Lobbying a Reciprocal Policymaker

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Abstract

We extend lobbying theory by assuming that the policymaker has reciprocal preferences. When the lobby's contribution is above (below) a reference contribution a reciprocal policymaker considers the behavior of the lobby to be kind (unkind) and chooses a(n) kind (unkind) policy. We show that if the reference contribution is small and the policymaker is highly responsive to kind behavior of the lobby, then the lobby obtains a more favorable policy offering lower contributions. This result provides a new explanation for Tullock's paradox: the empirical fact that lobbying contributions are small relative to the value of the policies at stake.

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1 Introduction

Tullock's paradox is a long-standing puzzle in the lobbying literature. While there is a popular perception that there is too much money in politics, empirical evidence shows that lobbying contributions are extremely small with respect to the enormous interests involved in the policymaking process.[1]

For example, the Farm Security and Rural Investment Act of 2002 states that "dairy producers, who since 1996 have had to have subsidies renewed annually, gave 1.3 million in 2000 and received price supports worth almost 1 billion." According to Chamon and Kaplan (forthcoming) "The sugar program provides subsidies and huge tariff and non-tariff protection to U.S. producers. The General Accounting Office estimates that the sugar program led to a net gain of over one billion dollars to the sugar industry in 1998. However, the sugar industry's total campaign contributions in the two years of that election cycle were a mere \$2.8 million (1.5 thousandths of the net gain from the sugar program)." Ansolabehere et al. (2003) show that campaign contributions represent only 0.5 percent of GDP and discuss a number of other similar examples.

In this paper we offer a new explanation for Tullock's paradox: if a policymaker considers the lobby's contribution to be kind and is sufficiently responsive to kind behavior of the lobby, then positive reciprocity of the policymaker leverages lobbying contributions. To make this point we generalize Grossman and Helpman's (2001) model of lobbying by relaxing the assumption that the policymaker is self-interested.[2]

In Grossman and Helpman (2001) a lobby offers a contribution to a policymaker

[1] Tullock (1972) was the first to point out that contributions are extremely small relative to the value of the favors they allegedly buy. For some scholars small lobbying contributions are associated with a weak influence of lobbies' on policymaking; for others, lobbies heavily influence policy decisions in spite of the small contributions. We review this literature in Section 6.

[2] There are two main reasons for lobbying contributions. First, lobbies contribute to politicians and/or parties to influence electoral outcomes taking the political platform of the candidates as given (electoral motive). Second, lobbies seek to influence elected politicians' decisions or policies (influence motive). In this paper we concentrate on the second type of lobbying.

to influence the policy choice. The lobby (typically a firm or an industry) is self-interested and maximizes net profits, the difference between gross profits and contributions. The policymaker (typically a politician) observes the lobby's contribution and makes the policy decision. The policymaker is also assumed to be self-interested and maximizes a weighted average of social welfare and contributions given by the lobby.

The assumption that individuals are self-interested, despite its central role in economic analysis, is at odds with a large body of evidence from psychology and from experimental economics. Economic agents often pursue objectives other than actual payoff maximization. Many observed departures from material payoff maximizing behavior arise through actions that favor fairness or reciprocity.[3]

According to Fehr and Gächter (2000) "reciprocity means that in response to friendly actions, people are frequently much nicer and much more cooperative than predicted by the self-interest model (positive reciprocity); conversely, in response to hostile actions they are frequently much nastier and even brutal (negative reciprocity)." This is often referred to as intrinsic reciprocity or reciprocal preferences.

We extend Grossman and Helpman (2001) by assuming that the policymaker has reciprocal preferences.[4] Moreover, the policymaker considers that the lobby behaves kindly (unkindly) when the lobby makes a contribution greater (smaller) than a reference contribution. The policymaker responds to kind behavior of the lobby with a kind policy (positive reciprocity), while at the same time, he responds to unkind behavior of the lobby with an unkind policy (negative reciprocity).

We start by showing that policy is more favorable to the lobby with a reciprocal policymaker than with a self-interested one and therefore social welfare is lower. Hence, when a policymaker has reciprocal preferences there are adverse welfare con-

[3] See the literature review by Sobel (2005).

[4] We assume that the policymaker has reciprocal preferences but not the lobby since empirical evidence shows that lobbyists are typically self-interested. See e.g. Snyder (1990, 1992, 1993), Grier and Munger (1991), Romer and Snyder (1994), Kroszner and Stratmann (1998, 2000), Ansolabehere and Snyder (1999, 2000).

sequences for consumers.

The main finding of the paper is that positive reciprocity of the policymaker can make lobbying more effective in a strong sense: with a reciprocal policymaker the lobby obtains a more favorable policy, offers a lower contribution, and attains a higher net profit than with a self-interested policymaker. This happens when the reference contribution is low and when the policymaker is sufficiently responsive to kind behavior by the part of the lobby. The intuition behind this result is as follows.

When the reference contribution is low the model has a positive reciprocity equilibrium, i.e., an equilibrium where the lobby is kind to the policymaker and the policymaker is kind to the lobby. The lobby is kind to the policymaker because she gives a contribution greater than the reference contribution. The policymaker is kind to the lobby because he chooses a policy that is more favorable to the lobby than the policy a self-interested policymaker would choose. When the policymaker is sufficiently responsive to kind behavior by the part of the lobby, the lobby is able to obtain a more favorable policy offering a lower contribution.

Finally, we show that negative reciprocity of the policymaker can make lobbying less effective in a weak sense: with a reciprocal policymaker the lobby attains a lower net profit than with a self-interested policymaker. This happens when the policymaker is sufficiently responsive to unkind behavior by the part of the lobby.

2 Standard Model of Lobbying

Grossman and Helpman (2001, ch. 7) consider a game played between a policymaker and a lobby. The lobby–a monopolistic firm or an industry–produces a good that is sold at price p. In the absence of any policy intervention by the policymaker the lobby maximizes its profit $\pi(p)$ by choosing the monopoly price p^m. The policymaker–a politician or a political party–cares about social welfare and contributions given by the lobby. The policymaker chooses some policy p to regulate the monopoly and the lobby offers a contribution C to influence the policymaker's policy choice.

There is no uncertainty and the timing of the game is:

1. The lobby offers a contribution C to the policymaker.

2. The policymaker sets the policy p.

This is a dynamic game of complete information so the appropriate solution concept is Subgame Perfect Equilibrium (equilibrium from now on).

In the second stage, the policymaker sets the policy p. Specifically, the objective function of a self-interested policymaker is

$$G(p, C) = \alpha W(p) + (1 - \alpha)C \tag{1}$$

where $\alpha \in (0, 1)$ represents the weight the policymaker places on social welfare $W(p) = CS(p) + \pi(p)$, the sum of consumer surplus $CS(p)$ and the lobby's (gross) profit $\pi(p)$. Since $\pi(p) \geq 0$ and $CS(p) \geq 0$ (but $\pi(p)$ and $CS(p)$ are not zero at the same time), then $W(p) > 0$. Note that the contribution does not enter the objective function of the policymaker through aggregate welfare because otherwise it would be counted twice by the policymaker.

In the first stage, the lobby acts as a Stackelberg leader and picks the optimal policy-contribution bundle that leaves the policymaker at least indifferent between his favorite policy in the absence of any dealings with the lobby p^* and the lobby's desired policy. In the absence of any dealings with the lobby, the policymaker's favorite policy is $p^* = \arg\max W(p)$, i.e., $p^* = MC(p^*)$, where MC is the lobby's marginal cost of production. This leads to social welfare level $W(p^*)$.

Therefore, the problem of the lobby with a self-interested policymaker is:[5]

$$\begin{aligned} &\max_{p,C} \Pi(p, C) = \pi(p) - C \\ &\text{s.t. } \alpha W(p) + (1 - \alpha)C \geq \alpha W(p^*). \end{aligned}$$

[5]We assume that market demand and the lobby's costs are such that the lobby's gross profit and social welfare are both strictly concave functions of p. Hence, the second-order conditions to the lobby's problem are satisfied.

