UNIVERSIDAD DE SAN ANDRÉS

Seminario del Departamento de Economía

"Learner and meaner? Size, concentration, and lobby formation."

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(Universitat Pompeu Fabra)

Martes 8 de agosto del 2000
11 hs.
Aula Chica de Planta Baja

Leaner and Meaner? Size, Concentration, and Lobby Formation

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July 2000

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[2]I am very grateful to Esther Hauk, Torsten Persson, David Strömberg, and Fabrizio Zilibotti for their useful comments and suggestions. Financial support from a CYCIT Research Grant from the Government of Spain is gratefully acknowledged. All errors are mine.

Abstract

This paper studies the roles played by group size and inequality on the sustainability of cooperation in lobbying activities through the implementation of trigger strategies. In the case of an egalitarian distribution and no fixed costs of lobbying, cooperation becomes less sustainable as group size grows. This result can be reversed when there are fixed costs of lobbying. Bigger inequality facilitates cooperation in large groups, but makes it more difficult in small groups.

1 Introduction

This paper studies the role that group size and asset ownership concentration play in the sustainability of cooperation in lobbying for protection. A widely held view is that political organization of special-interest groups becomes more difficult as the group is enlarged and as asset ownership becomes less concentrated. It is argued that in both cases there would be a bigger incentive to free-ride on the lobbying effort of other group members. The available empirical evidence seems to support this view. Olson (1965) provides a significant number of examples of sectors that have been able to form a lobby only when the number of producers had become relatively small. A highly sugestive example is given by the pattern of protection to agriculture accross countries. This sector is heavily taxed in poor agrarian economies, where farmers mostly remain politically inactive. The opposite happens in rich countries where farmers, which are politically very active, represent less than ten percent of the labor force (see Anderson, Hayami, and Honma, 1986).

However, the theoretical literature does not offer conclusive predictions in this regard.[1] A larger group size is likely to lead to a bigger provision of

[1]For instance, while Lohmann (1998) and Mitra (1999) find that cooperation becomes more difficult when size is increased, Pecorino (1998) finds that an increase in the number of producers has an ambiguous effect on the sustainability of cooperation.

the public good both under full cooperation and under the deviation of one member. The incentive to free ride will rise if the tariff under deviation grows faster. Aggregate contributions will also tend to rise, but the contributions per member may go up or down.[2] Free riding will become more attractive if the cost of lobbying per member goes up.

An increase in inequality alters both the distribution of the benefits from a tariff (larger producers benefit more) and the per member cost of lobbying. The effects of changes in size and concentration on these costs and benefits depend largely on how policy formation and lobby organization are modeled.

This paper develops a model that derives from first principles the costs and benefits of cooperating in lobbying activities. Although focus is placed on the determination of trade policies, the results are applicable to a wide range of policies that benefit specific groups at the expense of society. The problems of lobby formation and policy determination are modeled as a 3-stage game. In the first stage, producers in a given sector decide whether to cooperate in lobbying activities or to default. The lobby then seeks to maximize the joint welfare of its active members by entering a two-stage political contributions game with the politician, as in Grossman and Helpman (1994). Equilibrium tariffs and contributions will depend explicitly on fun-

[2] Additionally, if there were fixed costs of lobbying, each member's share in these costs would fall with group size.

damentals such as sectoral output, individual output, and preferences over consumption. Changes in sectoral size and in distribution will affect these fundamentals and the resulting tariffs and contributions.

The paper studies the sustainability of cooperation in a repeated game through the implementation of trigger strategies.[3] The punishment entails no lobbying for a given time lapse. In order for individuals to be willing to cooperate in influence activities, they must value enough the negative effect of a future punishment on their welfares. The critical discount factor for sustaining cooperation is derived as a function of tariffs and contributions under cooperation and under deviation.

In the case of an egalitarian distribution, cooperation becomes less sustainable as group size grows. The resulting rise in sectoral output raises tariffs both under cooperation and under deviation, and the per member contributions. However, the gain from deviating will rise relative to the loss from being punished in the future, leading to a bigger critical discount factor. The effect of a larger group size becomes ambiguous if fixed costs of lobbying are introduced. Each member's share of these costs could fall as group size grows, which could raise the benefits of cooperation enough to lower the critical discount factor. This result is derived from first principles, and should

[3] In a one-shot game an individual agent would always have the incentive to free ride on the others' lobbying efforts, and cooperation would not be sustainable.

be contrasted with Pecorino (1998), who found an ambiguous effect of size on the sustainability of cooperation.[4]

A novel contribution of the paper is the analysis of the effect of asymmetries in sectoral asset ownership on cooperation. In this setup, bigger inequality facilitates cooperation in large groups, but makes it more difficult in small groups. Richer individualss will benefit more from cooperation and will have smaller critical discount factors for participating in any coalition. In a large egalitarian group in which cooperation did not arise, an increase in inequality will induce some more endowed producers to form a coalition and to obtain positive protection. By the same token, in a small egalitarian group in which a grand coalition was formed, a regressive redistribution would create a group of poorer individuals that cannot be induced to cooperate. As a result, only a group of richer producers would participate in the lobby, leading to a smaller tariff. This result challenges the conventional view that concentration is unambiguously good for the formation of a lobby. Previous work that concluded that concentration always favors cooperation relies on the assumption that all the producers in the sector are identical.[5]

Section 2 reviews the related literature. Section 3 describes the economic

[4]Magee (2000) derives from first principles the conditions under which size undermines cooperation when tariffs are determined through bargaining. See the Literature Review.

