both groups can have upwards sloping best response functions (see Becker, 1983; or Aidt, 2002).

9 We use superscript A to indicate equilibrium values of the relevant variables.

10 To insure that the transfer is positive in all the equilibrium configurations I study, it is sufficient to assume that $\bar{t} > \max_{\theta_T \in [1,4/3]}\{2 - 1/2\theta_T^2\} = 55/32$.

11 This assumption distinguishes the model from previous work on one-stage political games in which corner solutions (zero investment) have been interpreted as a decision not to participate. See, for example, Hirshleifer (1989) and Körber and Kolmar (1996).

groups will be politically active under either program. Proposition 1 reproduces the main insight.

Proposition 1 **(Becker, 1983, Proposition 2)**

1. *For all* $f \in (\underline{f}, \bar{f})$, $\partial t^A / \partial \theta_S > 0$.
2. *For all* $f \in (\underline{f}, \theta_S/\theta_T)$, $\partial t^A / \partial \theta_T < 0$.
3. *For all* $f \in (\theta_S/\theta_T, \bar{f})$, $\partial t^A / \partial \theta_T \geq 0$.

Proof. See Appendix A. □

The proposition says—with one caveat—that the (equilibrium) size of inefficient distributive programs (in the sense of Definition 1) is smaller than that of efficient distributive programs. In other words, one may say that competition between the two groups limits the growth of inefficient and promotes the growth of efficient programs. This is due to two intuitively appealing effects. First, taxpayers are more eager to oppose policies with high marginal deadweight cost of taxes ($\partial y_T^A / \partial \theta_T > 0$) because the utility cost associated with each tax dollar raised is larger. Second, subsidy recipients are less eager to support policies with high marginal deadweight cost of subsidies ($\partial y_S^A / \partial \theta_S > 0$) because it requires a larger increase in tax revenues to generate a given utility gain. Since high (marginal) deadweight costs encourage political investments of taxpayers and discourage political investments of subsidy recipients, taxpayers, when politically active, have an "intrinsic" advantage in limiting the expansion of inefficient distributive programs.[12,13]

The second of Becker's propositions (Becker, 1983, Proposition 4) compares the utility of the two groups under two different programs with different deadweight cost functions, taking into account that the political investments and thus the equilibrium size of the two programs will be different. The main result is that both groups prefer a program with low (average) deadweight cost of taxation to one with high (average) deadweight cost of taxes, and one may argue, therefore, that political competition will promote efficient means of taxation (in the sense of Definition 1).[14] The intuition is appealing. Taxpayers support efficient means of taxation because it becomes less costly to finance a given subsidy. Subsidy recipients support efficient means of taxation because taxpayers invest less to oppose such taxation and so, it is cheaper for them to secure a given subsidy. It is less certain, however, that political competition will promote efficient means of subsidization.

[12] Notice what really matters for these results are the *marginal* deadweight costs, and that the proposition does not depend on the functional form of the influence function or on the parameterization of the functions F and G.

[13] The caveat arises when the complementarity between the political investments strongly favors subsidy recipients. In this case, programs with high (marginal) deadweight cost of taxes are large ($\partial t^A / \partial \theta_T \geq 0$). Becker (1983, p. 379) rules this case out by restricting attention to the case with "weak complementarity" in the influence function.

[14] Dixit et al. (1997) derive a related result using a common agency model of special-interest group competition. They show that political competition among lobby groups induces the government to use the most efficient policy instruments available. However, since the government captures all the surplus from the agency relationship with the lobby groups if lump sum instruments are used, the lobby groups *can have* an incentive to restrict the set of available policy instruments to inefficient ones.

While programs with low average deadweight cost of subsidies are supported by subsidy recipients, taxpayers typically prefer policies with high average deadweight cost of subsidies, and would, therefore, oppose efficient means of subsidization. The (potential) opposition from taxpayers arises because programs with low average deadweight cost of subsidies attract large political investments from subsidy recipients, leaving taxpayers with a large tax bill.[15]

4. Incomplete political participation

In the previous section, it was assumed that supporters and opponents of redistribution were active in the political process, no matter what the characteristics of the underlying distributive program happened to be. In this section, I endogenize the participation decisions to allow for the possibility that taxpayers or subsidy recipients may voluntarily decide not to participate. Incomplete political participation can arise for many different reasons, and is often related to free rider problems (Olson, 1965) or to the fact that rent seekers value transfers differently (Hillman and Riley, 1989). Here, I shall focus on an alternative source of incompleteness. In particular, based on previous work, reported in Aidt (2002), I show (Proposition 2) how strategic considerations can induce either of the two groups to be politically inactive. Having established that incomplete political participation is one possible equilibrium outcome, I analyze how the participation decision of the two groups is affected by the (average) deadweight costs generated by the policy instruments used by the underlying distributive program.