The equilibrium policy with a self-interested policymaker p^S is implicitly defined as

$$\frac{\alpha}{1-\alpha} = -\frac{\pi'(p^S)}{W'(p^S)}. \tag{2}$$

It follows from (2) and $\alpha \in (0,1)$ that $p^S \in (p^*, p^m)$. The equilibrium contribution with a self-interested policymaker C^S is

$$C^S(p^S) = \frac{\alpha\left[W(p^*) - W(p^S)\right]}{1-\alpha}. \tag{3}$$

We see from (3) that the equilibrium contribution with a self-interested policymaker is increasing with α. When α is close to 1 the policymaker has strong preferences for social welfare and it is very costly to influence its policy choice. When α is close to 0 the policymaker has strong preferences for the lobby's interests and there is little need for influence.

3 Introducing Reciprocal Preferences

The objective function of a reciprocal policymaker is

$$G(p, C; C^f) = \alpha W(p) + (1-\alpha)[C + g(C; C^f)], \tag{4}$$

where C^f represents the reference contribution which we assume to be nonnegative. The term $g(C; C^f)$ is the fairness payoff of the policymaker. If the policymaker views the lobby's contribution to be kind, i.e., to be greater than the reference contribution, then $g(C; C^f)$ is positive capturing positive reciprocity. If the policymaker views the lobby's contribution to be unkind, i.e., to be smaller than the reference contribution, then $g(C; C^f)$ is negative capturing negative reciprocity. If the policymaker considers the lobby's contribution to be neither kind nor unkind, i.e., to be equal to the reference contribution, then $g(C; C^f)$ is zero. We also assume that $g(C; C^f)$ is an increasing function of C and a decreasing function of C^f.

Throughout the paper we will focus on a linear specification for $g\left(C; C^f\right)$, namely,

$$g\left(C; C^f\right) = \begin{cases} \beta\left(C - C^f\right), & \text{if } C \geq C^f \\ -\lambda\beta\left(C^f - C\right), & \text{if } C < C^f \end{cases}, \tag{5}$$

where $\beta > 0$ and $\lambda > 1$. We see from (5) that as β gets closer to 0 the model collapses to the benchmark model of lobbying with a self-interested policymaker. The parameter β can also be thought of as a measure of the responsiveness of the policymaker to kind behavior by the part of the lobby. The assumption that $\lambda > 1$ implies that the policymaker is loss averse in the spirit of Kahneman and Tversky (1979), i.e., losses from some reference level figure larger than gains. A loss averse policymaker is more responsive to a contribution which is x units below the reference contribution than to one which is x units above it. The interaction term $\beta\lambda$ can be thought of as a measure of the responsiveness of the policymaker to unkind behavior by the part of the lobby.

Substituting (5) into (4) we obtain

$$G\left(p, C; C^f\right) = \begin{cases} \alpha W(p) + (1-\alpha)\left[C + \beta(C - C^f)\right], & \text{if } C \geq C^f \\ \alpha W(p) + (1-\alpha)\left[C - \lambda\beta(C^f - C)\right], & \text{if } C < C^f \end{cases}. \tag{6}$$

Recall from (1) that the preferences of a self-interested policymaker over policy and contributions are quasilinear. We see from (6) that the assumption that $g\left(C; C^f\right)$ is linear in contributions implies that the preferences of a reciprocal policymaker over policy and contributions are also quasilinear. Hence, the linear specification for $g\left(C; C^f\right)$ makes the benchmark model of lobbying directly comparable to the model of lobbying with a reciprocal policymaker.

4 Main Results

In this section we describe the impact of the policymaker's reciprocal preferences on lobbying effectiveness.

As in the benchmark model, the lobby picks the optimal policy-contribution bundle that leaves the reciprocal policymaker indifferent between his favorite policy in the absence of any dealings with the lobby p^* and the lobby's desired policy. The novelty is that the policymaker's objective function is now given by (6). Hence, the problem of the lobby is now:

$$\max_{p,C} \Pi(p, C) = \pi(p) - C$$
$$\text{s.t. } \alpha W(p) + (1-\alpha)\left[C + \beta(C - C^f)\right] \geq \alpha W(p^*) \qquad \text{if } C \geq C^f$$
$$\alpha W(p) + (1-\alpha)\left[C - \lambda\beta(C^f - C)\right] \geq \alpha W(p^*) \qquad \text{if } C < C^f. \qquad (7)$$

We will denote the values of p and C that solve this problem by p^R and C^R. Our first result characterizes the solution to (7).

Proposition 1: *The equilibrium price chosen by the reciprocal policymaker is implicitly defined by*

$$\begin{cases} \frac{\alpha}{(1-\alpha)(1+\beta)} = -\frac{\pi'(p_l^R)}{W'(p_l^R)} & \text{if } \quad 0 \leq C^f < C_l^f \\ W(p_m^R) = W(p^*) - \frac{1-\alpha}{\alpha} C^f & \text{if } \quad C_l^f \leq C^f \leq C_h^f \\ \frac{\alpha}{(1-\alpha)(1+\beta\lambda)} = -\frac{\pi'(p_h^R)}{W'(p_h^R)} & \text{if } \quad C_h^f < C^f \leq \bar{C}^f \end{cases},$$

the lobby's equilibrium contribution to the reciprocal policymaker is

$$C^R(p^R, C^f) = \begin{cases} \frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{(1-\alpha)(1+\beta)} + \frac{\beta}{1+\beta} C^f & \text{if } \quad 0 \leq C^f < C_l^f \\ C^f & \text{if } \quad C_l^f \leq C^f \leq C_h^f \\ \frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{(1-\alpha)(1+\beta\lambda)} + \frac{\beta\lambda}{1+\beta\lambda} C^f & \text{if } \quad C_h^f < C^f \leq \bar{C}^f \end{cases},$$

and the equilibrium net profit of the lobby is

$$\Pi(p^R, C^R(p^R, C^f)) = \begin{cases} \pi(p_l^R) - \frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{(1-\alpha)(1+\beta)} - \frac{\beta}{1+\beta} C^f & \text{if } \quad 0 \leq C^f < C_l^f \\ \pi\left(p_m^R\right) - C^f & \text{if } \quad C_l^f \leq C^f \leq C_h^f \\ \pi(p_h^R) - \frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{(1-\alpha)(1+\beta\lambda)} - \frac{\beta\lambda}{1+\beta\lambda} C^f & \text{if } \quad C_h^f < C^f \leq \bar{C}^f \end{cases},$$

where

$$C_l^f = \frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{1-\alpha},$$

and

$$C_h^f = \frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{1-\alpha},$$

and

$$\bar{C}^f = \frac{1+\beta\lambda}{\beta\lambda}\pi(p_h^R) - \frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{(1-\alpha)\beta\lambda}.$$

Proposition 1 tells us that the solution to (7) depends on the reference contribution C^f. If the reference contribution is low–$C^f \in [0, C_l^f)$–, then the game has a positive reciprocity equilibrium where the contribution given by the lobby to the policymaker is higher than the reference contribution: $C^R > C^f$. If the reference contribution is moderate–$C^f \in [C_l^f, C_h^f]$–, then the contribution given by the lobby to the policymaker is identical to the reference contribution: $C^R = C^f$. Finally, if the reference contribution is high–$C^f \in (C_h^f, \bar{C}^f]$–, then the game has a negative reciprocity equilibrium where the contribution given by the lobby to the policymaker is lower than the reference contribution: $C^R < C^f$.

From now on we will denote the policy-contribution bundle in a positive reciprocity equilibrium by $(p_l^R, C^R(p_l^R, C^f))$, that in a negative reciprocity equilibrium by $(p_h^R, C^R(p_h^R, C^f))$, and that in an equilibrium where the lobby gives the reference contribution to the policymaker by $(p_m^R, C^R(p_m^R, C^f))$. Our next result compares the three policy-contribution bundles.

Corollary 1:
(i) $p_l^R < p_h^R$;
(ii) $C_l^f < C_h^f$;
(iii) $C^R(p_l^R, C^f) < C_l^f$, *for all* $C^f \in [0, C_l^f)$;
(iv) $C_h^f < C^R(p_h^R, C^f)$, *for all* $C^f \in (C_h^f, \bar{C}^f]$;
(v) $p_m^R \in \left[p_l^R, p_h^R\right]$ *and* $C^R(p_m^R, C^f) \in [C_l^f, C_h^f]$.

