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A THEORY OF COMPETITION AMONG PRESSURE GROUPS FOR POLITICAL INFLUENCE*

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This paper presents a theory of competition among pressure groups for political influence. Political equilibrium depends on the efficiency of each group in producing pressure, the effect of additional pressure on their influence, the number of persons in different groups, and the deadweight cost of taxes and subsidies. An increase in deadweight costs discourages pressure by subsidized groups and encourages pressure by taxpayers. This analysis unifies the view that governments correct market failures with the view that they favor the politically powerful: both are produced by the competition for political favors.

I. INTRODUCTION

The economic approach to political behavior assumes that actual political choices are determined by the efforts of individuals and groups to further their own interests. Most applications of the economic approach emphasize voters, politicians, bureaucrats, and political parties (see Schumpeter [1947], Downs [1957], Buchanan and Tullock [1962], Riker [1962], and Niskanen [1971]). However, the pioneering book by Bentley [1908] at the turn of the century used an

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"economic approach" that focused on political pressure groups,[1] and his book led to a large literature by political scientists on the pluralistic society (see, e.g., Truman [1971]).

In the last two decades some economists have also followed up Bentley's insight (see Stigler [1975], Peltzman [1976], and Posner [1974]). I was stimulated by the atmosphere created by Stigler, Peltzman, Posner, and others to build a model of political competition among pressure groups. Politicians, political parties, and voters will receive little attention because they are assumed mainly to transmit the pressure of active groups.[2]

Individuals belong to particular groups—defined by occupation, industry, income, geography, age, and other characteristics—that are assumed to use political influence to enhance the well-being of their members. Competition among these pressure groups for political influence determines the equilibrium structure of taxes, subsidies, and other political favors.

Political influence is not simply fixed by the political process, but can be expanded by expenditures of time and money on campaign contributions, political advertising, and in other ways that exert political pressure. Political equilibrium has the property that all groups maximize their incomes by spending their optimal amount on political pressure, given the productivity of their expenditures, and the behavior of other groups. For analytical convenience, each group is assumed to act as if expenditures by other groups are unaffected by changes in its own expenditures.

Taxes and subsidies are related by the identity between revenue and expenditures: the total amount raised from taxes, including hidden taxes like inflation, equals the total amount available for subsidies, including hidden subsidies like restrictions on entry into an industry. This government budget equation implies that a change in the influence of any group that affects its taxes and subsidies must affect the subsidies and taxes, and hence the influence, of other groups. Therefore, groups do not entirely win or lose the competition for political influence because even heavily taxed groups can raise their influence and cut their taxes by additional expenditures on political activities. This contrasts with the all-or-nothing outcomes

1. Bentley stated his views forcefully: "Pressure . . . is always a group phenomenon. It indicates the push and resistance between groups. The balance of this group pressure *is* the existing state of society. Pressure is broad enough to include . . . from battle and riot to abstract reasoning and sensitive morality" [1908, pp. 258–60; italics in original].

2. In a much earlier paper [Becker, 1958] I considered competition among politicians and political parties.

implied by many other formal models of political behavior, where the "majority" clearly wins and the "minority" clearly loses.

The distortions in the use of resources induced by different taxes and subsidies, usually called deadweight costs, have a major effect on the competition for influence. Deadweight costs stimulate efforts by taxed groups to lower taxes, but discourage efforts by subsidized groups to raise subsidies. The favorable effect of costs on the political activities of taxed groups gives these groups an intrinsic advantage in the competition for influence that presumably is offset by other advantages of groups obtaining large subsidies (see the discussion in Section IV).

The analysis in this paper is not limited to taxes and subsidies that distort incentives and reduce aggregate efficiency. The same analysis of competition among pressure groups, without the introduction of social welfare functions or a benevolent government, explains expenditures on defense and other public goods, taxes on pollution, and other government activities that raise efficiency, even when some groups are hurt by these activities. A unified approach is possible because whereas groups harmed by activities that reduce efficiency have the intrinsic advantage in the competition for influence, groups benefiting from activities that raise efficiency have the intrinsic advantage relative to groups harmed by these activities (see Section IV).

Section II discusses the influence functions of two homogeneous pressure groups competing for political favors. Section III develops market equilibrium conditions for these competing groups that determine actual influence, subsidies, and taxes. Sections III and IV derive various propositions from the equilibrium conditions, including the effect on taxes and subsidies of the following: free riding by members of each group, the number of members in each, the deadweight cost from redistributing income, and public activities that raise efficiency. Section V develops market equilibrium conditions and their comparative static properties when many groups compete, and considers whether the total amount raised in taxes is likely to be "excessive." Section VI briefly discusses how to reconcile my analysis, which emphasizes pressure groups and neglects voting, with the apparent importance of voting in many political systems.

II. Political Influence Functions

The basic assumption of the analysis is that taxes, subsidies, regulations, and other political instruments are used to raise the

welfare of more influential pressure groups. Groups compete within the context of rules that translate expenditures on political pressure into political influence and access to political resources. These rules may be embodied in political constitutions and other political procedures, including perhaps "rules" about the use of force to seize power.

To simplify the analysis without any significant loss in generality, I assume that the utility of each person is measured by his real full income, and that full incomes can be added to measure aggregate income or aggregate output.[3] Full income is a better measure of utility than market income because it depends on the time spent at leisure and other nonmarket activities. Envy and altruism are excluded by the assumption that full income depends only on own commodities.

Assume initially only two *homogeneous* groups in the society, s and t. Since identical persons must have the same income, Z_s^0 and Z_t^0 can measure the full income of each member of s and t prior to government redistribution, and Z_s and Z_t can measure their incomes after redistribution, so that

$$R_s = Z_s - Z_s^0 \quad \text{and} \quad R_t = Z_t^0 - Z_t \tag{1}$$

are the redistributions to each s and away from each t.

All political activities that raise the income of a group will be considered a subsidy to that group, and all activities that lower incomes will be considered a tax. The amount raised by all taxes on t can be written as

$$S = n_t F(R_t), \tag{2}$$

where n_t is the number of members of t, and R_t is the taxes paid by each member. The function F is the revenue from a tax of R_t and incorporates the deadweight costs that result from the distorting effects of taxes on hours worked, investments, and other taxpayer choices. Since these costs tend to increase as the rate of taxation increases (see Harberger [1971] for a good discussion),

$$F(R_t) \leq R_t, \quad F' \leq 1, \quad \text{and} \quad F'' \leq 0. \tag{3}$$

$F(R_t) = R_t$, $F' = 1$, and $F'' = 0$ when taxes do not distort behavior; that is, when "lump sum" taxes are used.

The subsidy to each member of s is determined from

3. Full income can be added without ambiguity if there is a single household commodity, or if relative prices of different commodities are the same to all persons (see the discussion of full income in Becker [1981, Chs. 1 and 4]).

$$n_s G(R_s) = S = n_t F(R_t), \tag{4}$$

where n_s is the number of members and R_s is the subsidy to each member. G is the cost of providing R_s and incorporates the deadweight costs from the distorting effects of subsidies on hours worked, investments, and other choices by recipients. The properties of G are

$$G(R_s) \geq R_s, \quad G' \geq 1, \quad \text{and} \quad G'' \geq 0. \tag{5}$$

$G(R_s) = R_s$, $G' = 1$, and $G'' = 0$ when subsidies do not distort behavior; that is, when "lump sum" grants are used. Equation (4) gives the budget equation between the amount paid in taxes and the amount received as subsidies, a relation that has a major effect on the competition for political influence. Note that the budget equation does not state that subsidies ($n_s R_s$) equal taxes ($n_t R_t$) because deadweight costs reduce subsidies below taxes.