In the extended model, political competition takes place in two stages. In the first stage (at time 0), the two groups decide simultaneously whether they want to participate in the political game that determines the size of the distributive program under consideration. If a group decides not to participate at this stage, it cannot subsequently reverse its decision. The participation decisions are observed by everybody. In stage 2 (at time 1), the size of the distributive program is determined by the political investments made by the group or groups that decided to participate.[16]

To characterize the set of (pure strategy) subgame perfect Nash equilibria of this game, I use backwards induction, and begin by analyzing the four subgames (labelled A to D) that can arise in stage 2. In subgame A, both groups are politically active, and the relevant investment strategies and the equilibrium transfer have already been characterized in Lemma 1. In subgame B, subsidy recipients do not participate and the Nash equilibrium is (y_T^B, y_S^B) with $y_S^B = 0$ and $y_T^B = r_T(0) = 2 - (1/\theta_T) > 0$. The equilibrium transfer is $t^B = \bar{t} - 2 + (1/(2\theta_T^2))$. In subgame C, taxpayers do not participate and the Nash equilibrium is (y_T^C, y_S^C) with $y_T^C = 0$ and $y_S^C = r_S(0) = 2 - (1/\theta_S) > 0$ as $\theta_S \in [4/5, 1]$. The equilibrium transfer is $t^C = \bar{t} + 2 - (1/(2\theta_S^2))$. Finally, in subgame D, neither group participates and $(y_T^D, y_S^D) = (0, 0)$ and $t^D = \bar{t}$. By substituting the relevant political investments into the objective functions

[15] A formal proof of these statements is contained in Appendix A.

[16] Gradstein (1995) studies participation decisions in a rent seeking contest with a similar sequential structure.

Table 1
The normal form representation of the political game

S	T	
	Participate	Not participate
Participate	$v_T^A = -\theta_T t^A - y_T^A$ $v_S^A = \theta_S t^A - y_S^A$	$v_T^C = -\theta_T \bar{t} + (\theta_T/(2\theta_S^2)) - 2\theta_T$ $v_S^C = \theta_S \bar{t} + (1/(2\theta_T)) + 2\theta_S - 2$
Not participate	$v_T^B = -\theta_T \bar{t} + (1/(2\theta_T)) + 2\theta_T - 2$ $v_S^B = \theta_S \bar{t} + (\theta_S/(2\theta_T^2)) - 2\theta_S$	$v_T^D = -\theta_T \bar{t}$ $v_S^D = \theta_S \bar{t}$

of the two groups, I can express the payoffs associated with the four subgames as functions of the three key parameters of the model (θ_S,θ_T,f). I show the normal form of the political game in Table 1.[17]

In stage 1, the two groups look ahead to stage 2 and base their participation strategies on the payoffs they expect to obtain in the various subgames. From Table 1, it is immediately clear that each group wants to participate if the other group decides to be politically inactive: $v_S^C > v_S^D$ and $v_T^B > v_T^D$. This rules out the situation in which both groups are inactive as an equilibrium. The next proposition shows that the remaining three configurations can arise in equilibrium. That is, political participation can be incomplete either because taxpayers do not voice opposition or because subsidy recipients do not voice support.

Proposition 2. *For each* $\{\theta_T,\theta_S\} \in \Delta$, *there exist an* $f_l \in (\underline{f},0)$ *and an* $f_u \in (0,\bar{f})$ *such that*

1. *For all* $f \in (f_u,\bar{f})$, *only subsidy recipients are politically active.*
2. *For all* $f \in [f_l,f_u]$, *both groups are politically active.*
3. *For all* $f \in (\underline{f},f_l)$, *only taxpayers are politically active.*
4. *For all* $f \in [f_l,f_u]$, *it is true that* $t^C > t^A(f) > t^B$.

Proof. See Appendix A. □

The intuition behind Proposition 2 can most easily be understood by referring to the two welfare effects associated with the participation decision: the *influence loss* and the *strategic gain*. First, an inactive group foregoes the option to influence policy making. The resulting loss of influence makes active participation from either group attractive. Second, to see why it can be in the best interest of one of the groups not to participate, notice that the size of the distributive program depends on how the active group behaves in the absence of competition. Let us consider the case where $f>0$ in detail.[18] In this case, subsidy recipients are offensive, and always want to participate. If taxpayers decide not to participate, subsidy recipients are motivated to reduce their political investment from y_S^A to y_S^C. This reduces, ceteris paribus, the tax bill by $I(0,y_S^A) - I(0,y_S^C)$ and in a sense, subsidy recipients reward taxpayers for not participating. The result is a *strategic gain*. The

[17] t^A, y_T^A and y_S^A are defined in Lemma 1.
[18] The case with $f \leq 0$ can be interpreted along similar lines.

strategic gain is larger than the influence loss when $f\in(f_u,\bar{f})$. That is, taxpayers want to opt out when subsidy recipients are sufficiently offensive. This should, however, not be taken as evidence that the tax bill paid by a group of inactive taxpayers ($I(0,y_S^C)$) is smaller than the tax bill it would have paid if it had decided to be politically active ($I(y_T^A,y_S^A)$). Part 4 of Proposition 2 demonstrates that the opposite is, in fact, true: $t^C>t^A$ for all $f\in[f_l,f_u]$. It is the combination of the moderation of the demands of subsidy recipients and the fact that their own political investment is saved that induces taxpayers to be inactive. To see why subsidy recipients decide to be active, suppose on the contrary that they opt out. When taxpayers are defensive, the reduction in the political investment of the subsidy recipients motivates taxpayers to increase their political investment from y_T^A to y_T^B. This reduces, ceteris paribus, the subsidy received by the recipients by $I(y_T^A,0)-I(y_T^B,0)$ and results in a *strategic loss* that adds to the influence loss. Hence, the group of subsidy recipients is better off participating.[19]

Having established that incomplete political participation is an equilibrium possibility for each $\{\theta_T,\theta_S\}\in\Delta$, I can now turn to the main question: are the two groups more likely to become politically active when the underlying distributive program is inefficient (in the sense of Definition 1) than when it is efficient? To answer this question, it is convenient to define the *region of political competition* as $R=[f_l,f_u]$, and ask how this region is affected by the size of the average deadweight cost associated with the underlying distributive program.