Part (i) of Corollary 1 tells us that policy is lower in a positive reciprocity equilibrium than in a negative reciprocity equilibrium, i.e., $p_l^R < p_h^R$. This result is driven by the quasilinearity and loss aversion assumptions. Quasilinearity implies that the equilibrium policy does not depend on the contribution but only on the marginal impact of the contribution on the policy choice. Loss aversion implies that the marginal impact of the contribution on the policy choice is higher (lower) when the contribution is lower (higher) than the reference contribution. Hence, the policy choice in a negative reciprocity equilibrium must be higher than in a positive reciprocity equilibrium.

Part (ii) tells us that the threshold C_l^f is less than C_h^f, part (iii) that the contribution in a positive reciprocity equilibrium is lower than C_l^f, and part (iv) that the contribution in a negative reciprocity equilibrium is greater than C_h^f. These three results imply that the contribution in a positive reciprocity equilibrium is lower than that in a negative reciprocity equilibrium. The intuition behind this result is straightforward.

The lobby acts as a Stackelberg leader and picks the optimal policy-contribution bundle that leaves the policymaker at least indifferent between his favorite policy in the absence of any dealings with the lobby p^* and the lobby's desired policy. We know that in a positive reciprocity equilibrium the equilibrium policy is lower than that in a negative reciprocity equilibrium. Since the objective function of the policymaker is decreasing in policy (for prices above marginal cost) and increasing in contribution, in a positive reciprocity equilibrium the lobby can make the policymaker indifferent between p^* and p_l^R with a lower contribution than that needed to make the policymaker indifferent between p^* and p_h^R in a negative reciprocity equilibrium.

Part (v) of Corollary 1 shows that the policy in an equilibrium where the lobby gives the reference contribution to the policymaker is at least equal to the policy in a positive reciprocity equilibrium and at most equal to the policy in a negative reciprocity equilibrium, i.e., $p_m^R \in \left[p_l^R, p_h^R\right]$.

Proposition 2: *Welfare is lower with a reciprocal policymaker than with a self-interested policymaker, i.e.,* $W(p^R) < W(p^S)$*, for all* $p^R \in \{p_l^R, p_m^R, p_h^R\}$.

This result follows from the fact that social welfare is decreasing in policy for price above marginal cost and that policy is less favorable to the lobby with a self-interested policymaker than with a reciprocal policymaker, i.e., $p^S < p^R$ for any

$p^R \in \{p_l^R, p_m^R, p_h^R\}$.

Our next result is the main finding of the paper and shows that positive reciprocity of the policymaker can make lobbying more effective.

Proposition 3: *Let $C^f \in [0, C_l^f)$, i.e., the lobbying game with a reciprocal policymaker has a positive reciprocity equilibrium.*
(i) If $C^f \in [0, C_y^f)$, where

$$C_y^f = \frac{\alpha(1+\beta)}{\beta(1-\alpha)}\left[W(p^*) - W(p^S) - \frac{W(p^*) - W(p_l^R)}{1+\beta}\right], \tag{8}$$

and

$$\beta > \frac{W(p^S) - W(p_l^R)}{W(p^*) - W(p^S)}, \tag{9}$$

then $C^R(p_l^R, C^f) < C^S(p^S)$ and $\Pi(p_l^R, C^R(p_l^R, C^f)) > \Pi(p^S, C^S(p^S))$, $\forall C^f \in [0, C_y^f)$;
(ii) If $C^f \in [C_y^f, C_x^f]$, where

$$C_x^f = \frac{\alpha(1+\beta)}{\beta(1-\alpha)}\left[W(p^*) - W(p^S) - \frac{W(p^*) - W(p_l^R)}{(1+\beta)}\right] + \frac{1+\beta}{\beta}\left[\pi(p_l^R) - \pi(p^S)\right], \tag{10}$$

then $C^R(p_l^R, C^f) > C^S(p^S)$ and $\Pi(p_l^R, C^R(p_l^R, C^f)) > \Pi(p^S, C^S(p^S))$, $\forall C^f \in [C_y^f, C_x^f]$;
(iii) If $C^f \in (C_x^f, C_l^f)$, where

$$C_l^f = \frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{1-\alpha},$$

then $C^R(p_l^R, C^f) > C^S(p^S)$ and $\Pi(p_l^R, C^R(p_l^R, C^f)) < \Pi(p^S, C^S(p^S))$, $\forall C^f \in (C_x^f, C_l^f)$.

Part (i) of Proposition 3 shows that positive reciprocity of the policymaker makes lobbying more effective in a strong sense: with a reciprocal policymaker the lobby obtains a more favorable policy, offers a lower contribution, and attains a higher net profit than with a self-interested policymaker. This happens when the reference contribution is small–$C^f < C_y^f$ where C_y^f is given by (8)–and the reciprocal policymaker is sufficiently responsive to kind behavior by the lobby–β satisfies condition (9). The intuition behind this result is as follows.

In a positive reciprocity equilibrium the reciprocal policymaker considers the lobby's contributions to be kind and therefore chooses a higher policy than a self-interested policymaker. In addition, the fact that the reference contribution is small and the fact that the reciprocal policymaker is sufficiently responsive to kind behavior by the lobby, imply that the lobby can make the reciprocal policymaker indifferent between p^* and the lobby's preferred policy p_l^R giving a smaller contribution than that with a self-interested policymaker.

Part (ii) shows that if the reference contribution is moderate–$C^f \in [C_y^f, C_x^f]$ where C_x^f is given by (10)– then positive reciprocity of the policymaker makes lobbying more effective in a weak sense but not in a strong sense: with a reciprocal policymaker the lobby obtains a more favorable policy, offers a higher contribution and attains a higher net profit than with a self-interested policymaker.

Finally, part (iii) shows that if the reference contribution is high–$C^f \in (C_x^f, C_l^f)$–, then positive reciprocity of the policymaker makes lobbying less effective in a weak sense: with a reciprocal policymaker the lobby obtains a more favorable policy, offers a higher contribution, and attains a lower net profit than with a self-interested policymaker.

Our next result shows that negative reciprocity of the policymaker can make lobbying less effective in a weak sense, i.e., with a reciprocal policymaker the lobby's net profit can be lower than with a self-interested one.

Proposition 4: *If $C^f \in (C_h^f, \bar{C}^f]$, i.e., the lobbying game with a reciprocal policymaker has a negative reciprocity equilibrium, and*

$$\frac{\pi(p_h^R) - \pi(p^S)}{CS(p^S) - CS(p_h^R)} < \alpha, \tag{11}$$

then $C^R(p_h^R, C^f) > C^S(p^S)$ and $\Pi(p_h^R, C^R(p_h^R, C^f)) < \Pi(p^S, C^S(p^S))$, $\forall C^f \in (C_h^f, \bar{C}^f]$.

Proposition 4 provides a condition under which negative reciprocity makes lobbying less effective in a weak sense. If the policymaker is sufficiently responsive to unkind behavior of the lobby–the interaction term $\beta\lambda$ is high enough such that the left-hand side of (11) is less than α–, then the lobby attains a lower net profit with a reciprocal policymaker than with a self-interested one. The intuition behind this result is as follows.

In a negative reciprocity equilibrium the reciprocal policymaker considers the lobby's contribution to be unkind. We also know from Proposition 2 that policy is more favorable to the lobby in a negative reciprocity equilibrium than in an equilibrium with a self-interested policymaker. Hence, in a negative reciprocity equilibrium the lobby's contribution to the reciprocal policymaker must be greater than the equilibrium contribution with a self-interested policymaker. In addition, if the policymaker is sufficiently responsive to unkind behavior of the lobby, then the equilibrium net profit of the lobby with a reciprocal policymaker is smaller than the equilibrium net profit of the lobby with a self-interested policymaker because the negative effect of the higher contribution dominates the positive effect of the more favorable policy.

5 The Specialized Model

In this section we use a specialized version of the model to illustrate our main findings. A monopolist (the lobby) faces the following direct demand function for its good:

$$q = 1 - p. \tag{12}$$

The marginal cost of production is zero and there are no fixed costs. In the absence of policy interventions the lobby maximizes its profit $\pi(p) = p(1-p)$ by choosing the monopoly price $p^m = 1/2$. In this case social welfare is $W(p^m) = 3/8$.