Very different methods have been used to choose legislatures and government officials, to limit the powers of heads of state, and to provide for political succession. All political systems, however, including dictatorial as well as democratic systems, have been subject to pressures from special interest groups that try to use influence to enhance their welfare. I shall not try to model how different political systems translate the activities of pressure groups into political influence. Instead, I deal with the end product of such a translation, called "influence functions," that relate subsidies and taxes to the pressures exerted by all groups and to other variables. Since only weak restrictions are imposed on these functions, the basic implications of the analysis should be applicable to widely different political systems, including nondemocratic systems, although, of course, the influence of particular groups is often sensitive to the characteristics of a political system. Even though Schumpeter [1947] and others[4] have identified selfish pressure groups with democratic capitalism, I believe that pressure groups of workers, managers, intellectuals, etc. have an incentive to be more rather than less active under democratic and other forms of socialism because a larger fraction of resources is controlled by the State under socialism than under capitalism.

The amount raised in taxes on t is determined by an influence function that depends on the pressure (p) exerted by s and t and other variables (x):

$$n_t F(R_t) = -I^t(p_s, p_t, x). \tag{6}$$

4. For example, Samuelson [Heertje, 1981, p. 19] also appears to argue that democratic capitalism is especially vulnerable to political pressure groups.

Similarly, the amount available to subsidize s is determined by an influence function that also depends on political pressures and other variables:

$$n_s G(R_s) = I^s(p_s, p_t, x). \tag{7}$$

The political budget equation in (4) clearly implies that these influence functions cannot be independent because increased influence of s that raises its subsidy must be financed by increased taxes on t, and hence must lower the influence of t. That is,

$$n_t F(R_t) = -I^t \equiv n_s G(R_s) = I^s \tag{8}$$

or

$$I^s + I^t \equiv 0.$$

Equality between the amount raised in taxes and the amount spent on subsidies implies that *aggregate influence is zero:* increased influence of some groups decreases the influence of others by equal amounts. Therefore, the political game modeled in this paper is zero-sum in influence and negative-sum in taxes and subsidies because of deadweight costs.

Differentiation of equation (8) with respect to any variable y gives

$$\frac{\partial I^s}{\partial y} \equiv I^s_y \equiv -\frac{\partial I^t}{\partial y} \equiv -I^t_y. \tag{9}$$

Therefore, if, say, increased pressure by t raises its influence (and thereby lowers its taxes), increased pressure by t would lower the influence (and subsidy) of s:

$$I^t_t > 0 \Rightarrow I^s_t < 0. \tag{10}$$

Moreover, since $I^s_{ts} = I^s_{st}$, if an increase in p_t raises the marginal product of p_s (if $I^s_{st} > 0$), then an increase in p_s would lower the *absolute* value of the marginal effect of p_t on I^s (for then $I^s_t < 0$ and $I^s_{ts} > 0$). Note also that if some characteristics of a group, such as the occupation or ages of members, raise its influence, these characteristics would lower the influence of the other group.

III. Competition Among Pressure Groups

If $R_t > 0$ and $R_s > 0$, s would be considered the winner, and t the loser from the political "game" because s is subsidized and t is taxed. The identity of winners and losers and the amounts won and lost are

not rigidly determined by the nature of a political system because they are also affected by the political activities of each group. Losers need not passively accept their fate, but can trim their losses and the gains to winners by lobbying, threats, disobedience, migration, and other kinds of political pressure to raise their influence.

Groups compete for political influence by spending time, energy, and money on the production of political pressure. To model this competition, I assume that each group has a function relating its production of pressure to various inputs:

$$p = p(m,n), \quad \text{where } m = an, \tag{11}$$

and where a are the resources spent per member on maintaining a lobby, attracting favorable votes, issuing pamphlets, contributing to campaign expenditures, cultivating bureaucrats and politicians, and in other ways. Presumably, pressure cannot decrease and generally increases when expenditures (m) increase.

The total effect of an increase in the number of members on the marginal product of political expenditures, with the amount spent per member held constant, is

$$\frac{\partial p_m}{\partial n} = \frac{\partial^2 p}{\partial m \partial n} = a p_{mm} + p_{mn}. \tag{12}$$

The sign of the first term is determined by whether there are increasing or decreasing returns to the scale of expenditures. The second term tends to be negative because of free riding: each person wants to shirk his obligations and impose the cost of producing pressure on other members (see the pioneering study by Olson [1965]). Free riding can be partially controlled by policing behavior, punishing deviant members with ostracism, intimidation, and fines, and by implementing rules for sharing benefits and costs that reduce the incentive to shirk (see, e.g., Groves and Ledyard [1977], and Tideman and Tullock [1976]). In essence, free riding raises the cost of producing pressure. Therefore, total expenditures on the production of pressure equals the sum of expenditures on direct political activity and on the control of free riding.

The full incomes of each member of s and t net of expenditures on political activities, including expenditures to control free riding, are defined by

$$Z_s = Z_s^0 + R_s - a_s, \quad \text{and} \quad Z_t = Z_t^0 - R_t - a_t. \tag{13}$$

Income per member of a politically active group ($a > 0$) is maximized when

$$\frac{dR_s}{da_s} = 1, \quad \text{and} \quad \frac{dR_t}{da_t} = -1, \tag{14}$$

and these conditions take account of all expenditures to control free riding. A group would be politically active only if additional pressure raises its influence. The inequalities in (10) imply that pressure by each group reduces the influence of the other group, and thereby partially or fully offsets the effect of pressure by the other group.

The influence and pressure production functions permit a straightforward translation of the optimality conditions for s and t given by equation (14) into political market equilibrium conditions determining expenditures and pressures by both groups. To simplify the analysis, I assume that each group acts as if the pressure exerted by the other group is unaffected by its behavior.[5] Then

$$\frac{dR_s}{da_s} = \frac{1}{n_s G'} \frac{\partial I^s}{\partial p_s} \frac{\partial p_s}{\partial m_s} \frac{\partial m_s}{\partial a_s} = \frac{I^s_s p^s_m}{G'} = 1, \tag{15}$$

and using equation (9),[6]

$$\frac{dR_t}{da_t} = -\frac{1}{n_t F'} \frac{\partial I^t}{\partial p_t} \frac{\partial p_t}{\partial m_t} \frac{\partial m_t}{\partial a_t} = \frac{I^s_t p^t_m}{F'} = -1. \tag{16}$$

These conditions can be solved for equilibrium values of a_s and a_t, and p_s and p_t. They can also be used to derive the effect on the optimal pressure by one group of a given change in the pressure by the other group (see the Mathematical Appendix). Rising deadweight losses from taxes and subsidies ($F'' < 0$ and $G'' > 0$) cause the optimal pressure by one group to increase when pressure by the other is raised (see the discussion in the next section). "Complementarity" in the influence function of s between s and t ($I^s_{st} > 0$) also increases the optimal pressure by s when pressure by t is raised because additional pressure by s would then be more effective. However, such "complementarity" reduces the optimal pressure by t when pressure by s is raised because the negative effect on I^s of additional pressure by t is reduced.