Proposition 3. *For each $(\theta_S,\theta_T)\in\Delta$, let $R=[f_l,f_u]$ be the region of political competition. Then*

1. *R is small for policies with relatively high (average) deadweight cost of subsidies.*
2. *R is large for policies with relatively high (average) deadweight cost of taxes.*

Proof. See Appendix A. □

Part 1 of the proposition demonstrates that distributive programs with high average deadweight cost of subsidies tend to elicit little political competition compared to programs with lower average deadweight costs of subsidies and similar average deadweight costs of taxes: *programs that employ highly distorting policy instruments to distribute subsidies are unlikely to be contested*. Part 2 of the proposition demonstrates that distributive programs with high average deadweight cost of taxes tend to elicit a lot of political competition compared to programs with lower average deadweight costs of taxes and similar average deadweight costs of subsidies: *programs that employ highly distorting policy instruments to collect taxes are likely to be contested*.

[19] Hillman and Riley (1989) prove a related "incompleteness result." They study a transfer contest in which the direction, but not the size, of the transfer is determined by the bids made by the active contestants. They show that the player with the highest gross valuation always enters, while the player with the second highest valuation only enters with some probability and players with yet lower valuations do not enter at all. The keys to this result are asymmetric valuations of the transfer and the fact that the contestant making the highest bid receives the transfer. Proposition 2 provides another reason why participation may be incomplete, stressing that the size of the transfer is endogenous.

Recall from Proposition 2 that political participation can be incomplete for two reasons: either because opposition from taxpayers or because support from subsidy recipients to specific programs is not forthcoming. To understand the implications of Proposition 3, it is useful to discuss the two situations separately. I begin with taxpayers' participation decision. Taxpayers are, ceteris paribus, less likely to form active opposition against distributive programs that use highly distorting policy instruments to distribute subsidies. This is because such programs elicit only a limited political investment from subsidy recipients whose demands in the absence of opposition from taxpayers are modest. This pattern of behavior increases the strategic gain relative to the influence loss, and in a sense renders opposition unnecessary. On the other hand, taxpayers are, ceteris paribus, more likely to form active opposition against programs that use highly distorting policy instruments to collect taxes. The intuition is that such programs make it expensive (in terms of lost utility) for taxpayers to finance a given subsidy, and they therefore dislike paying taxes more. Despite the fact that subsidy recipients respond to active opposition against programs with high average deadweight cost of taxes by scaling their political activities up by a relatively large amount, the prospective influence loss is sufficiently large to make it in taxpayers' best interest to oppose such programs actively.

It is of interest to contrast these results with those of Proposition 1. Under conditions of complete political participation, distributive programs with high average deadweight cost of subsidies generate little support and a lot of opposition, and so their size is contained by the competitive political process. However, the very fact that subsidy recipients are less eager to invest in support of such programs reduces taxpayers' incentive to mobilize opposition and, at the end of the day, they may decide to stay politically inactive—ensuring the political survival and growth of programs with high average deadweight cost of subsidies. The situation is different with respect to programs with high average deadweight cost of taxes. Proposition 1 predicts (for $f < \theta_S/\theta_T$) that such programs will be small, while Proposition 3 predicts that they are more likely than programs with lower average deadweight costs of taxes to attract active opposition from taxpayers, which, ceteris paribus, helps contain their size.

To illustrate some of these properties, numerical examples are useful. In Table 2, I compare three different distributive programs in a sequence of four examples. Program 1 uses the most efficient tax and subsidy instrument to redistribute between the two groups and entails no deadweight cost at all ($\theta_S = \theta_T = 1$). I compare this benchmark to two alternative programs that use a distorting policy instrument to collect taxes or to distribute subsidies. Program 2*S* employs a distorting method of subsidy distribution ($\theta_S = 4/5$) but collects taxes lump sum. Program 2*T* employs a distorting method of tax collection ($\theta_T = 4/3$) but distributes subsidies lump sum. In both cases, the average deadweight cost is 25%. The four examples are constructed such that the participation decision of one of the groups will change when one moves from one program to the other.[20] The table contains information about the size of the program if participation were always complete (t_A);

[20] This is done by picking *f* such that taxpayers (examples 1 and 2) or subsidy recipients (examples 3 and 4) are indifferent between participating or not under program 1.