[5]See Pecorino (1998), and Mitra (1999), for whom bigger concentration amounts to having a smaller number of identical producers holding equal shares of sectoral assets.

environment. The political determination of trade policies and campaign contributions and the sustainability of cooperation under equality are analyzed in section 3. Section 4 studies the implications of allowing for inequality in the distribution of sector-specific assets. Section 5 concludes.

2 Literature review

Pecorino (1998) studies the sustainability of cooperation by means of an ad hoc function that maps contributions into tariffs. He assumes that this tariff formation function applies regardless of whether firms lobby cooperatively or non-cooperatively. This certainly arguable, as one would expect the politician to have a larger bargaining power when lobbyists act non-cooperatively. He derives the tariffs and contribution under cooperation, deviation, and non-cooperation, and the critical discount factor for sustaining cooperation when the punishment implies a reversal to non-cooperation. He finds an ambiguous effect of group size on the sustainability of cooperation. This is because both the benefits of deviating and the cost of the punishment will move in the same direction. The lack of microfoundations in the derivation of tariffs and contributions prevents him from establishing which effect prevails.

Magee (2000) seeks to derive the tariff formation function from first principles. He analyzes an environment in which firms first act cooperatively in bargaining with the politician over a tariff formation function.[6] In a second stage firms take this function as given and choose their contributions either cooperatively or non-cooperatively. The same function applies regardless of whether firms cooperate or not. The criticisms made to Pecorino (1998) would also apply here. The critical discount factor is derived, finding that a larger size will facilitate cooperation when the government has little or no bargaining power.

The present paper contradicts Magee's result. Here the politician has no bargaining power and yet a larger size undermines cooperation. The key reason for this difference is not the nature of the punishment (non-cooperative lobbying vis-à-vis no lobbying) but the way in which the tariff under deviation is derived. In the present setup this tariff is proportional to the output of the *active* members, and grows at the same rate than group size, rapidly increasing the attractiveness of default.[7] Magee's tariff is proportional to a geometric mean of sectoral output and the output of the *active* members, and grows at a lower rate than group size.[8] This slower growth of the benefit

[6]Bargaining occurs over the campaign contribution schedule. The tariff formation function is derived by inverting the contribution schedule.

[7]In the present setup the lobby moves first, seeking to maximize the joint profits of the active members. The equilibrium tariff maximizes a weighted average of aggregate welfare and lobby's profits, and is proportional to the number of members of the lobby.

[8]This results again from the fact that firms have first cooperated in the agreement over the contributions schedule, and that this contribution schedule will be the same under cooperation, deviation or non-cooperation. As a result the tariff under deviation will be proportional to the square root of the cooperative contribution minus the defaulter's share.

of deviating is not enough to compensate the increase in the harshness of the punishment, thus reducing the critical discount factor.

Mitra (1999) analyzes simultaneous lobby formation in a static general equilibrium model where there is a fixed organizational cost. Once this cost is incurred, the lobby has the power to enforce the payment of the contributions. He studies whether cooperation in the payment of the fixed cost can be an equilibrium in a one-shot game, finding that this will depend on the size of this cost and on the political status of other sectors. He also finds that smaller sectors are more likely to get organized. Lohmann (1998) studies cooperation in lobbying in the presence of asymmetric information, finding also that smaller groups are more likely to cooperate.

What none of these papers do is to study the effect of asymmetries in asset holdings on the sustainability of cooperation. This is done in the present paper, where very interesting results are derived. Namely, that the effect of inequality on cooperation depends crucially on the size of the sector.

3 Economic environment

Two goods X and Y are produced, consumed and traded in this small open economy. Taking the good Y as numeraire, the domestic relative price is $p_x = p_x^* + t_x$, where p_x^* is the world price and t_x is a specific tariff. Preferences over consumption are quasi-linear $U = u(d_x) + d_y$, $u(d_x) = \beta d_x - \frac{d_x^2}{2}$, where d_x and d_y respectively denote the consumption levels of X and Y. With these preferences, demand schedules are given by $d_x(p_x) = \beta - p_x$, and $d_y(p_x; E) = E - p_x d_x(p_x)$, where E stands for consumption expenditure. An individual's welfare is measured by his indirect utility function $V[p_x, E] = E + S(p_x)$, where $S(p_x) = u(d_x(p_x)) - p_x d_x(p_x) = \frac{(\beta - p_x)^2}{2}$ measures consumer surplus.

The two goods are produced under linear technologies that employ only sector-specific labor. Each individual i owns either $\mu(i)$ efficiency units of sector X-specific labor or one efficiency unit of sector Y-specific labor. Total outputs are given by $X = \int_0^{l_x} \mu(j)\, dj$ and $Y = l_y$, where l_x and l_y are the respective sectoral employment levels. Normalizing population size to one, $l_x + l_y = 1$. Aggregate welfare is defined as the sum of the welfare of all individuals, given by $W = p_x X + Y + t_x M_x + S(p_x)$, where $t_x M_x = t_x [d_x(p_x) - X]$ represents tariff revenues, which are re-distributed in a lump-sum fashion. The welfare maximizing policy in this economy is free trade.