Comparative static properties of the political equilibrium will be derived graphically, with rigorous proofs given in the Mathematical Appendix. Figure I assumes that the reaction curves of both s and t

5. Cournot-Nash models of competition among pressure groups are also considered by Brock and Magee [1975, 1978], briefly by Stigler [1975], and by Findlay and Wellisz [1981].

6. Second-order conditions insuring that (15) provides an optimal value of a_s and (16) an optimal value of a_t are considered in the Mathematical Appendix. Sufficient conditions are $I^s_{ss} < 0$, $I^s_{tt} > 0$, p^s_{mm} and $p^t_{mm} \leq 0$, $G' > 0$, and $F'' < 0$.

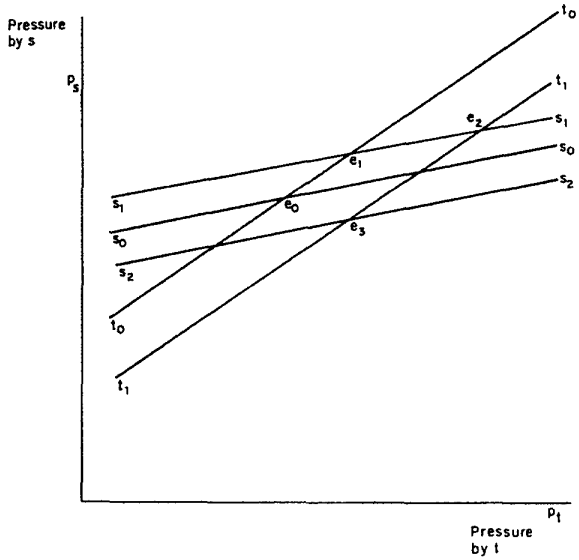

FIGURE I
Reaction Curves of t and s

are positively sloped because deadweight costs rise sufficiently rapidly as taxes and subsidies increase to dominate any offsetting effects from "substitutability" in the influence functions. Stable equilibrium is implied by the assumption in this figure that t's reaction curve is steeper than s's curve.[7]

If a group became more efficient at producing pressure, perhaps because of greater success at controlling free riding or at using television and other media, its optimal production of pressure would be raised for any level of pressure by the other group. For example, the reaction curve of s would be shifted upward in Figure I from s_0s_0 to s_1s_1, and the equilibrium position changed from e_0 to e_1. Pressure by s would necessarily increase, and pressure by t would also increase if its reaction curve were positively sloped. Regardless of the induced effect on pressure by t, the subsidy to s and the tax on t would be increased by an upward shift in s's reaction curve.

7. This assumption is strongly satisfied when $I^s_{tt} = I^t_{ss} = F'' = G'' = 0$ because then s's reaction curve would be horizontal and t's would be vertical.

This straightforward result applies equally to improved efficiency and will be stated as

PROPOSITION 1. A group that becomes more efficient at producing political pressure would be able to reduce its taxes or raise its subsidy.

If an increase in the efficiency of producing pressure of both s and t shifted the reaction curve of s upward and that of t to the right, the equilibrium pressures of both groups would increase (say from e_0 to e_2). The influence of either group, however, and hence taxes and subsidies, might not change much, if at all, because the increased pressure by t would offset the increased pressure by s. Recall that the political budget equation implies that both groups cannot increase their influence because aggregate influence is zero (see equation (8)). This illustrates an important corollary to Proposition 1 that has been neglected in discussions of pressure groups.

COROLLARY. The political effectiveness of a group is mainly determined not by its absolute efficiency—e.g., its absolute skill at controlling free riding—but by its efficiency relative to the efficiency of other groups.[8]

For example, a group may be highly subsidized, even though it cannot control free riding very well because it has much better control than other groups. Therefore, the emphasis on free riding in many discussions of the effectiveness of pressure groups is a little excessive because political success is determined by relative, not absolute, degree of control over free riding.

Since economies of scale are important at low levels of expenditure on producing pressure, and since free riding is usually more easily controlled in small groups, a modest increase in the size of small groups would usually raise the marginal product of their expenditures because the benefit from a larger scale would exceed the cost from greater free riding. Continued expansion in size would eventually cause a decline in marginal products because free riding would become troublesome and scale economies unimportant. Beyond some point, marginal products may stabilize because further increases in size induce little additional scale effects or free riding (per member).

An increase in the size of a group lowers marginal deadweight costs of subsidies or taxes (G' or F') because the subsidy or tax on each member of the group would be reduced. Therefore, the total effect

8. I am indebted to Rodney Smith for stressing this corollary; Smith takes a related approach to political behavior in [1982].

of an increase in the size of a group on its influence depends on the effects on efficiency, subsidies, and deadweight costs. To determine this, it is necessary to consider how deadweight costs affect pressure, taxes, and subsidies.

IV. Deadweight Costs and Redistribution

An increase in the marginal deadweight cost of taxes (a reduction in F' in equation (16)) raises the pressure exerted by taxpayers essentially because a reduction in taxes then has a smaller (adverse) effect on the revenue from taxation. On the other hand, an increase in the marginal deadweight cost of subsidies (an increase in G' in equation (15)) reduces the pressure exerted by recipients because a given increase in the subsidy then requires a larger increase in tax revenue. Hence an exogenous increase in the deadweight cost of both taxes and subsidies would shift the reaction curves of t and s to the right and downward, respectively, and change the equilibrium position from e_0 to e_3 in Figure I. Either the equilibrium pressure of t must increase, or the pressure of s must decrease, or both. However, the following proposition holds, regardless of the exact effects on pressure.

PROPOSITION 2. An increase in deadweight cost reduces the equilibrium subsidy.

The cost of many programs, such as agricultural price supports or oil entitlements, has often seemed distressingly large. Yet this proposition implies that politically successful programs are "cheap" relative to the millions of programs that are too costly to muster enough political support,[9] where "cheap" and "expensive" refer to marginal deadweight costs, not to the size of taxes and subsidies.

Since deadweight costs encourage pressure by taxpayers and discourage pressure by recipients, taxpayers have an "intrinsic" advantage in influencing political outcomes. For, combine equations (15) and (16) to get

$$-\frac{dR_s/da_s}{dR_t/da_t} = -\frac{I_s^s p_m^s}{I_t^t p_m^t}\frac{F'}{G'} \tag{17}$$

If s and t were the same size ($n_s = n_t$), equally efficient at producing pressure ($p_m^s = p_m^t$ when $m_s = m_t$ and $n_s = n_t$), and equally important in the influence function ($I_s^s = -I_t^t$ when $p_s = p_t$), then (17) would

9. I made this point earlier [Becker, 1976] without analyzing how deadweight costs affect pressure groups.

imply that

$$\frac{-dR_s/da_s}{dR_t/da_t} = \frac{F'}{G'} \quad \text{when} \quad p_s = p_t. \tag{18}$$

The intrinsic advantage of taxpayers is measured by the right-hand side of (18) and increases as deadweight costs of taxes and subsidies increase—as F' falls and G' rises. There is no advantage with lump sum taxes and subsidies because then $F' = G' = 1$. Subsidized groups can overcome their intrinsic disadvantage with an optimal size, efficiency at producing pressure, success at converting pressure into influence, or with characteristics that raise their influence. Indeed, the presumption must be that heavily subsidized groups, such as sugar growers and dairy farmers in the United States, not only can redistribute with relatively low deadweight cost, but also can overcome their intrinsic disadvantage with political appeal and efficiency.