Table 2
Some illustrative numerical examples

	θ_S	θ_T	t_A	t^*	v_S^*	v_T^*	Taxpayers	Subsidy recipients
Example 1 (f = 1/3)								
Program 1	1	1	2.9	2.9	1.7	− 3.5	yes	yes
Program 2*S*	4/5	1	2.3	3.2	1.8	− 3.2	no	yes
Example 2 (f = 1/3)								
Program 1	1	1	2.9	3.5	2.5	− 3.5	no	yes
Program 2*T*	1	4/3	2.6	2.6	1.3	− 4.3	yes	yes
Example 3 (f = − 1/3)								
Program 1	1	1	1.1	1.1	0.5	− 2.3	yes	yes
Program 2*S*	4/5	1	0.7	0.8	0.6	− 1.5	yes	no
Example 4 (f = − 1/3)								
Program 1	1	1	1.1	0.5	0.5	− 1.5	yes	no
Program 2*T*	1	4/3	0.6	0.6	0.1	− 2.3	yes	yes

Yes = group is active; no = group is inactive.

the (equilibrium) size of the program when the two groups are free to decide if they want to participate (t^*); the equilibrium utility levels of the two groups (v_S^* and v_T^*); and an indication of who is politically active at political equilibrium.

Example 1 shows a case in which taxpayers actively oppose program 1 that employs lump sum taxes and subsidies, but decide not to oppose program 2*S* that employes a distorting policy instrument to distribute subsidies. As a consequence, the equilibrium size of program 2*S* is larger than that of program 1 (3.2 versus 2.9). Had taxpayers decided to lobby against program 2*S*, it would have been smaller, as predicted by Becker's Proposition 2 (2.3 versus 2.9). This illustrates the important role played by the *assumption* that all groups are politically active underlying Becker's propositions. The example also illustrates the possibility that the two groups might actually prefer program 2*S* to program 1: the program that employs the distorting policy instrument to distribute subsidies Pareto-dominates the program that employs lump sum subsidies. This is in contrast to when political participation is *assumed* to be complete where programs (such as program 1) with low average deadweight cost of subsidies are preferred by subsidy recipients to programs (such as program 2*S*) that employ a more distorting subsidy instrument. Thus, the fact that taxpayers might not oppose such a program can induce subsidy recipients to prefer it to programs with lower average deadweight costs of subsidies. Example 2 compares program 1 to program 2*T*, and illustrates how political competition (arising from mobilization of taxpayers) can help contain the (equilibrium) size of distributive programs that employ inefficient means of taxation.

Now, let me move on to the discussion of subsidy recipients' participation decision. Subsidy recipients are, ceteris paribus, less likely to voice active support in favor of programs with high average deadweight cost of subsidies and, ceteris paribus, more likely to be active when the average deadweight cost of subsidies is relatively low. This is because more taxes must be raised to generate a given utility gain when the average deadweight cost of subsidies is high. Despite the fact that taxpayers are known to respond to active support from subsidy recipients by investing a relatively limited amount of resources, the influence loss associated with programs with high average deadweight cost of subsidies is sufficient to motivate active participation of subsidy recipients. On the other hand, subsidy recipients, ceteris paribus, are more likely to support actively programs with high average deadweight cost of taxes. This is because taxpayers are known to resist such programs fiercely even in the absence of active support from subsidy recipients. Consequently, the "reward" for political inactivity—the strategic gain—is decreasing in the average deadweight cost of taxes, and subsidy recipients are therefore more likely to let their support to such programs be voiced actively.

Again, these results can be compared to Proposition 1. When both groups are active, distributive programs with high average deadweight cost of taxes attract little support and a lot of opposition, and that helps contain their size in political equilibrium. However, the fact that taxpayers are more eager to oppose such programs increases subsidy recipients' incentives to mobilize active support, and, when it happens, this, ceteris paribus, increases their (equilibrium) size. This is illustrated by example 4 in Table 2 (0.5 versus 0.6). With respect to programs with high average deadweight cost of subsidies, it is noted that if actively supported by subsidy recipients such programs tend to be small, and, in addition, they are less likely to be supported by subsidy recipients than programs that employ more efficient methods of subsidy distribution. This is illustrated by example 3 in Table 2, which also provide yet another example in which the program that employs a distorting policy instrument to distribute subsidies Pareto-dominates the program using lump sum subsidies.

5. On the total social cost of redistribution

Tullock (1967), Krueger (1974) and many others[21] have pointed out that redistribution generates other social costs than deadweight costs. These additional costs—rent seeking costs—arise when valuable resources are used up in the process of gaining political influence. Becker (1985) mentions these costs only in passing,[22] leaving room for an explicit discussion of the issue. To this end and in contrast to the analysis of the previous sections, I focus on a particular distributive program with given deadweight cost functions. The question is now how the *total* social cost is affected by the degree of political competition. The total social cost of a distributive program with average deadweight cost (d^T,d^S) can, to a first approximation, be measured as:

$$\mathrm{TSC}(f,\theta_S,\theta_T) = \frac{\theta_T - \theta_S}{\theta_S\theta_T} t(f,\theta_S,\theta_T) + y_T(f,\theta_S,\theta_T) + y_S(f,\theta_S,\theta_T), \tag{12}$$

[21] For surveys, see, for example, Hillman (1989), Nitzan (1994) and Tollison (1997).