4 Lobby formation and policy determination

This section models the problems of lobby formation and policy determination as a three-stage political contributions game à la Grossman and Helpman (1994). In the first stage X-specific labor owners must decide whether they will participate in the lobbying effort or not. Focus is placed on symmetric equilibria where each agent's share in the political contributions is proportional to his relative size in the group. In the second stage the lobby collects the contributions, which are then offered to the politician in exchange for a tariff. Contributions are chosen so as to maximize the joint welfare of the *politically active* individuals in X. In the third stage the government will implement the tariff that maximizes its welfare. It is assumed that the politician has the power to enforce the payment of the contributions.

Solving the game by backward induction, it is shown that in a one-shot game an individual producer will always have the incentive to deviate when the others cooperate. It is next analyzed whether cooperation can be sustained as an equilibrium in a repeated game through the implementation of trigger strategies. The effects of changes in group size and in asset ownership concentration on the sustainability of cooperation are then analyzed.

4.1 Endogenous trade policies and contributions

This subsection solves the last two stages of the campaign contributions game. In the second stage the lobby offers the government a contribution contingent on the tariff implemented. In the third stage the politician implements tariff that maximizes a weighted average of aggregate welfare and campaign contributions from the X sector lobby.

The lobby will seek to maximize the joint welfare of its members. Let us consider the case of a grand coalition where all owners of X-specific labor participate in the lobbying effort. The joint welfare of this group is given by $p_x X + \alpha_x \left[t_x M_x + S\left(p_x\right)\right] - C_x\left(t_x\right)$, where α_x represents the share of X-producers in the total population, and $C_x\left(t_x\right)$ denotes the contribution that the lobby will pay the politician. Assuming that l_x is a continuum of small agents with measure zero, the lobby will take α_x as being equal to zero. It will then choose a contribution schedule to maximize $p_x X - C_x\left(t_x\right)$.

Faced with the contribution schedule offered by the lobby, the government will choose the tariff that maximizes $W + aC_x\left(t_x\right)$, where the parameter a represent's the marginal rate of substitution between aggregate welfare and campaign contributions in the politician's preferences. As shown in Grossman and Helpman (1994), focusing on truthful Nash equilibria, the equilibrium tariffs will maximize a weighted average of aggregate welfare and the gross-of-contributions welfare of the lobbyists, $W + ap_x X$. The equilibrium tariff under full cooperation, t_x^c, will be given by:

$$t_x^c = aX \qquad (1)$$

Since this single organized lobby moves first, it has full bargaining power and captures all the surplus in its relationship with the government. Playing truthful Nash equilibria, the lobby offers a contribution that leaves the politician indifferent between granting and not granting protection: $C_x(t_x^c) = \frac{1}{a}\left[W(p_x^*) - W(p_x^* + t_x^c)\right]$. Solving for this expression, the contribution is given by:

$$C_x(t_x^c) = \frac{t_x^{c2}}{2a} \tag{2}$$

With a fixed allocation of sector specific labor there is no distortion in production, and the welfare loss is given by the loss of consumer surplus net of tariff revenues. This loss is measured by the half square of the tariff, the usual Harberger triangle.

If an individual i chose not to participate in the lobbying effort at the first stage of the game, then the lobby's objective would be to maximize the joint welfare of participating producers, measured by $p_x(X - \mu(i)) - C_x(t_x)$. The equilibrium tariff in this case will maximize a weighted average of aggregate welfare and the gross of contributions welfare of the politically active members of sector X, $W + ap_x(X - \mu(i))$. This tariff is given by

$$t_x^d(i) = a(X - \mu(i)) \tag{3}$$

4.2 Group size and political participation

In the first stage of the game X-specific labor owners must decide whether they will contribute to the lobbying effort or not. It will be initially assumed that $\mu(i) = \mu$ for all the individuals in X. If all these producers cooperate by paying an equal share of the total contribution, the benefit each of them derives is $\varpi^c = (p_x^* + t_x^c)\mu - c_x$, where $c_x = \frac{C_x(t_x^c)}{l_x}$ stands for the per member contribution.[9] If, on the other hand, one producer chose not to participate in the lobbying effort when all the others do, he would derive a benefit given by $\varpi^d = (p_x^* + t_x^d)\mu$. Since $\varpi^d - \varpi^c = (t_x^d - t_x^c)\mu + c_x = a\mu\left[\frac{X}{2} - \mu\right] > 0$, in a one-shot game an individual producer would always prefer to deviate. All members of X would do the same, and no lobby would be formed.