Suppose now that a policymaker chooses $p \in \left[0, \frac{1}{2}\right]$ to regulate the monopoly and that the lobby can offer a contribution C to influence the choice of p. Specifically, from (12) the objective function of a self-interested policymaker is

$$G(p, C) = \alpha \left[\frac{(1-p)^2}{2} + p(1-p)\right] + (1-\alpha)C = \alpha \frac{1-p^2}{2} + (1-\alpha)C \tag{13}$$

where $CS(p) = \frac{(1-p)^2}{2}$, $\pi(p) = p(1-p)$, and $W(p) = \frac{1-p^2}{2}$. In the absence of any dealings with the lobby a policymaker sets the price equal to the marginal cost, i.e., $p^* = 0$ and social welfare is given by $W(p^*) = 1/2$.

The problem of the lobby with a self-interested policymaker is:

$$\max_{p,C} \Pi(p,C) = p(1-p) - C$$
$$s.t.\ \alpha\frac{1-p^2}{2} + (1-\alpha)\,C \geq \alpha\frac{1}{2}.$$

The equilibrium price with a self-interested policymaker is

$$p^S = \frac{1-\alpha}{2-\alpha} = \frac{1}{2+\frac{\alpha}{1-\alpha}}, \tag{14}$$

and the equilibrium contribution is

$$C^S = \frac{\alpha\,(1-\alpha)}{2(2-\alpha)^2}. \tag{15}$$

The net profit of the lobby with a self-interested policymaker is

$$\begin{aligned} \Pi(p^S, C^S) &= p^S(1-p^S) - C^S \\ &= \frac{1-\alpha}{2-\alpha}\left(1-\frac{1-\alpha}{2-\alpha}\right) - \frac{\alpha\,(1-\alpha)}{2(2-\alpha)^2} \\ &= \frac{1-\alpha}{2(2-\alpha)}. \end{aligned}$$

Social welfare with a self-interested policymaker is

$$\begin{aligned} W(p^S) &= CS(p^S) + \pi(p^S) \\ &= \frac{(1-p^S)^2}{2} + p^S(1-p^S) = \frac{1-(p^S)^2}{2} \\ &= \frac{1}{2(2-\alpha)^2} + \frac{1-\alpha}{(2-\alpha)^2} = \frac{3-2\alpha}{2(2-\alpha)^2}. \end{aligned}$$

The problem of the lobby with a reciprocal policymaker is:

$$\begin{aligned} &\max_{p,C} \Pi(p,C) = p(1-p) - C \\ &\text{s.t. } \alpha\frac{1-p^2}{2} + (1-\alpha)\left[C + \beta(C - C^f)\right] \geq \alpha\frac{1}{2} \qquad \text{if } C \geq C^f \\ &\qquad \alpha\frac{1-p^2}{2} + (1-\alpha)\left[C - \lambda\beta(C^f - C)\right] \geq \alpha\frac{1}{2} \qquad \text{if } C < C^f. \end{aligned} \tag{16}$$

Proposition 5: *In the specialized model the equilibrium price is*

$$p^R = \begin{cases} \frac{1}{2+\frac{\alpha}{(1-\alpha)(1+\beta)}} & \text{if} \quad 0 \leq C^f < C_l^f \\ \sqrt{\frac{2(1-\alpha)}{\alpha}C^f} & \text{if} \quad C_l^f \leq C^f \leq C_h^f \\ \frac{1}{2+\frac{\alpha}{(1-\alpha)(1+\beta\lambda)}} & \text{if} \quad C_h^f < C^f \leq \bar{C}^f \end{cases},$$

the lobby's contribution to the reciprocal policymaker is

$$C^R = \begin{cases} \frac{\alpha(1-\alpha)(1+\beta)}{2[2-\alpha+2\beta(1-\alpha)]^2} + \frac{\beta}{1+\beta}C^f & \text{if} \quad 0 \leq C^f < C_l^f \\ C^f & \text{if} \quad C_l^f \leq C^f \leq C_h^f \\ \frac{\alpha(1-\alpha)(1+\beta\lambda)}{2[2-\alpha+2\beta\lambda(1-\alpha)]^2} + \frac{\beta\lambda}{1+\beta\lambda}C^f & \text{if} \quad C_h^f < C^f \leq \bar{C}^f \end{cases},$$

and the net profit of the lobby is

$$\Pi(p^R, C^R) = \begin{cases} \frac{(1-\alpha)(1+\beta)}{2[2-\alpha+2\beta(1-\alpha)]} - \frac{\beta}{1+\beta}C^f & \text{if} \quad 0 \leq C^f < C_l^f \\ \sqrt{\frac{2(1-\alpha)}{\alpha}C^f} - \frac{2-\alpha}{\alpha}C^f & \text{if} \quad C_l^f \leq C^f \leq C_h^f \\ \frac{(1-\alpha)(1+\beta\lambda)}{2[2-\alpha+2\beta\lambda(1-\alpha)]} - \frac{\beta\lambda}{1+\beta\lambda}C^f & \text{if} \quad C_h^f < C^f \leq \bar{C}^f \end{cases},$$

where

$$C_l^f = \frac{\alpha(1-\alpha)\left(1+\beta\right)^2}{2\left[2-\alpha+2\beta(1-\alpha)\right]^2},$$

and

$$C_h^f = \frac{\alpha(1-\alpha)(1+\beta\lambda)^2}{2\left[2-\alpha+2\beta\lambda(1-\alpha)\right]^2},$$

and

$$\bar{C}^f = \frac{(1-\alpha)\left(1+\beta\lambda\right)^2}{2\beta\lambda\left[2-\alpha+2\beta\lambda(1-\alpha)\right]}.$$

We see from Proposition 5 that the main difference between the general and the specialized model is that in the latter we obtain explicit solutions for p^R and C^R as functions of the parameters: α, β, λ and C^f. It follows from Proposition 2 that in the specialized model of lobbying with a reciprocal policymaker welfare is lower than with a self-interested policymaker.[6]

We will now state the conditions under which a policymaker's reciprocal preferences make lobbying more or less effective in the specialized model.

Proposition 6: *In the specialized model:*
(i) If $C^f \in [0, C_y^f)$ *where*

$$C_y^f = \frac{\alpha(1-\alpha)(1+\beta)\left[4(1-2\alpha)(1+\beta)+\alpha^2(3+4\beta)\right]}{2(2-\alpha)^2\left[2-\alpha+2\beta(1-\alpha)\right]^2}, \tag{17}$$

and

$$\beta > \frac{4(2\alpha-1)-3\alpha^2}{(1-\alpha)^2}, \tag{18}$$

then $C^R(p_l^R, C^f) < C^S(p^S)$ *and* $\Pi(p_l^R, C^R(p_l^R, C^f)) > \Pi(p^S, C^S(p^S))$, $\forall C^f \in [0, C_y^f)$*;*
(ii) If $C^f \in [C_y^f, C_x^f]$*, where*

$$C_x^f = \frac{\alpha\,(1-\alpha)\,(1+\beta)}{2(2-\alpha)\left[2-\alpha+2\beta(1-\alpha)\right]}, \tag{19}$$

then $C^R(p_l^R, C^f) > C^S(p^S)$ *and* $\Pi(p_l^R, C^R(p_l^R, C^f)) > \Pi(p^S, C^S(p^S))$, $\forall C^f \in [C_y^f, C_x^f]$*;*
(iii) If $C^f \in (C_x^f, \bar{C}^f]$*, where*

$$\bar{C}^f = \frac{(1-\alpha)\,(1+\beta\lambda)^2}{2\beta\lambda\left[2-\alpha+2\beta\lambda(1-\alpha)\right]},$$

then $C^R(p^R, C^f) > C^S(p^S)$ *and* $\Pi(p^R, C^R(p^R, C^f)) < \Pi(p^S, C^S(p^S))$, $\forall C^f \in (C_x^f, \bar{C}^f]$.