Proposition 2 implies some "tyranny of the status quo" because the political sector would not interfere much with the private distribution of income even when groups benefiting from interference are better organized politically than groups harmed, as long as they are not much better organized. Consequently, the importance of the private status quo does not imply that politicians are lackeys of the rich, and is even consistent with the poor being *more* effective politically.

This tyranny of the status quo is not the same, however, as laissez faire because the political sector would protect the status quo against many shocks and changes in the private sector. Suppose that an industry (autos) pays much higher wages than are available to its employees elsewhere (because they have invested in industry-specific capital) until unexpected competition from imports (Japan) reduces equilibrium wages in the industry below those available elsewhere. If government assistance were not forthcoming, workers would leave the industry and suffer a large reduction in earnings.

Tariffs or quotas on these imports might raise earnings by much more than the loss in efficiency. For example, if earnings initially were 50 percent higher than available elsewhere, and if they would become 5 percent lower, a complete banning of imports would cost society only 10 percent (5/50) of the subsidy to workers (neglecting the consumer surplus from the increased consumption of autos induced by the lower price of imports). These workers may be able to exert influence and elicit political support because the deadweight cost of doing so is cheap relative to those of other programs.

A well-known maxim of economics states that "sunk costs are sunk," that individuals look only to the future as they allocate labor and other resources. Without government assistance, even large investments in industry-specific capital would not deter exit from the industry if imports reduced earnings below those available elsewhere. "Sunk costs are not sunk" in the political sector, however, because investments in human or physical capital specific to a firm, industry, or even region reduce the short-run elasticity of supply, and the deadweight costs of "distortions" are lower when supply (and demand) is less elastic. Many persons have been annoyed by the recent political support to Chrysler because the earnings of their workers had been so high. My analysis suggests that annoying or not, this may be precisely the reason why Chrysler has been supported.

Political protection against changes in the private sector is likely to be incomplete and temporary. Incomplete because the marginal deadweight cost of protection rises as the degree of protection increases; temporary because supply (and demand) becomes more elastic over time as specific investments depreciate. Therefore, one explanation for periodic efforts at deregulation, such as the recent deregulation of airlines and securities markets, and to a lesser extent of trucking, is that deadweight costs rise as the duration of regulations increases. A study by Jarrell [1982] indicates that the deregulation of the securities market appears to have been induced by the growth of large institutional traders with elastic demands.

Economists have traditionally explained political behavior not by the power of interest groups but by market "failure." Governments produce public goods, reduce externalities, and overcome other failures. Although these political activities raise rather than lower aggregate efficiency, they can be readily incorporated into the previous analysis of competition among pressure groups for political influence.

Activities that benefit all groups are opposed by none, and may be actively supported by pressure from some of the groups. More challenging to the analysis are activities that also raise efficiency, but harm some groups (say t) who may exert pressure in opposition. The "tax" on t would still finance the "subsidy" to s according to the political budget equation in (4), except that now efficiency would be raised because $n_s R_s > n_t R_t$. If efficiency were also raised at the margin, that is, if $n_s dR_s > n_t dR_t$, subsidized groups have the intrinsic advantage in affecting political outcomes, for equation (18) implies that s has the intrinsic advantage when $F' > G'$, which is the necessary

and sufficient condition for an increase in the subsidy to raise efficiency.[10]

Subsidized groups with an intrinsic advantage exert more pressure than taxed groups of the same size, efficiency, and political appeal. Since political policies strongly supported by pressure from subsidized groups are likely to win out in the competition against other policies, those policies raising efficiency are likely to win, unless the groups harmed offset their intrinsic disadvantage with efficient production of pressure or in other ways. This result can be stated as a corollary to Proposition 2:

COROLLARY. Political policies that raise efficiency are more likely to be adopted than policies that lower efficiency.

This corollary indicates that the model in this paper of competition among political pressure groups to enhance their own welfare does not neglect market failures. That is, the model does not emphasize political redistribution of income at the expense of political increases in efficiency, even though groups do not cooperate and side payments are not permitted. Therefore, an analysis of noncooperative competition among pressure groups can unify the view that governments correct market failures and what has seemed to be a contrary view that governments favor the politically powerful.

Since an increase in the number of persons taxed reduces the tax required on each person to obtain a given revenue and thereby reduces the marginal (and total) deadweight cost of taxation, an increase in the number of taxpayers would reduce their production of pressure (see (A.19)). This is why a group would prefer its subsidy to be financed by small taxes on many persons, even when that does not reduce the political efficiency of the taxed groups.[11] The optimal size

10. Since

$$n_s G(R_s) = n_t F(R_t),$$

then

$$G' n_s dR_s = F' n_t dR_t,$$

and

$$n_s dR_s > n_t dR_t \quad \text{if and only if } G' < F'.$$

11. Many persons have argued that subsidies are more readily acquired when each taxpayer is only slightly affected, but the emphasis has been on the cost of organizing taxpayers. An early statement can be found in Simon Newcomb: "If Congress can be induced to adopt a certain policy. . . [a company] can collect an extra profit of one cent per annum out of each inhabitant of the country. Not one person in a thousand would give a moment's attention to the wrong, or indeed ever find it out. . . , or call a meeting of his neighbors without spending more time than the question was worth" [1886, p. 457, footnote 9]. For a similar statement by Pareto, see [1971, p. 329].

of a subsidized group is smaller than its most efficient size because an increase in the number of members reduces the net income per member if efficiency does not significantly increase.[12] These results can be stated as

PROPOSITION 3. Politically successful groups tend to be small relative to the size of the groups taxed to pay their subsidies.

Proposition 3 appears to be consistent with the evidence for agriculture in different countries: agriculture is often heavily subsidized when a small sector, as in Japan, Israel, or the United States; and heavily taxed when a large sector, as in Poland, China, Thailand, or Nigeria (see Peterson [1979], and especially the evidence for Africa in Bates [1981]). Proposition 3 and this evidence for agriculture are contrary to the frequent view that small groups are at a disadvantage politically because they do not have many votes. Section VI argues that voting and majorities are not the *fundamental* determinants of political influence even in democracies.

I have taken as given the method used to subsidize or tax each group, although usually many methods are possible, and the political sector must choose among them. Does competition among pressure groups as modeled in this paper imply that the most efficient method is used? To simplify the discussion of this question, assume that one method of taxation or subsidization is uniformly more efficient than other methods: that $F^* > F$ and $G^* < G$, and $F^{*\prime} > F'$ and $G^{*\prime} < G'$, for all R_t and R_s, where F and G refer to any other method.[13] If influence functions were independent of the tax method in the sense that tax revenue is the same with different methods when pressures by s and t are given,[14] then replacement of a less efficient by a more efficient tax reduces the optimal pressure by t because the marginal

12. Assume that G has a constant elasticity ($\beta > 1$) with respect to R_s, I^s a constant elasticity ($\gamma < 1$) with respect to p_s, and that p_s has a constant elasticity (α) with respect to m_s and does not directly depend on n_s (no free riding). Equation (15) then implies that the equilibrium values of R_s and a_s change by the same proportion, = to $(\alpha\gamma - 1)/(\beta - \alpha\gamma)$, as n_s increases. Therefore, if $\alpha \leq 1$, both R_s and a_s, and hence the net income per member, would fall as the number of members increased (even without free riding). However, if $\alpha > 1$ because of economies of scale, net income per member would rise as n_s increased if $\alpha > 1/\gamma$ (without free riding).