In order to sustain cooperation, all members may agree to sign a contract that will commit them to a course of action that would violate subgame perfection in order to punish a deviating member. This contract would specify that in case any agent did not participate in lobbying activities this period, then no lobbying would be done next period. Lobbying activities would resume after this period of punishment. To make this threat credible, it will be assumed that the cost of renegotiating this contract is prohib-

[9]It is assumed that each individual in X is infinitesimal relative to the population, so that his participation in tariff revenues is basically equal to zero. It is additionally assumed that the consumer surplus for these individuals is extremely small relative to production income. Hence they care only about the effect of the tariff on the value of production.

itely high. The welfare of an individual during the period of punishment would be given by $\varpi^n = p_x^*\mu$. Cooperation would become sustainable only if $\varpi^d + \delta\varpi^n + \sum_{t=2}^{\infty}\delta^t\varpi^c \leq \sum_{t=0}^{\infty}\delta^t\varpi^c$. Fulfillment of this condition requires that the X-producers have a discount factor that is greater or equal than the following critical discount factor:

$$\delta^* = \frac{\varpi^d - \varpi^c}{\varpi^c - \varpi^n} \tag{4}$$

Indivdiuals with a discount factor larger than δ^* value enough the future as to derive a present loss from next period's punishment that exceeds the benefit from deviating in the present period. In such case they will always prefer to participate in lobbying activities.[10]

The number of producers in X affects the critical discount factor through its effects on tariffs and on aggregate and per member contributions.

Proposition 1 *The critical discount factor for sustaining cooperation in lobbying activities through the implementation of trigger strategies increases with group size.*

Proof. The critical discount factor can be re-expressed as $\delta^* = \frac{t_x^d\mu-(t_x^c\mu-c_x)}{(t_x^c\mu-c_x)} =$

[10]Punishing deviation by a more protracted interruption of lobbying activities would reduce the critical discount factor for cooperation. If the punishment were to stop lobbying forever, the critical discount factor would become $\delta^*(\infty) = \frac{\varpi^d-\varpi^c}{\varpi^d-\varpi^n} < \delta^*$. This inequality follows from the fact that $\varpi^d - \varpi^n > \varpi^c - \varpi^n$.

$\frac{X-2\mu}{X}$. Differentiating with respect to the number of producers, it is found that $\frac{d\delta^*}{dl_x} = \frac{2\mu^2}{X^2} > 0$. ∎

As the number of individuals in X grows, the payoff from deviating for one period rises faster than the corresponding punishment. Hence producers should become more patient in order not to deviate from cooperation. For a given degree of impatience, cooperation in lobbying activities is thus more probable to occur in smaller groups.

The critical discount factor can be re-expressed as $\delta^* = \frac{t_x^d \mu}{t_x^c \mu - c_x} - 1$. It will go up if the income gains from deviating $(t_x^d \mu)$ grow than the gains of cooperating $(t_x^c \mu - c_x)$. An enlargement of the group will raise sectoral output and the marginal benefit of a tariff by μ both when all members cooperate and when one member deviates. This will lead to an identical increase by $a\mu$ in the tariffs under cooperation and under deviation, but the latter will increase proportionally more. On the other hand, the per member contribution, $c_x = \frac{t_x^c \mu}{2}$, will increase by $\frac{a\mu^2}{2}$ every time the sector is enlarged, which further reduces the income gains under cooperation.[11] Therefore the incentive to free ride will be become bigger when the number of producers goes up, reducing the sustainability of cooperation. This result

[11] The aggregate contribution reflects the deadweight loss from protection, measured by half the square of the tariff (the Harberger triangle). Since the tariff grows linearly with output, then the aggregate contribution grows faster than the number of producers, leading to a rise in the per member contribution.

is independent of the duration of the punishment.[12] [13]

It could be argued that lobbying activities additionally require fixed costs, like "the costs of of communication among group members, the costs of bargaining among them, and the costs of creating, staffing, and maintaining any formal group organization" (Olson, 1965, p. 47). In this vein let us assume that each period a fixed cost Q has to be incurred in addition to the campaign contributions. Each member of the lobby would have to pay $q = Q/l_x$. Producer's welfare under cooperation would be given by $\varpi^c = (p_x^* + t_x^c)\mu - c_x - q$.

Proposition 2 *In the presence of fixed costs of lobbying, the critical discount factor for sustaining cooperation through the implementation of trigger strategies may go up or down with group size.*

Proof. The critical discount factor will be $\delta^* = \frac{t_x^d \mu}{t_x^c \mu - c_x - q} - 1 = \frac{X - \mu}{\frac{X}{2} - \frac{q}{a\mu}} - 1$. Differentiating with respect to size, $\frac{d\delta^*}{dl_x} = \frac{\left(\frac{\mu^2}{2} - \frac{k}{a}\right) - \frac{X-\mu}{a\mu}\frac{\partial k}{\partial l_x}}{\left(\frac{X}{2} - \frac{k}{a\mu}\right)^2}$. The sign of this derivative is ambiguous. ■

Sufficient conditions for $\frac{d\delta^*}{dl_x} < 0$ are that $\frac{\partial q}{\partial l_x} \leq 0$ and that $\frac{a\mu^2}{2} \leq q$, with

[12] The critical discount factor for sustaining cooperation when the punishment lasts more periods will also increase with sectoral size. When the punishment entails to stop lobbying forever, the critical discount factor becomes $\delta^*(\infty) = \frac{\varpi^d - \varpi^c}{\varpi^d - \varpi^n} = \frac{\left(\frac{X}{2} - \mu\right)}{X - \mu}$. The effect of a change in sectoral size is $\frac{d\delta^*(\infty)}{dl_x} = \frac{1}{2}\left(\frac{\mu}{X-\mu}\right)^2 > 0$.