Part (i) of Proposition 6 tells us that positive reciprocity of the policymaker makes lobbying more effective in a strong sense when the reference contribution is low–$C^f < C_y^f$ where C_y^f is given by (17)–and the policymaker's responsiveness to

[6] It is clear from Proposition 5 that $p^R > p^S$ for $C^f \in (0, C_l^f) \cup (C_h^f, \bar{C}^f)$. When $C^f \in [C_l^f, C_h^f]$. we have that $p^R > p^S$ is equivalent to $\sqrt{\frac{2(1-\alpha)}{\alpha}C^f} > \frac{1-\alpha}{2-\alpha}$. Solving for C^f we obtain $C^f > \frac{\alpha(1-\alpha)}{2(2-\alpha)^2} = C^S$. This inequality is satisfied since $\alpha\beta > 0$ implies $C_l^f = \frac{\alpha(1-\alpha)(1+\beta)^2}{2[2-\alpha+2\beta(1-\alpha)]^2} > \frac{\alpha(1-\alpha)}{2(2-\alpha)^2}$.

kind behavior by the lobby is sufficiently high–β satisfies condition (18).[7] Part (ii) tells us that positive reciprocity of the policymaker makes lobbying more effective in a weak sense but not in a strong sense when the reference contribution is moderate–$C^f \in [C^f_y, C^f_x]$ where C^f_x is given by (19). Part (iii) tells us that: (1) positive reciprocity of the policymaker makes lobbying less effective in a weak sense when the reference contribution is high–$C^f \in (C^f_x, C^f_l)$, (2) reciprocity of the policymaker makes lobbying less effective in a weak sense when the lobby gives the reference contribution to the policymaker, and (3) negative reciprocity of the policymaker always makes lobbying less effective in a weak sense since condition (11) is satisfied for all $\beta\lambda > 0$.[8]

6 Discussion

In this section we provide support for our main assumption. We also explain how our paper contributes to the economics' literature and discuss alternative explanations to Tullock's paradox.

We extend Grossman and Helpman's (2001) model of lobbying by relaxing the assumption that the policymaker is self-interested. Moreover, we assume that the policymaker has reciprocal preferences. This assumption finds some support in the literature that studies the personal interactions between lobbies and policymakers.

Susman (2008) observes that "reciprocity echoes throughout the halls of the Capitol, the tables of nearby restaurants, and even the witness stand at the federal courthouse." Igan and Mishra (2011) show that personal interactions between the lobbyist and the politician play a critical role on lobbying. To do that, they study the relationship between the political influence of the finance, insurance and real estate

[7]Note that since $\beta > 0$ inequality (18) is always satisfied for $\alpha \leq \frac{2}{3}$, i.e., when the weight placed by the policymaker on social welfare is relatively low by comparison with the weight placed on contributions. When $\alpha > \frac{2}{3}$ the condition is satisfied if $\beta > \frac{4(2\alpha-1)-3\alpha^2}{(1-\alpha)^2}$, i.e., when the policymaker is sufficiently responsive to kind behavior of the lobby.

[8]In the specialized model $\frac{\pi(p^R_h)-\pi(p^S)}{CS(p^S)-CS(p^R_h)} = \alpha\frac{4-2\alpha+2\beta\lambda(1-\alpha)}{4-2\alpha+2\beta\lambda(1-\alpha)+\beta\lambda(2+\alpha^2-3\alpha)} < \alpha$.

industry and financial regulation in the US between 1999 and 2006. They show that lobbyists were often previously employed in the politicians' staffs and that "spending an extra dollar is almost twice as effective in switching a legislator's position if the lobbyist is connected to the legislator compared to the case where the lobbyist is unconnected."[9]

We assume that the reference contribution is exogenous. One way to think of it is as a function of the history of contributions associated with past dealings of the lobby with policymakers. Hence, if the past history of contributions consists mostly of high (low) contributions, then the reference contribution is high (low). Another way to think of the reference contribution is that it depends on how close the lobbyist is to the policymaker. If the policymaker and the lobbyist are very close (e.g., friends or ex-colleagues), then the reference contribution is low. If the policymaker and the lobbyist are unknown to each other, then the reference contribution is high.[10]

Our paper is an additional contribution to the literature on the impact of fairness and reciprocity on market outcomes and economic interactions. Rabin (1993) and Rotemberg (2011) show that fairness concerns on the part of consumers can improve consumer welfare. For example, Rabin (1993) finds that a monopolist ought to set a price lower than "the monopoly price" if consumers have concerns about fairness. In contrast, we find that reciprocal preferences on the part of a policymaker towards a lobby reduce consumer welfare.

The paper offers a novel explanation to Tullock's paradox by showing that lobbying can be more effective with a reciprocal policymaker than with a self-interested one. Previous explanations to Tullock's paradox reflect two distinct views. A first strand of papers argue that small contributions are associated to a weak influence of lobbies on policies.

Konrad and Schleisinger (1997) study the impact of risk aversion on rent-seeking contests where players' expenditures raise either the probability of obtaining a payoff

[9]It is not clear from these studies whether the authors are referring to reciprocal perferences or instrumental reciprocity which is motivated by forward-looking self-interest in repeated interactions.

[10]Endogeneizing the reference contribution is left for future research.

or the payoff itself. In the latter case risk averse players lower their expenditures relative to risk neutral players to bear a lower risk.

Ansolabehere et al. (2003) argue that lobbying expenditures are low because politicians behave properly, i.e., they place a high weight on social welfare and a small weight on contributions.

In Cornes and Hartley (2003) loss averse lobbies devote few resources to lobbying instead of contributing more and enjoying a higher probability of success in lobbying. In fact, if a lobby offers a large contribution and an opposing lobby offers a larger contribution, the first lobby will loose the lobbying contest and experience a disutility greater than the utility resulting from the win of the contest.

A second strand of papers contends that lobbies heavily influence policy decisions in spite of the small contributions observed empirically. Our paper fits into this second category.

Helpman and Persson (2001) analyze legislative bargaining and lobbying in the congressional and parliamentary systems. They show that lobbies associated with agenda-setting policymakers (or with the government coalition) need small contributions to bias the policy outcome in their favor because the non-agenda setting policymakers compete to support the policy of the agenda-setting policymakers. Similarly, in Dal-Bó (2007) a lobby influence a committee with small or no expenditures by guaranteeing a contribution to a committee's member only if the latter is pivotal, which is not the case in equilibrium.

Dari-Mattiacci and Parisi (2005) posit that total expenditures in lobbying are low if returns to expenditures are sufficiently high. In this paper parties compete harshly to influence a policy decision and several parties prefer to quit the competition. The remaining parties offer contributions to politicians and obtain favorable policies but total expenditures are small.

Polborn (2006) models lobbying as a repeated competition between two groups for a prize in every time period. In each period the state of the game favors one group and both groups can choose to lobby policymakers to maintain or to change the status quo. The equilibrium expenditure necessary to change the status quo is low in comparison to the expected payoff when there is a sufficiently high probability that the per period payoff resulting from a favorable state raises in the next periods and the groups' discount factor is close to 1.

Chamon and Kaplan (forthcoming) propose a model of campaign contributions where a special interest group can condition its contributions not only on the receiving candidate's support but also on that of her opponent. They show that the implicit out-of-equilibrium threat of giving to the opponent can increase the effectiveness of contributing to the candidate.

7 Conclusion

We study the role that reciprocal preferences of policymakers might play on lobbying. To do that we extend Grossman and Helpman's (2001) model of lobbying by allowing the policymaker to not only care about social welfare and contributions but also about how contributions deviate from a reference contribution.

We find that policy is more favorable to the lobby with a reciprocal policymaker than with a self-interested one and therefore social welfare is lower. Hence, when policymakers have reciprocal preferences there are adverse welfare consequences for consumers.

We also find that if a reciprocal policymaker considers relatively small contributions by a lobby as kind and the policymaker is highly responsive to kind behavior of the lobby, then lobbying is more effective, i.e., the lobby obtains a more favorable policy with lower contributions with a reciprocal policymaker than with a self-interested one. This finding provides a new explanation for Tullock's paradox.