13. Note that no method may be *uniformly* most efficient because methods with relatively large fixed (collection?) costs and small effects on incentives are not efficient at low tax or subsidy levels, and may be efficient at high levels. This point has been stressed in correspondence from Geoffrey Brennan and James Buchanan; see also Brennan and Buchanan [1980].

14. An alternative assumption with similar implications is that taxes (R_t) rather than tax revenue would be the same with different methods when pressures are given.

deadweight loss decreases. This reduction in pressure raises the subsidy to s as well as the net income of t.

Therefore, both t and s would lobby and otherwise exert political pressure in favor of the most efficient method of taxing t (assuming that the method of subsidizing is unaffected) because both groups are better off with the efficient method. This important result can be stated as

PROPOSITION 4. Competition among pressure groups favors efficient methods of taxation.

If all subsidy methods also yield the same tax revenue when pressures are given, replacement of a less efficient by a more efficient subsidy would raise the subsidy to s at the initial equilibrium. If the marginal loss at the initial equilibrium were larger with the more efficient than with the less efficient method (it may not be), the optimal pressure by s would be reduced, and t as well as s would be made better off by the more efficient method. Both groups would then favor efficient methods of subsidizing s (assuming that the method of taxing t does not become less efficient). However, t would be made worse off by more efficient subsidies if they induced greater pressure by s.[15]

Consequently, noncooperative competition among pressure groups for political influence sometimes, but not necessarily always, *favors efficient* subsidies. This conclusion may mollify persons who believe that inefficient taxes and subsidies are often used; for example, that a steeply progressive income tax is an inefficient provider of revenue, the inflation tax should be replaced with consumption or other more efficient taxes, or aid to farmers and the railroad industry would be provided more efficiently by direct subsidies rather than by restrictions on acreage or on competition from trucks.

Yet a progressive income tax may harm the rich as well as raise revenue, and direct subsidies to farmers encourage entry that can dissipate the gain to established farmers. Indeed, Bruce Gardner has shown nicely [1981] that acreage restrictions are *more* efficient than output subsidies at raising the incomes of established farmers when the supply of farmers is elastic.

Still another example is the evidence that public enterprises are less efficient than private enterprises producing the same products

15. If different methods of subsidizing s yielded the same subsidy rather than the same tax revenue for given pressure by s and t, pressure by s would always increase when a more efficient subsidy replaced a less efficient subsidy. Although the subsidy would also increase, tax revenue might decrease, and hence the welfare of t increase, because more efficient methods yield a larger subsidy from a given revenue.

(evidence from many studies is ably reviewed by Borcherding [1982]). Public enterprises often subsidize employees,[16] customers, or suppliers, as well as produce various products. If public ownership is an efficient way to subsidize these groups, replacement of public by seemingly more efficient private enterprises could *lower* rather than raise *aggregate* efficiency because less efficient subsidies must be used. Consequently, public enterprises may only *appear* to be less efficient than private enterprises because intentional subsidies are not included in the definition of "output." This and the previous examples illustrate some difficulties in evaluating the efficiency of the public sector, difficulties ignored by numerous casual evaluations.

Expenditures on the production of pressure are not Pareto optimal because all groups could be made better off by reduced expenditures. Since the influence indifference curves shown in Figure II are positively inclined because greater pressure by one group lowers the influence of the other group, reduced pressure by both groups could

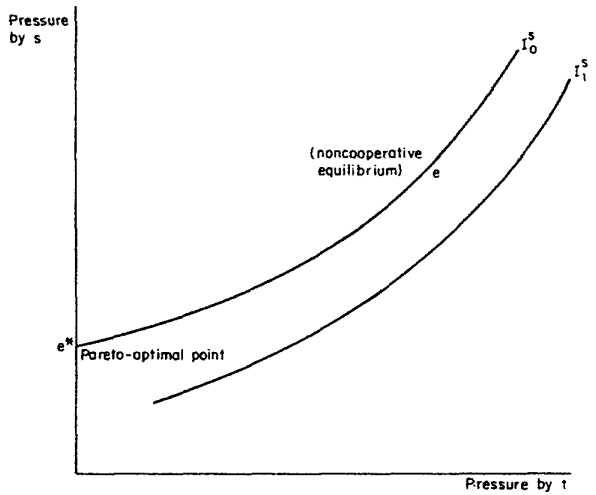

FIGURE II
Influence Indifference Curves

16. For example, public sanitation workers and public transit workers apparently are better paid than private workers (see Edwards and Edwards [1981] and Pashigian [1973]).

maintain their influence, and hence would raise both their net incomes by economizing on political expenditures. As point e^* in this figure indicates, Pareto optimality is attained when one group (t in the figure) does not produce any pressure.

Cooperation among pressure groups is necessary to prevent the wasteful expenditures on political pressure that result from the competition for influence. Various laws and political rules may well be the result of cooperation to reduce political expenditures, including restrictions on campaign contributions and the outside earnings of Congressmen, the regulation and monitoring of lobbying organizations, and legislative and executive rules of thumb that anticipate (and thereby reduce) the production of pressure by various groups. Cooperation is difficult, however, because each group wants other groups to reduce their pressure and tries to evade restrictions on its own efforts.

V. Many Pressure Groups

In all societies virtually an unlimited number of pressure groups could form to lobby for political aid to their members, categorized by occupation, industry, income, sex, age, height, consumption, and other characteristics. Even the United States, however, has only several thousand active pressure groups [U. S. Federal Election Commission, 1982]. The previous analysis indicated that taxed groups are likely to be active when the deadweight cost of taxes is significant, whereas subsidized groups are likely to be active when deadweight costs are relatively small (perhaps because most of the gains are not dissipated by competitors). Moreover, active groups control free riding relatively easily, partly because their members are affected by the taxes or subsidies in similar and more easily identifiable ways. In addition, active subsidized groups are sufficiently large to take advantage of scale economies, but are not large relative to the groups harmed by their activities. I believe that these conditions, far more than the social significance of production relations emphasized by Marx, explains the prominence in political life of economic pressure groups;[17] that

17. The founding fathers of the United States were well aware of the political importance of economic pressure groups. In his Federalist Paper on factions, Madison wrote, "... [T]he most common and durable source of factions has been the various and unequal distribution of property .... A landed interest, a manufacturing interest, a mercantile interest, a moneyed interest, with many lesser interests, grow up of necessity in civilized nations, and divide them into different classes.... The regulation of these various and interfering interests forms the principal task of modern legislation, and involves the spirit of party and faction in the necessary and ordinary operations of the government" [Hamilton, Jay, and Madison, 1941, p. 56].

is, of groups lobbying for subsidies to or reduced taxes on the occupations, industries, incomes, or consumptions of their members.

The previous sections consider competition between two homogeneous pressure groups, one taxed and the other subsidized. The taxed group might try to reduce taxes but would not seek a separate subsidy financed by taxes on the subsidized group because deadweight costs raise the political effectiveness of its pressure to reduce taxes above that of its pressure to elicit a subsidy.[18] Therefore, under these conditions, each person might be taxed or subsidized but not both. Actually, however, most persons are both taxed and subsidized in various ways, and are members of several, sometimes overlapping, pressure groups that lobby to reduce different taxes, and also of several that lobby to raise different subsidies. For example, a person might be joined with others in the same occupation or city to lobby for subsidies, and with somewhat different persons having similar consumption or income to lobby for reduced taxes.