[13] The case where the size X is non-negligible relative to the total population is worked out in Appendix C, available upon request. The critical discount factor for cooperation will be growing initially with size, and then will start to decline at a slow rate. It is shown that there will always exist a range of discount factors at which cooperation will arise in a small group, but will not do so in a large group.

at least one inequality holding strictly. It would seem reasonable to assume that the fixed costs per member would not grow with size, $\frac{\partial q}{\partial l_x} \leq 0$. It is not obvious that $\frac{a\mu^2}{2} \leq q$, should hold.[14] If $\frac{\partial q}{\partial l_x} < 0$, it is possible that $q < \frac{a\mu^2}{2}$ when all members cooperate, rendering the sign of $\frac{d\delta^*}{dl_x}$ ambiguous.[15]

The above results have been obtained assuming that the punishment entails reversal to no lobbying instead of a reversal to non-cooperative lobbying. The equilibrium when producers in a same sector act non-cooperatively in this kind of campaign contributions game has not been formally derived.[16] In Appendix B, available upon request, it is shown that such an equilibrium in this setup would entail a tariff $t_x^n = a\mu$, which depends only on individual output. Total contributions would still have to compensate the politician for the welfare losses of the tariff, $C_x\left(t_x^n\right) = \frac{a\mu^2}{2}$. There would be more than one equilibrium regarding individual contributions. One equilibrium would entail an equal share of the total contribution for each producer, $c_x\left(t_x^n\right) = \frac{a\mu^2}{2l_x}$, which falls with the number of producers.[17] If the punishment for deviating

[14]If $\frac{\partial q}{\partial l_x} = 0$, then $q \geq \frac{a\mu^2}{2}$ would entail that unilateral lobbying is not feasible. If only one individual were to lobby the tariff would be $t_x = a\mu$, the contribution $C_x = \frac{a\mu^2}{2}$ and the benefit from lobbying $\frac{a\mu^2}{2} - q$.

[15]A decline in each member's share of the fixed costs as size grows could raise the benefits of cooperation enough to require a lower discount factor to sustain cooperation.

[16]Magee (2000) has a proposed a solution in which firms in a sector first act cooperatively in bargaining with the politician over a campaign contribution schedule. In a second stage each firm takes this contribution schedule as given and chooses its contribution either cooperatively or non-cooperatively. The same contribution schedule applies regardless of whether firms cooperate or not. This is certainly arguable, as one would expect the politician to have a larger bargaining power when dealing non-cooperating lobbyists.

[17]Another equilibrium would have only one producer paying the total contribution and

entailed reversion to non-cooperation for one period, the critical discount factor would be $\delta^* = \frac{t_x^d\mu - (t_x^c\mu - c_x(t_x^c))}{(t_x^c\mu - c_x(t_x^c)) - (t_x^n\mu - c_x(t_x^n))}$, which would still go up with group size (see Appendix B). As the benefit of non-cooperation rises with group size, the punishment would become now less severe, calling for a bigger increase in the critical discount factor.[18]

4.3 Ownership distribution and political participation

Now assume a continous distribution of efficiency units of X-specific labor, and rank individuals according to their asset holdings so that $\mu'(i) > 0$. Aggregate output and the total number of producers in the sector will be held constant throughout the analysis. As before, the organized lobby will seek to maximize the joint welfare of those producers who choose to participate in the lobbying effort. Given the unequal distribution of sector-specific assets, X-producers will have different stakes in the political process. It will hence be possible to have lobbying coalitions that do not include all the individuals in this sector. The tariff under cooperation by a measure of producers $[h, k]$ $(h \geq 0,\ k \leq l_x)$ will be given by $t_x^c([h,k]) = a\int_h^k \mu(i)\,di$. The aggregate

the rest not contributing. The identity of the contributor would be indeterminate.

[18]It is also possible to apply Magee's proposed solution in this setup, assuming that producers have all the bargaining power. Tariffs and contributions would be the same, except for the tariff under deviation, which in Magee would be given by $t_x^d = a\sqrt{X(X-\mu)}$ (see Appendix B). In such case a bigger size would facilitate cooperation, as the benefits of deviating will grow relatively slowly with size.

contribution will be $C_x\left(t_x^c[h,k]\right) = \frac{t_x^c([h,k])^2}{2a}$. The share of each member in the aggregate contribution will now be given by his participation in the joint output of the coalition, $\frac{\mu(i)}{\int_h^k \mu(i)di}$. If an individual $i \in [h,k]$ does not cooperate, the lobby will seek to maximize $p_x\left(\int_h^k \mu(j)\,dj - \mu(i)\right) - C_x(t_x)$, and the resulting tariff will be $t_x^d(i,[h,k]) = a\left[\int_h^k \mu(j)\,dj - \mu(i)\right]$.

The welfare that producer i derives from participating in a coalition of measure $[h,k]$ is $\varpi^c(i,[h,k]) = (p_x^* + t_x^c([h,k]))\mu(i) - \frac{\mu(i)}{\int_h^k \mu(i)di} C_x\left(t_x^c[h,k]\right)$. If he chose not to cooperate, he would get $\varpi^d(i,[h,k]) = \left(p_x^* + t_x^d(i,[h,k])\right)\mu(i)$.