[22] See Becker (1985, p. 335).

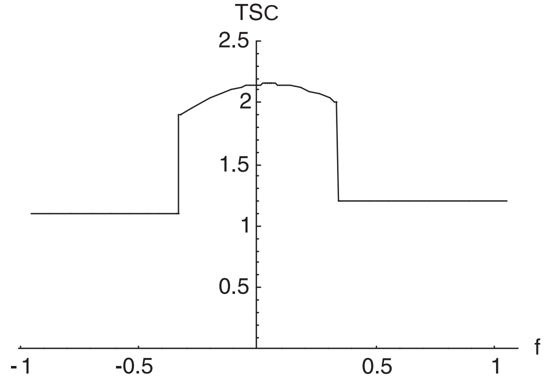

Fig. 1. The total social cost (TSC) and political competition.

where the first term is the *total* deadweight cost[23] and I use the political investments to approximate the rent seeking cost.[24]

From part 4 of Proposition 2, I know that $t^C > t^A(f) > t^B$ for all $f \in [f_l, f_u]$. For given (θ_T, θ_S), it therefore follows immediately that the total deadweight cost is maximum in the absence of active opposition from taxpayers and minimum in the absence of active support from subsidy recipients. This can be understood simply as a scale effect. Starting from a situation in which taxpayers are inactive ($f > f_u$), mobilization of taxpayers (arising from a fall in f) therefore reduces the total deadweight cost of redistribution. On the other hand, the opposite is true if the starting point is a situation in which subsidy recipients are inactive ($f < f_l$). Here political mobilization (arising from an increase in f) increases total deadweight costs by allowing the redistribution program to grow large. Overall, we see that political competition does not necessarily contain total deadweight cost, although it sometime does.

Turning to the rent seeking cost, the total political investment is significantly reduced when opposition or support to redistribution is absent, i.e., $y_S^C < y_T^A + y_S^A$ and $y_T^B < y_T^A + y_S^A$. This is true for two reasons. First, when a group is inactive, it does not engage in costly rent seeking. Second, a group has an incentive to withdraw from political competition only if the other group reduces its political investment (and so, its rent seeking expenditures) compared to the situation with political competition.[25]

These observations suggest that the total social cost may be minimum in the absence rather than in the presence of political competition, and so that the total social cost is self-limiting in the absence of competition. That this may indeed be the case is illustrated in

[23] The total deadweight cost is increasing in the size of the program. If a program provides public goods, reduces externalities or overcomes other market failures, then it is possible that an expansion of the program would increase efficiency (see Becker (1983, pp. 383–384) for a discussion of this case).

[24] Since political competition can bring forth decision-relevant information that contributes to social welfare, counting the total political investment as a rent seeking cost overestimates the (true) social cost of political competition (see, for example, Potters and van Winden, 1996).

[25] Hillman and Riley (1989) derive a similar result.

Fig. 1, which shows the total social cost (TSC) as a function of f.[26] The two horizontal segments correspond to the two equilibrium configurations with incomplete political participation (no active competition), while the segment in the middle corresponds to the equilibrium with political competition. We notice that the total social cost is significantly higher when political participation is complete than when it is not. Interestingly, when opposition from taxpayers is absent, the social cost is relatively low despite the fact that the total deadweight cost is large. When active support from subsidy recipients is absent, it is, on the other hand, not surprising to learn that the total social cost is relatively low, as both the total deadweight loss *and* the rent seeking cost are low. These considerations cast some doubt about the idea that political competition always reduces the social cost of redistribution: not only does political competition increase the total rent seeking cost, it may also, when it entails mobilization of subsidy recipients, increase the total deadweight cost of redistribution.

6. Conclusion

This paper studies the relationship between political competition and the size of distributive programs with different deadweight cost functions within an extended version of Becker's (1983) pressure group model that allows for endogenous political participation. The analysis produces two main results. First, I demonstrate that distributive programs that employ inefficient means of subsidization are relatively unlikely to be contested, while the opposite is true for distributive programs that employ inefficient means of taxation. Second, I show that political competition entails high total social cost—including rent seeking expenditures—and that the social cost therefore tends to be self-limiting in the absence of competition.

The analysis is facilitated by the introduction of simple functional forms and a particular parametrization of the dead weight cost functions, allowing me to derive closed form solutions. This, of course, reduces the generality of the analysis, and all results—in particular those in Section 5—should be interpreted with this caveat in mind. More importantly, the fact that the political process is modelled as a black box and the deadweight cost functions are treated as exogenous leaves many questions unanswered. Consequently, the results of the paper can perhaps best be understood as a clarification of some (important) aspects and limitations of Becker's seminal work on pressure groups. Even within the framework of Becker's pressure group model, political competition is not a panacea for promoting efficient distributive policies.

Acknowledgements

I would like to thank Jan Rose Skaksen, Christian Schultz, Vania Sena and the participants in the Public Choice Workshop, University of Aarhus, for constructive

[26] Fig. 1 is based on an example with average deadweight cost equal to 5%. The qualitative result is not sensitive to this choice.

comments. I am also grateful to two anonymous referees who provided many helpful but critical comments, and for the encouragement of one of the editors of the Journal, Arye Hillman. All remaining mistakes and misinterpretations are, of course, mine.