Subsidizing and taxing the same person may be socially inefficient because his welfare could be maintained by equal reductions in both, while aggregate output would be increased by the saving in deadweight costs from reduced taxes and subsidies. Therefore, if everyone were both taxed and subsidized, equal dollar reductions in all taxes and subsidies would make everyone better off. I argued in the previous section that certain laws and political rules are evidence of cooperation by pressure groups to reduce their expenditures on political activities because competition among pressure groups results in excessive expenditures. Likewise, propositions to limit total taxes and philosophies that limit subsidies might be interpreted as cooperative efforts to reduce inefficient "cross-hauling" (to use transportation terminology) of taxes and subsidies.

Revenue raised from taxes on the ith group is determined from the influence function,

$$(19) \quad n_i F_i(R_{t_i}) = -I^{t_i}(p_1, \ldots, p_q, p_{q+1}, \ldots, p_v, x), \quad i = 1, \ldots, q,$$

where R_{t_i} is a vector of the taxes paid by the n_i members, F_i determines the deadweight loss from taxes, $p_1, \ldots, p_q$ are the pressures exerted by the q taxed groups, $p_{q+1}, \ldots, p_v$ are the pressures by the $v - q$ subsidized groups, and x are other determinants of influence. Similarly, the subsidy available to the jth group is determined from the influence function,

18. The taxed group might seek a subsidy when its taxes are used to finance activities that raise efficiency because then the deadweight cost of its taxes would be negative.

$$(20)\quad n_j G_j(R_{s_j}) = I_{S_j}(p_1, \ldots, p_q, p_{q+1}, \ldots, p_v, x), \qquad j = 1, \ldots, v - q,$$

where R_{s_j} is the vector of subsidies to the n_j members, and G_j determines the deadweight loss of the subsidy. Although political systems greatly affect which groups gain from political activity, in all systems influence functions cannot be independent because the total revenue from taxes must equal the total amount spent on subsidies:

$$(21)\quad -\sum_{i=1}^{q} I^{t_i} = \sum_{i=1}^{q} n_i F_i(R_{t_i}) \equiv \sum_{j=1}^{v-q} n_j G_j(R_{s_j}) = \sum_{j=1}^{v-q} I^{s_j}.$$

Therefore, the aggregate influence of all groups is zero:

$$(22)\quad \sum I^{t_i} + \sum I^{s_j} = 0.$$

The Cournot-Nash assumption that each group acts as if pressure by other groups is unaffected by its behavior is more appealing with many than with two groups because each then tends to have a small effect on any other group. Pressure is exerted until the benefits from lower taxes or higher subsidies are no larger than the cost of producing additional pressure. Even with the assumption that pressure is increased by an active group until the additional income of the group equals its additional cost, heterogeneity affects the equilibrium production of pressure by raising the cost of controlling free riding. Moreover, heterogeneous groups may not maximize their incomes because more influential members may be better off at other pressure levels. However, to simplify the discussion, I assume that even heterogeneous groups do maximize their incomes. Then the equilibrium conditions for all successful groups are similar to equations (15) and (16):

$$(23)\quad -\frac{d\bar{R}_{t_i}}{d\bar{a}_{t_i}} = \frac{p_m^i \partial I^{t_i}}{\partial p_i} \Big/ F_i'(\bar{R}_{t_i}) = 1, \quad i = 1, \ldots, q^*,$$

$$(24)\quad \frac{d\bar{R}_{s_j}}{d\bar{a}_{s_j}} = \frac{p_m^j \partial I^{s_j}}{\partial p_j} \Big/ G_j'(\bar{R}_{s_j}) = 1, \quad j = 1, \ldots, (v^* - q^*),$$

where $\bar{a}$ and $\bar{R}$ are the cost and benefit per member, q^* are the number of active taxed groups, and $v^* - q^*$ are the number of active subsidized groups.

Equations (21), (23), and (24), and the production functions for pressure determine equilibrium levels of pressure and political expenditure by all v groups—inactive groups exert no pressure. The comparative statics are similar to those derived earlier for two groups (see Appendix to Becker [1982]): pressure tends to be greater by more

efficient groups, by subsidized groups with smaller deadweight costs (smaller G'), by taxed groups with larger deadweight costs (smaller F'), by groups with intrinsically more influence, and by subsidized groups whose benefits are financed by a small tax on many persons.

These equations also imply extensive political general equilibrium reactions to changes in the behavior of any group. Suppose, for example, that group j becomes more efficient, raises its pressure, and thereby increases its subsidy financed by additional taxes on active groups h and i. They would be induced to exert greater pressure because their marginal deadweight costs increase. Increased pressure by groups h, i, and j may affect the marginal influence of other groups because of complementarity or substitution in the influence functions. Moreover, increased pressure by h and i would lower the subsidy to or raise the taxes on other groups, who then might exert greater pressure that affects still other groups. The process continues until a new political general equilibrium is reached with possibly quite different pressures and gains by many groups. Increased pressure by one group may set in motion reactions throughout the political system because of the political budget constraint, which implies that subsidies are financed by taxes on other groups and that aggregate influence is zero.

Equations (23) and (24) imply that

$$(25) \qquad \frac{G_j'}{G_k'} = \frac{\partial I^{s_j}/\partial m_j}{\partial I^{s_k}/\partial m_k} \quad \text{and} \quad \frac{F_i'}{F_h'} = \frac{\partial I^{t_i}/\partial m_i}{\partial I^{t_h}/\partial m_h}.$$

The ratio of the marginal deadweight costs from subsidizing or taxing active groups equals the ratio of their marginal political effectiveness. The optimal tax literature, which generalizes Ramsey pricing to include welfare evaluations of the distribution of income, implies that the ratio of marginal deadweight costs equals the ratio of marginal "social worths." My analysis comes to a similar conclusion for active pressure groups after replacing the normative concept of "worth" with the behavioral concept of political effectiveness. Note, however, that the ratio of marginal deadweight costs between an active pressure group and an inactive group is less than the ratio of their marginal political effectiveness because the effectiveness of an inactive group is less than its deadweight loss.

VI. Voting and Influence

Theories of rational politics usually build on the *given* political preferences of voters, be they theories of the median voter [Romer and

Rosenthal, 1979], constitutional consent [Buchanan and Tullock, 1962], or cooperative political games [Riker, 1962; and Aumann and Kurz, 1977]. I too claim to have presented a theory of rational political behavior, yet have hardly mentioned voting. This neglect is not accidental because I believe that voter preferences are frequently not a crucial *independent* force in political behavior. These "preferences" can be manipulated and created through the information and misinformation provided by interested pressure groups, who raise their political influence partly by changing the revealed "preferences" of enough voters and politicians.

Although choices in the private sector are also affected by advertising and other selling activities, rational individuals become reasonably well informed about most private decisions because they and their families usually bear the main consequences of their mistakes. The incentive to become well informed about political issues is weaker because each individual has only a minor effect on political outcomes decided by the majority (or by similar rules). Hence the average person knows far more about supermarket prices or the performance of cars than about import quotas or public wages. Although rational political behavior has appeared to be contradicted by widespread voter ignorance and apathy, the opposite conclusion is justified because rational voters do not invest much in political information (see Downs [1957] and Becker [1958]).

To be sure, members of pressure groups have incentives to free ride that are similar to the incentives of voters to remain uninformed. However, some pressure groups can limit free riding because they are relatively small and homogeneous, and do not reach decisions with majority-type rules: informed or more affected members may acquire much greater influence than others. Most important, only groups that are relatively efficient at limiting free riding become politically powerful.