Proposition 3 *Cooperation in influence activities in a one-shot game will not be possible for any coalition when assets are unequally distributed.*

Proof. See Appendix. ■

In any coalition the least endowed member will always prefer to deviate when all the other members cooperate. The fall in the tariff when this individual deviates is proportional to his output. On the other hand, the contribution is proportional to half the joint output of the coalition.[19] Since the output of the least endowed member is never bigger than half the joint output, he will always be better off by deviating.

It is next inquired whether cooperation can be sustained by any coalition in a repeated game through the implementation of trigger strategies when

[19]The contribution is proportional to half the tariff (the Harberger triangle), which is in turn proportional to half the joint output of the coalition.

there is inequality. It will be assumed that in the first stage the members of a sustainable coalition that may include all or some of the individuals in X will be announced. A contract will then be signed such that if any of the potential members of this coalition deviates, then *no producer* in X will engage in lobbying activities the following period. This trigger strategy is necessary for the sustainability of cooperation. Non-members would be willing to sign this contract, which would allow them to free ride on the lobbying effort of the coalition.[20]

Let us consider the sustainability of cooperation by a coalition of size $[h,k]$, $(h \geq 0,\ k \leq l_x)$. Free trade attains when the punishment is applied, generating a welfare $\varpi^n(i) = p_x^* \mu(i)$ for each producer i. In order for an individual agent i not to deviate, it is necessary that $\varpi^d(i,[h,k]) + \delta \varpi^n(i) \leq \varpi^c(i,[h,k])(1+\delta)$, or that $\delta \geq \frac{\varpi^d(i,[h,k]) - \varpi^c(i,[h,k])}{\varpi^c(i,[h,k]) - \varpi^n(i)}$. Substituting for the equilibrium tariffs and contributions, the critical discount factor for individual $i \in [h,k]$ not to deviate is given by:

$$\delta^*(i,[h,k]) = 1 - \frac{2\mu(i)}{\int_h^k \mu(j)\,dj} \tag{5}$$

Proposition 4 *Less endowed individuals will have bigger critical discount*

[20] In Appendix B it is shown that if non-cooperative lobbying were allowed to any subset of producers, then cooperation would never be sustainable.

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factors for sustaining cooperation in any coalition.

Proof. It follows from differentiating (5) with respect to $\mu(i)$. ■

The reason for this result is that the cost of deviating, $\varpi^c(i,[h,k]) - \varpi^n(i) = \frac{a\int_h^k \mu(j)dj}{2}\mu(i)$, is proportional to the individual's sectoral assets; the bigger his productivity, the more a producer benefits from a tariff under cooperation. On the other hand, the benefit from deviating, $\varpi^d(i,[h,k]) - \varpi^c(i,[h,k]) = a\left(\frac{\int_h^k \mu(j)dj}{2} - \mu(i)\right)\mu(i)$, will increase less than proportionally (and may even fall) as individual i's asset holdings rise. This is because larger assets not only lead to a bigger gain from a given tariff under deviation, but also to a smaller tariff under deviation. Hence the more endowed an individual the smaller his incentive to deviate and his critical discount factor.

Corollary 5 *The critical discount factor for participating in influence activities will become lower whenever the size of a coalition is reduced.*

Proof. $\delta^*(i,[\tilde{\imath},k]) = 1 - \frac{2\mu(i)}{\int_{\tilde{\imath}}^k \mu(j)dj} < 1 - \frac{2\mu(i)}{\int_h^k \mu(j)dj} = \delta^*(i,[h,k])$ whenever $\tilde{\imath} < h$. ■

The joint output of the coalition will fall as the number of members is reduced. The resulting tariffs under deviation and under cooperation will fall by the same amount, but the former will fall proportionally more. Hence the incentives to deviate and the critical discount factor will be reduced.

Proposition 6 *In the case where the critical discount factor of the least endowed individual for sustaining a grand coalition is below the actual discount factor ($\delta^*(0,[0,l_x]) < \delta$), the formation of a grand coalition would be sustainable as an equilibrium.*

Proof. By Proposition 3, $\delta^*(i,[0,l_x]) < \delta$ for all $i \in [0,l_x]$, and a grand coalition is sustainable. ■

By Corollary 4 smaller coalitions would also be sustainable. However, it would be in the interest of the most endowed producers to enforce a grand coalition by threatening the least endowed ones with the implementation of trigger strategies, since $\varpi^c(i,[0,l_x]) = (p_x^* + \frac{aX}{2})\mu(i) > \varpi^c(i,[\tilde{\imath},l_x]) = (p_x^* + \frac{a\int_{\tilde{\imath}}^{l_x}\mu(j)dj}{2})\mu(i)$, $\tilde{\imath} > 0$.

If the critical discount factors of some or all individuals for sustaining a grand coalition exceeded the actual discount factor, then cooperation of all producers in lobbying activities would not be an equilibrium.

Proposition 7 *a) If the critical discount factor of some individuals for sustaining a grand coalition exceeded the actual discount factor, then only the formation of a small coalition of more endowed individuals would be sustainable as an equilibrium. b) Starting from such an equilibrium, an increase in inequality is expected is expected to reduce the size of the lobbying coalition.*

Proof. See Appendix. ■

The proof of part (a) of the proposition entails showing that the critical discount factor for the least endowed individual in a coalition declines as the number of members is reduced. This ensures that there will exist an individual $\hat{\imath}$ ($0 < \hat{\imath} < l_x$) whose critical discount factor for entering a coalition in which he is the least endowed member will be equal to the actual discount factor. All less endowed producers will not be willing to enter this coalition. The opposite will hold for the more endowed ones (see Figure 1). Proof of part (b) requires showing that bigger inequality will generally increase the endowment of the politically marginal individual proportionally less than for more endowed producers, raising his critical discount factor (see Figure 2).