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9 Appendix

Proof of Proposition 1: If $C^f < C_l^f$, then $C^R > C^f$. In this case the first constraint in (7) is binding and the second constraint is slack. Therefore p^R is implicitly defined by

$$\frac{\alpha}{(1-\alpha)(1+\beta)} = -\frac{\pi'(p^R)}{W'(p^R)}, \tag{20}$$

Denote the solution to (20) by p_l^R. Solving the first constraint with respect to C^R we obtain

$$C^R(p_l^R, C^f) = \frac{\alpha \left[W(p^*) - W(p_l^R)\right]}{(1-\alpha)(1+\beta)} + \frac{\beta}{1+\beta}C^f. \tag{21}$$

Hence, when $C^f < C_l^f$ the lobby attains a net profit of

$$\Pi(p_l^R, C^f) = \pi(p_l^R) - \frac{\alpha \left[W(p^*) - W(p_l^R)\right]}{(1-\alpha)(1+\beta)} - \frac{\beta}{1+\beta}C^f. \tag{22}$$

If $C^f \in [C_l^f, C_h^f]$, then $C^R = C^f$ and p^R is implicitly defined as

$$W(p^R) = W(p^*) - \frac{1-\alpha}{\alpha}C^f. \tag{23}$$

Denote the solution to (23) by p_m^R. Hence, when $C^f \in [C_l^f, C_h^f]$ the lobby attains a net profit of

$$\Pi(p_m^R, C^f) = \pi\left(p_m^R\right) - C^f. \tag{24}$$

Finally, if $C^f > C_h^f$, then $C^R < C^f$. In this case the first constraint in (7) is slack and the second constraint is binding. Therefore p^R is implicitly defined by

$$\frac{\alpha}{(1-\alpha)(1+\beta\lambda)} = -\frac{\pi'(p^R)}{W'(p^R)}. \tag{25}$$

Denote the solution to (25) by p_h^R. Solving the second constraint with respect to C^R we obtain

$$C^R(p_h^R, C^f) = \frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{(1-\alpha)(1+\beta\lambda)} + \frac{\beta\lambda}{1+\beta\lambda}C^f. \tag{26}$$

Hence, when $C^f > C_h^f$ the lobby attains a net profit of

$$\Pi(p_h^R, C^f) = \pi(p_h^R) - \frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{(1-\alpha)(1+\beta\lambda)} - \frac{\beta\lambda}{1+\beta\lambda}C^f. \tag{27}$$

The critical thresholds C_l^f and C_h^f that determine the solution to the lobby's problem are obtained as follows. The threshold C_l^f is defined as the C^f such that $\Pi(p_l^R, C^R(p_l^R, C^f)) = \Pi(p_m^R(C^f), C^R(C^f))$, i.e.,

$$\pi(p_l^R) - \frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{(1-\alpha)(1+\beta)} - \frac{\beta}{1+\beta}C^f = \pi\left(p_l^R\right) - C^f. \tag{28}$$

Solving (28) for C^f we obtain

$$C_l^f = \frac{\alpha}{1-\alpha}\left[W(p^*) - W(p_l^R)\right].$$

The threshold C_h^f is defined as the C^f such that $\Pi(p_h^R, C^R(p_h^R, C^f)) = \Pi(p_h^R, C^R(C^f))$, i.e.,

$$\pi(p_h^R) - \frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{(1-\alpha)(1+\beta\lambda)} - \frac{\beta\lambda}{1+\beta\lambda}C_h^f = \pi\left(p_h^R\right) - C_h^f. \tag{29}$$

Solving (29) for C^f we obtain

$$C_h^f = \frac{\alpha}{1-\alpha}\left[W(p^*) - W(p_h^R)\right].$$

The threshold $\bar{C}^f$ is the highest reference contribution for which the net profit of the lobby is non-negative. *Q.E.D.*

Proof of Corollary 1:

(i) It follows from (20), (25), and the fact that $\lambda > 1$, that

$$\frac{\pi'(p_l^R)}{-W'(p_l^R)} = \frac{\alpha}{(1-\alpha)(1+\beta)} > \frac{\alpha}{(1-\alpha)(1+\beta\lambda)} = \frac{\pi'(p_h^R)}{-W'(p_h^R)}. \tag{30}$$

Suppose, by contradiction, that $p_l^R \geq p_h^R$. If $p_l^R \geq p_h^R$, then $\pi'(p_l^R) \leq \pi'(p_h^R)$ since $\pi' > 0$, $\pi'' < 0$. Also, if $p_l^R \geq p_h^R$, then $-W'(p_l^R) \geq -W'(p_h^R)$ since $W' < 0$ for $p > p^*$, and $W'' < 0$. These two results imply that

$$-\frac{\pi'(p_l^R)}{W'(p_l^R)} \leq -\frac{\pi'(p_h^R)}{W'(p_h^R)}$$

which contradicts (30). Hence it must be that $p_l^R < p_h^R$.

(ii) It follows from $p^* < p_l^R < p_h^R$ and $W'|_{p>p^*} < 0$ that $W(p_l^R) > W(p_h^R)$. Hence, $C_l^f < C_h^f$ since $C_l^f = \frac{\alpha}{1-\alpha}\left[W(p^*) - W(p_l^R)\right]$ and $C_h^f = \frac{\alpha}{1-\alpha}\left[W(p^*) - W(p_h^R)\right]$.

(iii) From (21) and (28) we have $\max_{C^f \in [0, C_l^f]} C^R(p_l^R, C^f) = C_l^f$. Since $C^R(p_l^R, C^f)$ is increasing with C^f it follows that $C_l^R = C^R(p_l^R, C^f) < C_l^f$ for any $C^f \in [0, C_l^f)$.

(iv) From (26) and (29) we have $\min_{C^f \in [C_h^f, \bar{C}^f]} C^R(p_h^R, C^f) = C_h^f$. Since $C^R(p_h^R, C^f)$ is increasing with C^f it follows that $C_h^R = C^R(p_h^R, C^f) > C_h^f$ for any $C^f \in (C_h^f, \bar{C}^f]$.

(v) From (23) and (28) we have $\min_{C^f \in [C_l^f, C_h^f]} p_m^R(C^f) = p_l^R$. From (23) and (29) we have that $\max_{C^f \in [C_l^f, C_h^f]} p_m^R(C^f) = p_h^R$. Therefore, $p_m^R \in [p_l^R, p_h^R]$. When $C^f \in [C_l^f, C_h^f]$ we have $C_m^R = C^f$ and so $C_m^R \in [C_l^f, C_h^f]$. *Q.E.D.*

Proof of Proposition 2: It follows from (2), (20), and $\beta > 0$ that

$$\frac{\pi'(p^S)}{-W'(p^S)} = \frac{\alpha}{1-\alpha} > \frac{\alpha}{(1-\alpha)(1+\beta)} = \frac{\pi'(p_l^R)}{-W'(p_l^R)}. \quad (31)$$

Suppose, by contradiction, that $p^S \geq p_l^R$. If $p^S \geq p_l^R$, then $\pi'(p^S) \leq \pi'(p_l^R)$ since $\pi' > 0$, $\pi'' < 0$. Also, if $p^S \geq p_l^R$, then $-W'(p^S) \geq -W'(p_l^R)$ since $W' < 0$ for $p > p^*$, and $W'' < 0$. These two results imply that

$$-\frac{\pi'(p^S)}{W'(p^S)} \leq -\frac{\pi'(p_l^R)}{W'(p_l^R)}$$

which contradicts (31). Hence it must be that $p^S < p_l^R$. Since welfare is decreasing with price for price above marginal cost, it follows that $W(p^S) > W(p_l^R)$. We know from Corollary 1 that $p_l^R < p_m^R < p_h^R$ hence $W(p^S) > W(p^R)$, $\forall p^R \in \{p_l^R, p_m^R, p_h^R\}$. *Q.E.D.*

Proof of Proposition 3:

(i) First note that $C_y^f < C_l^f$ since

$$\frac{\alpha(1+\beta)}{\beta(1-\alpha)}\left[W(p^*) - W(p^S) - \frac{W(p^*) - W(p_l^R)}{1+\beta}\right] < \frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{1-\alpha},$$

or

$$(1+\beta)\left[W(p^*) - W(p^S) - \frac{W(p^*) - W(p_l^R)}{1+\beta}\right] < \beta\left[W(p^*) - W(p_l^R)\right],$$

or

$$(1+\beta)[W(p^*) - W(p^S)] < (1+\beta)\left[W(p^*) - W(p_l^R)\right],$$

or

$$W(p_l^R) < W(p^S),$$

which is true given that $p^S < p_l^R$. Since $C^f < C_l^f$, it follows from Proposition 1 that $C^R > C^f$, i.e., the solution to the lobby's problem is a positive reciprocity equilibrium where C^R is given by (21). Therefore, $C^R(p_l^R, C^f) < C^S(p^S)$ as long as

$$\frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{(1-\alpha)(1+\beta)} + \frac{\beta}{1+\beta}C^f < \frac{\alpha\left[W(p^*) - W(p^S)\right]}{1-\alpha},$$

or

$$C^f < \frac{\alpha(1+\beta)}{\beta(1-\alpha)}\left[W(p^*) - W(p^S) - \frac{W(p^*) - W(p_l^R)}{1+\beta}\right] = C_y^f.$$

Since $C^f \geq 0$, the above inequality only makes sense when the term inside square brackets is positive, i.e.,

$$\beta > \frac{W(p^S) - W(p_l^R)}{W(p^*) - W(p^S)},$$

which is inequality (9). Hence, when $C^f \in [0, C_y^f)$ we have $C^R(p_l^R, C^f) < C^S(p^S)$ and $\Pi(p_l^R, C^R(p_l^R, C^f)) > \Pi(p^S, C^S(p^S))$, $\forall C^f \in [0, C_y^f)$.