In effect, the analysis in this paper assumes that pressure groups can "purchase" favorable votes with lobbying and other political activities when a majority or plurality of votes is required for political success. The available empirical evidence does suggest a strong positive effect of campaign expenditures on the number of favorable votes (see Palda [1975] and Jacobson [1979]). If votes can be "purchased" from outsiders almost as cheaply as they can be obtained from members, cooperation among pressure groups to form a majority coalition would not be necessary. Indeed, many small independent pressure groups in the United States, such as the Sierra Club or sugar growers, do manage to acquire substantial influence.

Simple cooperative voting games where the majority completely controls political outcomes have empty cores because minorities are free to bid for votes, form majority coalitions, and win the political games. Since this is a comment on the relevance of these models to political behavior rather than evidence of political instability, several studies have modeled the political game differently. For example, in an interesting series of papers, Aumann and Kurz (see, e.g., [1977]) abandon the core as a solution concept—they use the Shapley-Harsanyi value—and limit the capacity of the majority to extract resources from the minority. In an insightful paper Telser [1982] shows that core solutions may exist when the winning coalition pays at least its proportional share of the cost of public goods.

My approach departs more radically from the cooperative game tradition by not explicitly modeling coalition formation, by dropping the unrealistic assumptions that the preferences of voters are fixed and that all votes have the same "price," and by emphasizing the importance of the following: deadweight costs of taxes and subsidies, free riding and other costs of organizing pressure groups, and the capacity of "losers" to limit the political gains of "winners." Implicitly, coalitions are formed in my analysis through expenditures by pressure groups to affect the revealed preferences of voters. However, the "cost" of a vote is not the same to all pressure groups or for all voters because some groups are more efficient at "buying" votes, and some voters are more easily persuaded. I believe that the issues stressed in my approach and neglected by most of the literature on cooperative voting games are crucial to understanding actual political systems, including nondemocratic ones, although an explicit modeling of coalition formation would surely add to the power of the approach.

I have little to say about the productivity of different kinds of political pressure in affecting public opinion, voting, and influence. Presumably, pressure groups can more readily promote interests believed to contribute to defense, nationalism, conservation, health, and other popular goals, and persons who contribute directly, such as doctors and military officers, often can elicit political support.

The ignorance of voters also explains the importance of political form—including political rhetoric, the attachment to ideologies (see Kalt and Zupan [1982]), endurance during long campaigns, and an "honest" face—because voters with little direct knowledge about matters of substance must rely on crude proxies. Moreover, research findings that oppose the interests of powerful pressure groups frequently have little political impact because they are offset by the dissemination of selected information and by other appeals to public

opinion and legislatures.[19] Voter ignorance does not imply, however, that defense and other public goods are neglected; groups benefited by policies raising efficiency tend to be more influential than groups harmed (see Section IV).

I have assumed that influence functions depend only on the characteristics of and the pressures exerted by political groups, and not on taxes and subsidies, the number of persons in each group, the distribution of income, or other variables. The ignorance of voters not only helps determine the influence of different characteristics and pressure, but may also make influence depend on other variables as well. For example, influence may depend on subsidies if voters mistakenly believe that certain subsidies (minimum wages or oil entitlements?) contribute to desired goals rather than to the incomes of particular groups. If influence functions were affected by taxes, subsidies, and other policies, the analysis in this paper might have to be significantly modified, including the conclusion that efficient taxes tend to dominate inefficient taxes (Proposition 4), or that policies raising efficiency tend to have greater political support than policies lowering efficiency (Corollary to Proposition 3).

On the other hand, systematic and persistent differences in voting behavior among persons differing by income, education, age, and other characteristics may indicate that I have exaggerated the fragility of these preferences and the ease of "purchasing" votes (Sam Peltzman has argued this in an oral communication). Yet even small groups may be able to obtain enough votes by convincing many of the persons unaffected and some of those harmed to support policies that favor these groups, without altering the tendency for persons harmed to be more opposed than persons unaffected, or the latter to be more opposed than persons aided. Unfortunately, these brief and inadequate remarks on the interaction between voter ignorance and competition among pressure groups must suffice for the present.

VII. Summary and Conclusions

This paper presents a theory of the political redistribution of income and of other public policies that builds on competition among pressure groups for political favors. Active groups produce pressure to raise their political influence, where all influences are jointly de-

19. Note the insightful comments of Simon Newcomb in 1886: "... One cent per year out of each inhabitant would make an annual income of $500,000. By expending a fraction of [their] profit the proposers of policy A could make the country resound with appeals in their favor... *Thus year after year every man in public life would hear what would seem to be the unanimous voice of public opinion on the side opposed to the public interests*" [p. 459; my italics].

termined by the pressures produced by all groups. The political budget equation between the total amount raised in taxes and the total amount available for subsidies implies that the sum of all influences is zero, which has a significant effect on the competition among pressure groups.

Each group is assumed to maximize the income of its members under the simplifying (Cournot-Nash) assumption that additional pressure does not affect political expenditures of other groups. Equilibrium expenditures on pressure and equilibrium incomes of all groups are determined from these maximizing conditions, and from the political budget equation. I show that political equilibrium depends on the efficiency of each group in producing pressure, the effect of additional pressure on their influence, the number of persons in different groups, and the deadweight costs of taxes and subsidies.

Efficiency in producing pressure is partly determined by the cost of controlling free riding among members. Greater control over free riding raises the optimal pressure by a group and thus increases its subsidy or reduces its taxes. Efficiency is also determined by the size of a group, not only because size affects free riding, but also because small groups may not be able to take advantage of scale economies in the production of pressure.

Perhaps the most important variables in the analysis are the deadweight costs of taxes and subsidies that result from their effects on the allocation of time between work and "leisure," investments in human and nonhuman capital, consumption of different goods, and other behavior. Deadweight costs generally rise at an increasing rate as taxes and subsidies increase. An increase in the deadweight cost of a subsidy discourages pressure by the subsidized group because a given revenue from taxes then yields a smaller subsidy. An increase in the deadweight cost of a tax, on the other hand, encourages pressure by taxpayers because a given reduction in their taxes then has a smaller effect on the amount available as a subsidy. Consequently, deadweight costs give taxpayers an intrinsic advantage in the competition for influence. Groups that receive large subsidies presumably have managed to offset their intrinsic disadvantage by efficiency, an optimal size, or easy access to political influence.

Since deadweight costs to taxpayers fall as the tax per person falls, the opposition of taxpayers to subsidies decreases as the number of taxpayers increases. Therefore, groups can more readily obtain subsidies when they are small relative to the number of taxpayers. This may well explain why farmers in rich countries and urban dwellers in poor countries are politically successful.

All groups favor and lobby for efficient taxes (taxes with lower

deadweight costs) because these improve the welfare of subsidized as well as taxed groups, since taxpayers would produce less pressure. Efficient methods of subsidization raise subsidies and benefit recipients, but would harm taxpayers, unless recipients are induced to produce less pressure by a sufficiently rapid increase in their deadweight costs as their subsidy increases.

The analysis in this paper is relevant not only to taxes and subsidies that redistribute income—including regulations and quotas as well as explicit taxes and subsidies—but also to policies that raise efficiency by the production of public goods and the curtailment of other market failures. Policies that raise efficiency are likely to win out in the competition for influence because they produce gains rather than deadweight costs, so that groups benefited have the intrinsic advantage compared to groups harmed. Consequently, this analysis unifies the view that governments correct market failures with the view that they favor the politically powerful by showing that both are produced by competition among pressure groups for political favors.