Corollary 8 *If the critical discount factor for sustaining a grand coalition exceeds the actual discount factor for all producers, then there can still exist an equilibrium that involves a small coalition.*

Proof. See Appendix. ■

The critical discount factor for the least endowed member of a coalition tends to zero as the number of participants tends to two, and becomes equal to zero whenever the two richest individuals are equally endowed. Hence for any positive discount factor there should exist some measure of more endowed producers that are willing to cooperate (see Figure 2).[21]

[21] A unique equilibrium without a lobbying coalition could arise only if the there were a

4.4 Size, distribution, and cooperation

By Proposition 1, in a large sector with an egalitarian distribution, where $\delta^* (i, [0, l_x]) > \delta$ for all i, cooperation would not be sustainable. By Proposition 3 and Corollary 4, a redistribution that transferred efficiency units from some group of producers to another group would facilitate the political organization of the latter. A coalition of some more endowed individuals would now be willing to cooperate in lobbying activities. This sector would then receive positive protection.

By the same token, in a small egalitarian sector, where $\delta^* (i, [0, l_x]) < \delta$ for all i, a grand coalition would be sustainable, and this sector would receive the highest possible tariff. By Proposition 3 and Corollary 4, a redistribution that renders $\delta^* (i, [0, l_x]) > \delta$ for some producers would create a group of poorer individuals that cannot be induced to cooperate. As a result cooperation only among a group of richer producers would be sustainable. The smaller participation in the lobby would lead to a smaller tariff. These relations between size, distribution, and organization can be summarized in the following proposition.

Proposition 9 *Large egalitarian groups are expected to have no political or-*

very big gap between the productivities of the two most endowed individuals. In such case the critical discount factor for the second most endowed producer would be positive, but very low. In the presence of a positive, but very low, actual discount factor, cooperation would not be sustainable.

ganization and to receive no protection. Large groups with an unequal distribution are expected to have a lobby formed by a small coalition of richer producers, and to receive some positive protection. Small egalitarian groups are expected to have all their members participating in the lobby, and to receive the highest possible protection for the group. Small groups with an unequal distribution are expected to have a lobby formed by a smaller coalition, and to receive less protection.

5 Conclusions

This paper analyzes the sustainability of cooperation in lobbying activities in a repeated campaign contributions game through the implementation of trigger strategies. The paper derives from first principles the costs and benefits from cooperating and from deviating in lobbying for a tariff. It is found that an increase in group size reduces the sustainability of cooperation, confirming the widely held view is that political organization of special-interest groups becomes more difficult as the group is enlarged (see Olson, 1965). When the sectoral size goes up, the tariff under deviation grows proportionally more than the tariff under cooperation, and the per member contribution grows as well, raising the incentives to deviate. Therefore cooperation will become less sustainable when the special-interest group is enlarged.

The paper further inquires into the effects of asset ownership concentration on the sustainability of cooperation. It is found that the more endowed a producer is, the bigger is the fall in the tariff if he deviates. Hence more productive individuals will benefit more from cooperation by any coalition and will have smaller critical discount factors. Bigger inequality will facilitate cooperation by some members of a large group in which cooperation would break down under equality. On the other hand, larger concentration will reduce the scope for cooperation by *all* members of a small group in which a grand coalition would be sustained under equality. Concentration will then be good for cooperation in a large group but it will bad in a small group. This challenges the conventional view that concentration is unambiguously good for the formation of lobby (see Olson, 1965). This is one of the main and novel contributions of the paper, and it arises from analyzing the effects of concentration when producers have different productivities.[22]

[22] Previous work that concluded that concentration always favors cooperation relies on the assumption that all the producers in the sector are identical (see Mitra, 1999; Pecorino, 1998).

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6 Appendix

Proof of Proposition 2.

If types $j \in [h,k]$, $h \geq 0$, $k \leq l_x$, were to jointly lobby, the welfare of the least endowed member would be $\varpi^c(h,[h,k]) = (p_x^* + \frac{a\int_h^k \mu(j)dj}{2})\mu(i)$. If he were to deviate, his welfare would be $\varpi^d(h,[h,k]) = (p_x^* + a\left(\int_h^k \mu(j)\,dj - \mu(h)\right))\mu(h)$. This individual would always prefer to deviate, since $\varpi^d(h,[h,k]) - \varpi^c(h,[h,k]) = a\left(\frac{\int_h^k \mu(j)dj}{2} - \mu(h)\right)\mu(h) > 0$, given that $\frac{\int_h^k \mu(j)dj}{2} - \mu(h) > 0$.

Proof of Proposition 6.