(ii) In a positive reciprocity equilibrium the net profit of the lobby is

$$\Pi(p_l^R, C^R(p_l^R, C^f)) = \pi(p_l^R) - \frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{(1-\alpha)(1+\beta)} - \frac{\beta}{1+\beta}C^f.$$

Hence, $\Pi(p_l^R, C^R(p_l^R, C^f)) > \Pi(p^S, C^S(p^S))$ as long as

$$\pi(p_l^R) - \frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{(1-\alpha)(1+\beta)} - \frac{\beta}{1+\beta}C^f > \pi(p^S) - \frac{\alpha\left[W(p^*) - W(p^S)\right]}{1-\alpha}$$

or

$$\frac{\beta}{1+\beta}C^f < \pi(p_l^R) - \pi(p^S) - \frac{\alpha\left[W(p^*) - W(p_l^R)\right]}{(1-\alpha)(1+\beta)} + \frac{\alpha\left[W(p^*) - W(p^S)\right]}{1-\alpha}$$

or

$$C^f < \frac{\alpha(1+\beta)}{\beta(1-\alpha)}\left[W(p^*) - W(p^S) - \frac{W(p^*) - W(p_l^R)}{(1+\beta)}\right] + \frac{1+\beta}{\beta}\left[\pi(p_l^R) - \pi(p^S)\right] = C_x^f.$$

Hence, when $C^f \in [C_y^f, C_x^f]$ we have $C^R(p_l^R, C^f) > C^S(p^S)$ and $\Pi(p_l^R, C^R(p_l^R, C^f)) > \Pi(p^S, C^S(p^S))$, $\forall C^f \in [C_y^f, C_x^f]$.
(iii) Follows directly from (ii). *Q.E.D.*

Proof of Proposition 4: In a negative reciprocity equilibrium the equilibrium contribution is

$$C^R(p_h^R, C^f) = \frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{(1-\alpha)(1+\beta\lambda)} + \frac{\beta\lambda}{1+\beta\lambda}C^f, \ \forall C^f \in (C_h^f, \bar{C}^f].$$

We have that $C^R(p_h^R, C^f) \geq C^R(p_h^R, C_h^f)$. Hence $C^R(p_h^R, C^f) > C^S(p^S)$ $\forall C^f \in (C_h^f, \bar{C}^f]$ as long as $C^R(p_h^R, C_h^f) > C^S(p^S)$ or

$$\frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{(1-\alpha)(1+\beta\lambda)} + \frac{\beta\lambda}{1+\beta\lambda}C_h^f > \frac{\alpha\left[W(p^*) - W(p^S)\right]}{1-\alpha},$$

or

$$\frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{1-\alpha} > \frac{\alpha\left[W(p^*) - W(p^S)\right]}{1-\alpha},$$

which is true since $p_h^R > p^S$ implies $W(p_h^R) < W(p^S)$. The net profit of the lobby is

$$\Pi(p_h^R, C^R(p_h^R, C^f)) = \pi(p_h^R) - \frac{\alpha\left[W(p^*) - W(p_h^R)\right]}{(1-\alpha)(1+\beta\lambda)} - \frac{\beta\lambda}{1+\beta\lambda}C^f.$$

Since the net profit of the lobby is decreasing with C^f the highest possible net profit of the lobby for $C^f \in [C_h^f, \bar{C}^f]$ is attained at C_h^f. We will now show that (11) implies that $\Pi(p_h^R, C^R(p_h^R, C_h^f)) < \Pi(p^S, C^S(p^S))$, i.e.,

$$\pi(p_h^R) - \frac{\alpha \left[W(p^*) - W(p_h^R)\right]}{1-\alpha} < \pi(p^S) - \frac{\alpha \left[W(p^*) - W(p^S)\right]}{1-\alpha},$$

or

$$(1-\alpha)\left[\pi(p_h^R) - \pi(p^S)\right] < \alpha\left[\pi(p^S) + CS(p^S) - \pi(p_h^R) - CS(p_h^R)\right],$$

or

$$\alpha > \frac{\pi(p_h^R) - \pi(p^S)}{CS(p^S) - CS(p_h^R)}.$$

Q.E.D.

Proof of Proposition 5: In a positive reciprocity equilibrium $C^R > C^f$ and (p^R, C^R) are given by

$$1 - 2p = \frac{\alpha p}{(1-\alpha)(1+\beta)}$$

$$\alpha\frac{1-p^2}{2} + (1-\alpha)\left[(1+\beta)C - \beta C^f\right] = \frac{\alpha}{2}.$$

Solving the first equation for p we obtain

$$p_l^R = \frac{(1-\alpha)(1+\beta)}{2-\alpha+2\beta(1-\alpha)} = \frac{1}{2+\frac{\alpha}{(1-\alpha)(1+\beta)}} > p^S. \tag{32}$$

Solving the second equation for C we obtain

$$C^R = \frac{\alpha(p^R)^2}{2(1-\alpha)(1+\beta)} + \frac{\beta}{1+\beta}C^f, \tag{33}$$

where p^R is given by (32). It follows from (32) and (33) that

$$C^R = \frac{\alpha(1-\alpha)(1+\beta)}{2\left[2-\alpha+2\beta(1-\alpha)\right]^2} + \frac{\beta}{1+\beta}C^f.$$

Hence, in a positive reciprocity equilibrium the net profit of the lobby is

$$\Pi(p^R, C^R) = p_l^R(1-p_l^R) - C^R = \frac{(1-\alpha)(1+\beta)}{2\left[2-\alpha+2\beta(1-\alpha)\right]} - \frac{\beta}{1+\beta}C^f.$$

In a negative reciprocity equilibrium $C^R < C^f$ and (p^R, C^R) are given by

$$1 - 2p = \frac{\alpha p}{(1-\alpha)(1+\beta\lambda)}$$
$$\alpha\frac{1-p^2}{2} + (1-\alpha)\left[(1+\beta\lambda)C - \lambda\beta C^f\right] = \frac{\alpha}{2}$$

Solving the first equation for p we obtain

$$p_h^R = \frac{(1-\alpha)(1+\beta\lambda)}{2-\alpha+2\beta\lambda(1-\alpha)} = \frac{1}{2+\frac{\alpha}{(1-\alpha)(1+\beta\lambda)}} > p^S. \tag{34}$$

Solving the second equation for C we obtain

$$C^R = \frac{\alpha(p^R)^2}{2(1-\alpha)(1+\beta\lambda)} + \frac{\beta\lambda}{1+\beta\lambda}C^f, \tag{35}$$

where p^R is given by (34). It follows from (34) and (35) that

$$C^R = \frac{\alpha(1-\alpha)(1+\beta\lambda)}{2\left[2-\alpha+2\beta\lambda(1-\alpha)\right]^2} + \frac{\beta\lambda}{1+\beta\lambda}C^f.$$

Hence, in a negative reciprocity equilibrium the net profit of the lobby is

$$\Pi(p^R, C^R) = p_h^R(1-p_h^R) - C^R = \frac{(1-\alpha)(1+\beta\lambda)}{2\left[2-\alpha+2\beta\lambda(1-\alpha)\right]} - \frac{\beta\lambda}{1+\beta\lambda}C^f.$$

In an equilibrium where the lobby gives the reference contribution to the policymaker p^R is given by

$$p_m^R = \sqrt{\frac{2(1-\alpha)}{\alpha}C^f},$$

and the net profit of the lobby is

$$\Pi(p^R, C^R) = p_m^R(1-p_m^R) - C^R = \sqrt{\frac{2(1-\alpha)}{\alpha}C^f} - \frac{2-\alpha}{\alpha}C^f.$$