Appendix A

Proof of Proposition 1 (Becker, 1983, Proposition 2). Use Lemma 1 to calculate

$$\frac{\partial t^A}{\partial \theta_S} = \frac{\theta_S^{-2}}{1+f^2}\left[\frac{1}{\theta_S} + \frac{f}{\theta_T}\right], \tag{13}$$

$$\frac{\partial t^A}{\partial \theta_T} = \frac{\theta_T^{-2}}{1+f^2}\left[\frac{f}{\theta_S} - \frac{1}{\theta_T}\right]. \tag{14}$$

Clearly, $\partial t^A/\partial\theta_S > 0$ for $f \geq 0$. Evaluate $\partial t^A/\partial\theta_S$ at $\underline{f}$:

$$\frac{\theta_S^{-2}}{1+f^2}\left(\frac{2(\theta_T-\theta_S)}{\theta_S(2\theta_T-1)}\right) \geq 0 \text{ for } \theta_T \geq \theta_S, \tag{15}$$

and so, $\partial t^A/\partial\theta_S > 0$ for $f \in (\underline{f}, 0)$. Clearly, $\partial t^A/\partial\theta_T < 0$ for $f \leq 0$. Note that $\partial t^A/\partial\theta_T = 0 \Leftrightarrow f = \theta_S/\theta_T < \bar{f}$ for $\theta_T > \theta_S$. For $\theta_T = \theta_S = 1$, $\bar{f} = \theta_S/\theta_T = 1$ and $\partial t^A/\partial\theta_T < 0$ for all $f < 1$.

Proof of Becker (1983, Proposition 4). Using the expressions in Lemma 1, we can calculate the payoffs in the Nash equilibrium explicitly:

$$v_T^A = -\theta_T \bar{t} + \frac{1}{(1+f^2)}\left[\left(\frac{1}{2\theta_T} + \frac{\theta_T}{2\theta_S^2} - 2\right) + (2-4\theta_T)f\right] \tag{16}$$

$$v_S^A = \theta_S \bar{t} + \frac{1}{(1+f^2)}\left[\left(\frac{1}{2\theta_S} + \frac{\theta_S}{2\theta_T^2} - 2\right) - (2-4\theta_S)f\right] \tag{17}$$

The derivatives with respect to θ_S and θ_T are

$$\frac{\partial v_T^A}{\partial \theta_S} = -\frac{\theta_T}{(1+f^2)\theta_S^3} < 0 \tag{18}$$

$$\frac{\partial v_S^A}{\partial \theta_T} = -\frac{\theta_S}{(1+f^2)\theta_T^3} < 0 \tag{19}$$

$$\frac{\partial v_T^A}{\partial \theta_T} = -t^A(\cdot) - \frac{f}{\theta_S\theta_T(1+f^2)} \tag{20}$$

$$\frac{\partial v_S^A}{\partial \theta_S} = t^A(\cdot) + \frac{f}{\theta_S\theta_T(1+f^2)} \tag{21}$$

It is clear that $\partial v_S^A/\partial\theta_S > 0$ and $\partial v_T^A/\partial\theta_T < 0$ for $f \geq 0$. Evaluate Eqs. (20) and (21) at $f = \underline{f}$. For all $f < 0$, $\partial v_S^A/\partial\theta_S > 0$ and $\partial v_T^A/\partial\theta_T < 0$ if

$$\bar{t} > \max_{(\theta_T,\theta_S)\in\Delta}\left[2 - \frac{1}{2\theta_T^2} - \frac{\underline{f}}{\theta_S\theta_T(1+\underline{f}^2)}\right] \tag{22}$$

A sufficient condition is that $\bar{t}$ is greater than 75/32. This condition is stronger than the one imposed to insure that the equilibrium transfer is positive ($\bar{t} > 55/32$).

Proof of Proposition 2. From Table 1, it is immediately clear that at least one group wants to participate. Define the participation gain (PG) for each group as the difference between what it gets if it does and does not participate *given* that the other group decides to participate, i.e., $PG_T = v_T^A - v_T^C$ and $PG_S = v_S^A - v_S^B$, where v_T^A and v_T^A are defined in Eqs. (16) and (17). Some straightforward but tedious calculations yield:

$$PG_T(f, \theta_T, \theta_S) = \frac{a_0 f^2 + a_1 f + a_2}{1+f^2} \tag{23}$$

$$PG_S(f, \theta_T, \theta_S) = \frac{b_0 f^2 + b_1 f + b_2}{1+f^2} \tag{24}$$

where

$$a_0 = \left(2\theta_T - \frac{\theta_T}{2\theta_S^2}\right) > 0$$

$$a_1 = (2 - 4\theta_T) < 0$$

$$a_2 = \frac{2\left(\theta_T - \frac{1}{2}\right)^2}{\theta_T} > 0$$

$$b_0 = \left(2\theta_S - \frac{\theta_S}{2\theta_T^2}\right) > 0$$

$$b_1 = (4\theta_S - 2) > 0$$

$$b_2 = \frac{2\left(\theta_S - \frac{1}{2}\right)^2}{\theta_S} > 0$$

for all $\{\theta_T,\theta_S\} \in \Delta$.