Although numerous models of the political sector have been developed, successful modeling has been an elusive goal. I believe that the model of competition among pressure groups presented in this paper represents progress toward that goal; yet I recognize that progress has been obtained at the expense of various simplifying assumptions that should be modified. These include a neglect of voting, bureaucrats, politicians, and political parties. I partly justified the neglect of voting and the explicit formation of coalitions by arguing that even small groups may acquire enough votes by changing the opinions and preferences of voters because few voters have much incentive to be well informed.

Politicians and bureaucrats are assumed to carry out the political allocations resulting from the competition among pressure groups. Just as managers of firms are hired to further the interests of owners, so too are politicians and bureaucrats assumed to be hired to further the collective interests of pressure groups, who fire or repudiate them by elections and impeachment when they deviate excessively from these interests. However, just as managers acquire additional power when ownership and control are separated, bureaucrats and politicians may have significant political power (see Niskanen [1971]) when pressure groups cannot repudiate them easily. A more general analysis would incorporate this principal-agent relation between bureaucrats, politicians, and pressure groups into the determination of political equilibrium.

VIII. Mathematical Appendix

The second-order conditions to ensure that equations (15) and (16) give income-maximizing values of a_s and a_t are

$$\frac{d^2R_s}{da_s^2} = \frac{(I_{ss}(p_m^s)^2 + I_s p_{mm}^s)n_s}{G'} - \frac{I_s p_m^s G''}{(G')^2} < 0 \tag{A.1}$$

and

$$\frac{d^2R_t}{da_t^2} = \frac{(I_{tt}(p_m^t)^2 + I_t p_{mm}^t)n_t}{F'} + \frac{I_t p_m^t F''}{(F')^2} > 0, \tag{A.2}$$

where $I_s = I_s^s, I_t = I_t^s$, etc. Sufficient conditions are that $I_{ss} < 0, I_{tt} > 0, G'' > 0, F'' < 0$, and $p_{mm} \leq 0$.

The effect of a small change in a parameter α on the equilibrium values of p_s and p_t determined from equations (15) and (16) can be written in matrix notation as

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} \frac{dp_s}{d\alpha} \\ \frac{dp_t}{d\alpha} \end{bmatrix} = \begin{bmatrix} -s_\alpha \\ -t_\alpha \end{bmatrix}, \tag{A.3}$$

where s_α and t_α are the direct effects of a change in α on equations (15) and (16), respectively. Hence

$$\frac{dp_s}{d\alpha} = \frac{-s_\alpha a_{22} + t_\alpha a_{12}}{|A|}, \tag{A.4}$$

and

$$\frac{dp_t}{d\alpha} = \frac{s_\alpha a_{21} - t_\alpha a_{11}}{|A|}, \tag{A.5}$$

where $|A|$ is the determinant of the a_{ij} matrix.

The a_{ij} are determined by differentiating equations (15) and (16) with respect to any α:

$$a_{11} = \frac{I_{ss}p_m^s + (I_s p_{mm}^s)/p_m^s}{G'} - \frac{I_s G''}{(G')^2 n_s} < 0 \quad \text{by (A.1)} \tag{A.6}$$

$$a_{22} = \frac{I_{tt}p_m^t + (I_t p_{mm}^t)/p_m^t}{F'} + \frac{I_t F''}{(F')^2 n_t} > 0 \quad \text{by (A.2)} \tag{A.7}$$

$$a_{12} = \frac{I_{st}p_m^s}{G'} + \frac{I_s p_m^s F' G''}{(G')^3 p_m^t n_s} > 0 \quad \text{if } I_{st} \geq 0 \tag{A.8}$$

$$a_{21} = \frac{I_{ts}p_m^t}{F'} - \frac{I_t p_m^t G' F''}{(F')^3 p_m^s n_t} < 0 \quad \text{if } I_{ts} \leq 0. \tag{A.9}$$

The slope of s's reaction curve equals $-a_{12}/a_{11}$, and the slope of t's curve equals $-a_{21}/a_{22}$.

A reasonable dynamic extension of the Cournot-Nash equilibrium is each group chooses its pressure in any period while assuming that the pressure of the other group in the previous period is fixed.

If the pressures of t and s deviate in period $j-1$ from their equilibrium levels by the (small) amounts dp_t^{j-1} and dp_s^{j-1}, then the optimizing conditions for s and t given by equations (15) and (16) imply that

$$\begin{aligned} a_{11}dp_s^j + a_{12}dp_t^{j-1} &= 0 \\ a_{21}dp_s^{j-1} + a_{22}dp_t^j &= 0. \end{aligned} \tag{A.10}$$

Hence, by substitution

$$dp_s^j = \frac{a_{12}a_{21}}{a_{11}a_{22}}\, dp_s^{j-2}, \tag{A.11}$$

which implies that p_s and p_t return to their equilibrium values if

$$|A| = a_{11}a_{22} - a_{12}a_{21} > 0. \tag{A.12}$$

If α only directly affected either (14) or (15) so that t_α or $s_\alpha = 0$, then equations (A.4), (A.7), and (A.12) imply that

$$\operatorname{sgn}\frac{dp_s}{d\alpha_s} = \operatorname{sgn} s_\alpha = \operatorname{sgn}\frac{dp_t}{d\alpha_s} \quad \text{if } a_{21} < 0 \tag{A.13}$$

$$\operatorname{sgn}\frac{dp_t}{d\alpha_t} = -\operatorname{sgn} t_\alpha = \operatorname{sgn}\frac{dp_s}{d\alpha_t} \quad \text{if } a_{12} > 0. \tag{A.14}$$

Therefore, we can immediately derive the following:

(a) An increase in the marginal product of pressure by s raises pressure by s because

$$s_\alpha = \frac{I_s p^s_{m\alpha}}{G'} > 0 \quad \text{if } p^s_{m\alpha} > 0; \tag{A.15}$$

similarly for an increase in the marginal product of pressure by t.

(b) A reduction in the deadweight cost of subsidies raises pressure by s because

$$s_\alpha = \frac{-I_s p^s_m G'_\alpha}{(G')^2} < 0 \quad \text{if} \quad G'_\alpha = \frac{\partial^2 G}{\partial R_s \partial \alpha} > 0. \tag{A.16}$$

(c) A reduction in the deadweight cost of taxes reduces pressure by t because

$$-t_\alpha = \frac{I_s p^t_m F'_\alpha}{(F')^2} < 0 \quad \text{if} \quad F'_\alpha = \frac{\partial^2 F}{\partial R_t \partial \alpha} > 0. \tag{A.17}$$

(d) An increase in the number of s (n_s) would raise pressure by s if $p^s_{mn} \geq 0$ because

$$s_\alpha = \frac{I_s p^s_{mn}}{G'} + \frac{GG''}{n_s(G')^2} > 0 \quad \text{if } p^s_{mn} \geq 0. \tag{A.18}$$

The effect on the subsidy to s is considered in footnote 12.

(e) An increase in the number of t (n_t) would reduce pressure by t if $p^t_{mn} \leq 0$ because

$$t_\alpha = \frac{I_t p^t_{mn}}{F'} - \frac{FF''}{n_t (F')^2} > 0 \quad \text{if } p^t_{mn} \leq 0. \tag{A.19}$$

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