The solution to the problem depends on C^f. If C^f is relatively low, then the game has a positive reciprocity equilibrium. This happens for $C^f < C_l^f$ where C_l^f is the solution to

$$\frac{(1-\alpha)(1+\beta)}{2\left[2-\alpha+2\beta(1-\alpha)\right]} - \frac{\beta}{1+\beta}C^f = \sqrt{\frac{2(1-\alpha)}{\alpha}C^f} - \frac{2-\alpha}{\alpha}C^f,$$

or

$$\left[\frac{2-\alpha+2\beta(1-\alpha)}{\alpha\,(1+\beta)}\right]^2 (C^f)^2 - \frac{(1-\alpha)}{\alpha}C^f + \left\{\frac{(1-\alpha)\,(1+\beta)}{2\,[2-\alpha+2\beta(1-\alpha)]}\right\}^2 = 0.$$

The double root of this quadratic equation is

$$C_l^f = \frac{\alpha(1-\alpha)\,(1+\beta)^2}{2\,[2-\alpha+2\beta(1-\alpha)]^2}. \tag{36}$$

If C^f is relatively high, then the game has a negative reciprocity equilibrium. This happens for $C^f > C_h^f$ where C_h^f is the solution to

$$\frac{(1-\alpha)\,(1+\beta\lambda)}{2\,[2-\alpha+2\beta\lambda(1-\alpha)]} - \frac{\beta\lambda}{1+\beta\lambda}C^f = \sqrt{\frac{2(1-\alpha)}{\alpha}C^f} - \frac{2-\alpha}{\alpha}C^f,$$

or

$$\left[\frac{2-\alpha+2\beta\lambda(1-\alpha)}{\alpha(1+\beta\lambda)}\right]^2 (C^f)^2 - \frac{1-\alpha}{\alpha}C^f + \left\{\frac{(1-\alpha)\,(1+\beta\lambda)}{2\,[2-\alpha+2\beta\lambda(1-\alpha)]}\right\}^2 = 0.$$

The double root of this quadratic equation is

$$C_h^f = \frac{\alpha(1-\alpha)(1+\beta\lambda)^2}{2\,[2-\alpha+2\beta\lambda(1-\alpha)]^2}. \tag{37}$$

The assumption that $\lambda > 1$, (36) and (37) imply that $C_l^f < C_h^f$. When C^f is moderate, i.e., $C^f \in [C_l^f, C_h^f]$, then $C^R = C^f$. The threshold $\bar{C}^f$ is the highest reference contribution for which the net profit of the lobby is non-negative. *Q.E.D.*

Proof of Proposition 6: To prove this result we proceed as follows. First we show that for reference contributions above (below) C_x^f the lobby's net profit is lower (higher) with a reciprocal policymaker than with a self-interested one. Second, we show that for reference contributions below C_y^f and for sufficiently high β the lobby can obtain a more favorable policy with a smaller contribution. Note that $C_x^f < C_l^f$ since

$$\frac{\alpha\,(1-\alpha)\,(1+\beta)}{2(2-\alpha)\,[2-\alpha+2\beta(1-\alpha)]} < \frac{\alpha(1-\alpha)\,(1+\beta)^2}{2\,[2-\alpha+2\beta(1-\alpha)]^2},$$

or

$$\frac{1}{2-\alpha} < \frac{1+\beta}{2-\alpha+2\beta(1-\alpha)},$$

or

$$\alpha\beta > 0,$$

which is true since $\alpha \in (0,1)$ and $\beta > 0$. If $C^f \in (0, C_l^f)$, then $\Pi(p^R, C^R) \geq \Pi(p^S, C^S)$ if and only if

$$\frac{(1-\alpha)(1+\beta)}{2\left[2-\alpha+2\beta(1-\alpha)\right]} - \frac{\beta}{1+\beta}C^f \geq \frac{1-\alpha}{2(2-\alpha)}.$$

or

$$C^f \leq \frac{\alpha(1-\alpha)(1+\beta)}{2(2-\alpha)\left[2-\alpha+2\beta(1-\alpha)\right]} = C_x^f.$$

It follows that if $C^f \in (C_x^f, C_l^f)$, then $\Pi(p^R, C^R) < \Pi(p^S, C^S)$. Now consider the case where $C^f \in [C_l^f, C_h^f]$. We have that

$$\arg\max_{C^f} \sqrt{\frac{2(1-\alpha)}{\alpha}C^f} - \frac{2-\alpha}{\alpha}C^f = \frac{\alpha(1-\alpha)}{2(2-\alpha)^2} < C_l^f.$$

Hence,

$$\arg\max_{C^f \in [C_l^f, C_h^f]} \sqrt{\frac{2(1-\alpha)}{\alpha}C^f} - \frac{2-\alpha}{\alpha}C^f = C_l^f.$$

The correspondent net profit is

$$\sqrt{\frac{2(1-\alpha)}{\alpha}C_l^f} - \frac{2-\alpha}{\alpha}C_l^f = \frac{(1-\alpha)(1+\beta)(1-\alpha\beta)}{2\left[2-\alpha+2\beta(1-\alpha)\right]}.$$

We have that

$$\frac{1-\alpha}{2(2-\alpha)} > \frac{(1-\alpha)(1+\beta)(1-\alpha\beta)}{2\left[2-\alpha+2\beta(1-\alpha)\right]}$$

or

$$2-\alpha+2\beta(1-\alpha) > (2-\alpha)(1+\beta)(1-\alpha\beta)$$

or

$$\alpha\beta\left[(1-\alpha)+\beta(2-\alpha)\right] > 0.$$

which is true. Finally, in the case where $C^f \in (C_h^f, \bar{C}^f]$ we have

$$\frac{1-\alpha}{2(2-\alpha)} > \frac{(1-\alpha)(1+\beta\lambda)}{2\left[2-\alpha+2\beta\lambda(1-\alpha)\right]} - \frac{\beta\lambda}{1+\beta\lambda}C^f,$$

is true if

$$\frac{1-\alpha}{2(2-\alpha)} > \frac{(1-\alpha)(1+\beta\lambda)}{2\left[2-\alpha+2\beta\lambda(1-\alpha)\right]} - \frac{\beta\lambda}{1+\beta\lambda}C_h^f$$

or

$$\frac{1-\alpha}{2(2-\alpha)} > \frac{(1-\alpha)(1+\beta\lambda)}{2\left[2-\alpha+2\beta\lambda(1-\alpha)\right]} - \frac{\beta\lambda}{1+\beta\lambda}\frac{\alpha(1-\alpha)(1+\beta\lambda)^2}{2\left[2-\alpha+2\beta\lambda(1-\alpha)\right]^2}$$

or

$$\alpha\beta\lambda\left[(1-\alpha)+\beta\lambda(2-\alpha)\right] > 0.$$

which is true. We will now show that for $C^f < C_y^f$ and for sufficiently high β the lobby can obtain a more favorable policy with less contributions. First, note that $C_y^f < C_x^f$ since

$$\frac{\alpha(1-\alpha)(1+\beta)\left[4(1-2\alpha)(1+\beta)+\alpha^2(3+4\beta)\right]}{2(2-\alpha)^2\left[2-\alpha+2\beta(1-\alpha)\right]^2} < \frac{\alpha(1-\alpha)(1+\beta)}{2(2-\alpha)\left[2-\alpha+2\beta(1-\alpha)\right]}$$

or

$$4(1-2\alpha)(1+\beta)+\alpha^2(3+4\beta) < (2-\alpha)\left[2-\alpha+2\beta(1-\alpha)\right]$$

or

$$\alpha+\alpha\beta < 2+\beta,$$

which is true given that $\alpha \in (0,1)$. If $C^f < C_x^f$, then $C^R < C^S$ if and only if

$$\frac{\alpha(1-\alpha)(1+\beta)}{2\left[2-\alpha+2\beta(1-\alpha)\right]^2} + \frac{\beta}{1+\beta}C^f < \frac{\alpha(1-\alpha)}{2(2-\alpha)^2}$$

or

$$C^f < \frac{\alpha(1-\alpha)(1+\beta)\left[4(1-2\alpha)(1+\beta)+\alpha^2(3+4\beta)\right]}{2(2-\alpha)^2\left[2-\alpha+2\beta(1-\alpha)\right]^2} = C_y^f.$$

Since $C^f \geq 0$ the above inequality only makes sense if the term inside square brackets is positive, i.e.,

$$\beta > \frac{4(2\alpha-1)-3\alpha^2}{(1-\alpha)^2}.$$

Q.E.D.