It is immediately clear that $PG_T > 0$ for $f \leq 0$ and that $PG_S > 0$ for $f \geq 0$. I divide the proof into three parts.

(1) Consider taxpayers' participation decision. I have to show that there exist one and only one value of $f \in (0,\bar{f})$—call it f_u—such that $PG_T(f_u,\theta_T,\theta_S) = 0$ and that $PG_T(f,\theta_T,\theta_S) \geq 0$ for $f \in [0,f_u]$ and $PG_T(f,\theta_T,\theta_S) < 0$ for $f \in (f_u,\bar{f})$. We notice that $PG_T(f,\theta_T,\theta_S) = 0 \Leftrightarrow g_T(f) \equiv a_0 f^2 + a_1 f + a_2 = 0$. Note that $g_T(0,\theta_T,\theta_S) = a_2 > 0$ and $g_T(1,\theta_T,\theta_S) = (1/(4\theta_T))(1 - (\theta_T^2/\theta_S^2)) \leq 0$. Moreover, $g_T(\bar{f},\theta_T,\theta_S) = 0$ and $\bar{f} \geq 1$. Hence, $g_T(f,\theta_T,\theta_S) = 0$ has one and only one real root in $(0,\bar{f})$ equal to

$$f_u = \frac{\theta_S(1 - 2\theta_T)(1 - 2\theta_S)}{\theta_T(4\theta_S^2 - 1)} \in (0, 1). \tag{25}$$

Moreover, it follows that $PG_T(f,\theta_T,\theta_S) \geq 0$ for $f \in [0,f_u]$ and $PG_T(f,\theta_T,\theta_S) < 0$ for $f \in (f_u,\bar{f})$.

(2) The proof of the existence of f_l related to subsidy recipients' participation decision is similar to part 1 and available upon request.

(3) I want to show that $t^C > t^A(f) > t^B$ for $f \in [f_l,f_u]$. By definitions of f_l and f_u, I have

$$\theta_S t^A(f_l) - y_S^A(f_l) = \theta_S t^B \tag{26}$$

$$-\theta_T t^A(f_u) - y_T^A(f_u) = -\theta_T t^C. \tag{27}$$

Rearrange to see that $t^A(f_l) > t^B$ and that $t^A(f_u) < t^C$. Moreover, I note that $t^C > t^B$ for all $(\theta_T,\theta_S) \in \Delta$. To complete the proof, I need to show that $\partial t^A/\partial f > 0$ for $f \in [f_l,f_u]$. Define $q(f) \equiv \partial t^A/\partial f$ and calculate

$$q(f) = \frac{1}{(1+f^2)^2}\left[\left(\frac{4\theta_T\theta_S - 1}{\theta_T\theta_S}\right)(1 - f^2) + \frac{\theta_T^2 - \theta_S^2}{\theta_T^2\theta_S^2} f\right]. \tag{28}$$

Clearly, $\partial t^A/\partial f > 0$ for $f \in [0,1]$. Recall that $f_u < 1$. Consider the interval $f \in [f_l,0]$. Note that $q(\underline{f}) > 0$ and $q(0) > 0$ for all $(\theta_T,\theta_S) \in \Delta$. Show that $q(f) = 0$ has no real roots in $f \in [\underline{f},0]$. Suppose that it has. It must then have at least two roots. Note that $q(f) = 0 \Leftrightarrow p(f) \equiv ((4\theta_T\theta_S - 1)/\theta_T\theta_S)(1 - f^2) + ((\theta_T^2 - \theta_S^2)/\theta_T^2\theta_S^2)f = 0$. If $p(f) = 0$ has at least two solutions and $q(\underline{f}) > 0$ and $q(0) > 0$, then there most exist a value of f such that $\partial p/\partial f = 0$. However, I see that $\partial p/\partial f > 0$ for all $f \in [\underline{f},0]$ and so, I have a contradiction, and conclude that $\partial t^A/\partial f > 0$ for all $f \in [f_l,f_u] \subset [\underline{f},1]$.

Proof of Proposition 3

(1) Let $f=f_u(\theta_S, \theta_T)$ be defined by (see the Proof of Proposition 2):

$$\mathrm{PG}_T(f, \theta_T, \theta_S) = 0. \tag{29}$$

Using the implicit function theorem, I get that

$$\frac{\partial f_u}{\partial \theta_j} = -\frac{\frac{\partial \mathrm{PG}_T}{\partial \theta_j}\Big|_{f_u}}{\frac{\partial \mathrm{PG}_T}{\partial f}\Big|_{f_u}} \quad \text{for } j = S, T. \tag{30}$$