If $\delta^*(i,[0,l_x]) > \delta$ for all $i \in [0,\tilde{\imath})$, $\delta^*(\tilde{\imath},[0,l_x]) = \delta$, and $\delta^*(i,[0,l_x]) < \delta$ for all $i \in (\tilde{\imath}, l_x]$, the first group of producers cannot be induced to enter a grand coalition through the implementation of trigger strategies. The opposite would hold for the second group. A coalition of measure $[\tilde{\imath}, l_x]$ would not be an equilibrium since, by Corollary 4, $\delta^*(\tilde{\imath},[\tilde{\imath},l_x]) < \delta^*(\tilde{\imath},[0,l_x]) = \delta$, and by Proposition 3 there will be a measure of less endowed individuals $i < \tilde{\imath}$ for whom $\delta^*(i,[\tilde{\imath},l_x]) < \delta$. Let $\delta^*(i,[i,l_x]) = 1 - \frac{2\mu(i)}{\int_i^{l_x}\mu(j)dj}$ be the critical discount factor for i to enter a coalition where he is the least endowed member. Since $\frac{d\delta^*(i,[i,l_x])}{di} = -2\left(\frac{\mu'(i)\int_i^{l_x}\mu(j)dj + \mu(i)^2}{\left(\int_i^{l_x}\mu(j)dj\right)^2}\right) < 0$, there will exist a type $\hat{\imath}$ $(\hat{\imath} < \tilde{\imath})$ for whom $\delta^*(\hat{\imath},[\hat{\imath},l_x]) = \delta$. All higher types will have $\delta^*(i,[\hat{\imath},l_x]) < \delta$, and all lower types will have $\delta^*(i,[\hat{\imath},l_x]) > \delta$. A coalition of size $[\hat{\imath}, l_x]$ would then be sustainable. This proves part (a).

Now let $d\mu(i) < 0$ for all $i < \bar{\imath}$, $d\mu(\bar{\imath}) = 0$, and $d\mu(i) > 0$ for all $i > \bar{\imath}$, where $\bar{\imath}$ $(0 < \bar{\imath} < l_x)$ is some arbitrary type. Further assume that $\int_0^{l_x} d\mu(j)\, dj = 0$, and that $d\mu(i) < d\mu(h)$ whenever $i < h$. The effect of this redistribution on the critical discount factor for the least endowed member of a coalition will given by $d\delta^*(i,[i,l_x]) = 2\left(-\frac{d\mu(i)}{\int_i^{l_x}\mu(j)dj} + \frac{\mu(i)\int_i^{l_x} d\mu(j)dj}{\left(\int_i^{l_x}\mu(j)dj\right)^2}\right)$. The sign of this differential is equal to the sign of $\frac{\int_{i'}^{l_x} d\mu(j)dj}{\int_{i'}^{l_x}\mu(j)dj} - \frac{d\mu(i)}{\mu(i)}$, where $i' = i + di$. Since $\int_0^{l_x} d\mu(j)\, dj = 0$, and $d\mu(i) < d\mu(h)$ whenever $i < h$, then $\int_{i'}^{l_x} d\mu(j)\, dj > 0$ for all i. This means that $\frac{d\mu(i)}{\mu(i)} \leq 0 < \frac{\int_{i'}^{l_x} d\mu(j)dj}{\int_{i'}^{l_x}\mu(j)dj}$, and that $d\delta^*(i,[i,l_x]) > 0$ for all $i \leq \bar{\imath}$. Hence if $\hat{\imath} \leq \bar{\imath}$, the maximum number of members falls. For all $i > \bar{\imath}$, $0 < d\mu(i) < \int_{i'}^{l_x} d\mu(j)\, dj$. Redistribution could be such that $\frac{d\mu(i)}{\mu(i)} < \frac{\int_{i'}^{l_x} d\mu(j)dj}{\int_{i'}^{l_x}\mu(j)dj}$ for all $i > \bar{\imath}$, in which case $d\delta^*(i,[i,l_x]) > 0$, and the maximum number of members is reduced. But it could also be such that there exists a type $\check{\imath} > \bar{\imath}$ such that $\frac{d\mu(i)}{\mu(i)} > \frac{\int_{i'}^{l_x} d\mu(j)dj}{\int_{i'}^{l_x}\mu(j)dj}$ for all $i > \check{\imath}$. If $\hat{\imath} > \check{\imath}$, $d\delta^*(i,[i,l_x]) < 0$ in the vicinity of $\hat{\imath}$, and the maximum number of participants rises.

Proof of Corollary 7.

In the proof of Proposition 6 it was shown that $\frac{d\delta^*(i,[i,l_x])}{di} < 0$. It can further be shown that $\delta^*(i,[i,l_x]) = 1 - \frac{2\mu(i)}{\int_i^{l_x}\mu(j)dj}$ tends to zero as the number of members goes to two. Consider a coalition between the two most endowed producers. The critical discount factor for the less endowed one (denoted by

l'_x) would be: $\delta^*\left(l'_x, [l'_x, l_x]\right) = 1 - \frac{2\mu(l'_x)}{\mu(l'_x)+\mu(l_x)} > 0$, as long as $\mu\left(l'_x\right) < \mu\left(l_x\right)$. This discount factor tends to zero as as $\mu\left(l'_x\right)$ approaches $\mu\left(l_x\right)$. In such case a coalition between them could always be sustained. If on the other hand $\mu\left(l'_x\right) < \mu\left(l_x\right)$, then only some very low discount factor could strictly prevent cooperation.