From Proposition 2, I have that $(\partial \mathrm{PG}_T/\partial f)|_{fu}<0$. I find

$$\frac{\partial \mathrm{PG}_T}{\partial \theta_S} = \frac{\theta_T}{\theta_S^3} \frac{f^2}{1+f^2} > 0 \tag{31}$$

for all f including f_u. Hence, $\partial f_u/\partial \theta_S>0$. Consider the impact of an increase in the deadweight cost of taxes on the taxpayers' participation gain. Recall that at $f=f_u(\cdot)$,

$$\theta_T[I(y_S^C, 0) - I(y_S^A, y_T^A)] = y_T^A > 0, \tag{32}$$

and so I get

$$\left.\frac{\partial \mathrm{PG}_T}{\partial \theta_T}\right|_{f_u} = \frac{y_T^A}{\theta_T} - \frac{\theta_T}{\theta_S}\frac{\partial y_S^A}{\partial \theta_T} = \frac{1}{(1+f_u^2)\theta_T}\left[2(1-f_u) - \frac{1}{\theta_T}\right]. \tag{33}$$

$\partial \mathrm{PG}_T/\partial \theta_T|_{f_u}>0 \Leftrightarrow f_u<1-(1/(2\theta_T))$. Evaluate $\mathrm{PG}_T(\cdot)$ at $f=1-(1/(2\theta_T))$:

$$\mathrm{PG}_T\left(1-\frac{1}{2\theta_T}, \theta_T, \theta_S\right) = \frac{\theta_T(2\theta_T-1)^2}{2\theta_S^2(4\theta_T - 8\theta_T^2 - 1)} < 0 \tag{34}$$

for all $(\theta_T,\theta_S)\in\Delta$. Hence, $f_u<1-(1/(2\theta_T))$ and I conclude that $\partial f_u/\partial \theta_T>0$.

(2) The proof that $\partial f_l/\partial \theta_T>0$ and $\partial f_l/\partial \theta_S<0$ is similar to part 1 and available upon request.

References

Aidt, T.S., 2002. Strategic political participation and redistribution. Economics and Politics 14, 19–40.

Alesina, A., Drazen, A., 1991. Why are stabilization delayed? American Economic Review 81, 1170–1188.

Baba, S.A., 1997. Democracies and inefficiency. Economics and Politics 9, 99–114.

Becker, G.S., 1983. A theory of competition among pressure groups for political influence. Quarterly Journal of Economics 98, 371–400.

Becker, G.S., 1985. Public policies, pressure groups, and dead weight costs. Journal of Public Economics 28, 329–347.

Becker, G.S., Mulligan, C.B., 1998. Deadweight Costs and the Size of Government. National Bureau of Economic Research, Working Paper no. 6789.

Besley, T., Coate, S., 1998. Sources of inefficiencies in a representative democracy: a dynamic analysis. American Economic Review 88, 139–156.

Buchanan, J.M., Wagner, R.E., 1977. Democracy in Deficit: the Political Legacy of Lord Keynes. Academic Press, New York.

Coate, S., Morris, S., 1995. On the form of transfers to special interests. Journal of Political Economy 103, 1210–1235.

Dixit, A., 1987. Strategic behavior in contests. American Economic Review 77, 891–898.

Dixit, A., Grossman, G.M., Helpman, E., 1997. Common agency and coordination: general theory and application to government policy making. Journal of Political Economy 105, 752–769.

Fernandez, R., Rodrik, D., 1991. Resistance to reform: status quo bias in the presence of individual-specific uncertainty. American Economic Review 81, 1146–1155.

Gradstein, M., 1995. Intensity of competition, entry and entry deterrence in rent seeking contests. Economics and Politics 7, 79–91.

Hillman, A.L., 1989. The Political Economy of Protection. Harwood Publishers, Chur.

Hillman, A.L., Riley, J.G., 1989. Politically contestable rents and transfers. Economics and Politics 1, 17–39.

Hirshleifer, J., 1989. Conflict and rent-seeking success functions: ratio vs. difference models of relative success. Public Choice 63, 101–112.

Körber, A., Kolmar, M., 1996. To fight or not to fight? Public Choice 88, 381–392.

Kristov, L., Lindert, P., McClelland, R., 1992. Pressure groups and redistribution. Journal of Public Economics 48, 135–163.

Krueger, A.O., 1974. The political economy of the rent-seeking society. American Economic Review 64, 291–303.

Nitzan, S., 1994. Modeling rent-seeking contests. European Journal of Political Economy 10, 41–60.

Olson, M., 1965. The Logic of Collective Action. Harvard Univ. Press, Cambridge, MA.

Olson, M., 1982. The Rise and Decline of Nations: Economic Growth, Stagflation and Social Rigidities. Yale Univ. Press, New Haven.

Persson, T., Tabellini, G., 2000. Political Economics. Explaining Economic Policy. MIT Press, Cambridge, MA.

Potters, J., van Winden, F., 1996. Models of interest groups: four different approaches. In: Schofield, N. (Ed.), Collective Decision-Making: Social Choice and Political Economy. Kluwer Academic Publishing, Boston.

Tollison, R.D., 1997. Rent seeking. In: Mueller, D.C. (Ed.), Perspectives on Public Choice, A Handbook. Cambridge Univ. Press, Cambridge, UK, pp. 506–525 (Chap. 23).

Tullock, G., 1967. The welfare cost of tariffs, monopolies, and theft. Western Economic Journal 5, 224–232.

Wittman, D.A., 1989. Why democracies produce efficient results. Journal of Political Economy 97, 1395–1425.

Wittman, D.A., 1995. The Myth of Democratic Failure: Why Political Institutions are Efficient. University of Chicago Press, Chicago.